2009

THE CANADIAN PHYTOPATHOLOGICAL SOCIETY

CANADIAN PLANT DISEASE SURVEY

DISEASE HIGHLIGHTS

SOCIÉTÉ CANADIENNE DE PHYTOPATHOLOGIE

INVENTAIRE DES MALADIES DES PLANTES AU CANADA

APERÇU DES MALADIES

The Society recognizes the continuing need to publish plant disease surveys to document plant pathology in Canada and to benefit federal, provincial and other agencies in planning research and development on disease control.

La Société estime qu'il est nécessaire de publier régulièrement les résultats d'études sur l'état des maladies au Canada afin qu'ils soient disponibles aux phytopathologistes et qu'ils aident les organismes fédéraux, provinciaux et privés à planifier la recherche et le développement en lutte contre les maladies.

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Canadian Plant Disease Survey

Inventaire des maladies des plantes au Canada

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Contents: **DISEASE HIGHLIGHTS** - 2009 GROWING SEASON
(+ earlier years for historical significance)

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

Authors who wish to publish articles and notes on other aspects of plant pathology are encouraged to submit this material to the scientific journal of their choice, such as the Canadian Journal of Plant Pathology or Phytoprotection

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

Les auteurs qui veulent publier des articles et des notes sur d'autres aspects de la phytopathologie sont invités à soumettre leurs textes à la revue scientifique de leur choix, par exemple à la Revue canadienne de phytopathologie ou à Phytoprotection.

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DIAGNOSTIC LABORATORIES / LABORATOIRES DIAGNOSTIQUES

CEREALS / CÉRÉALES

Diagnostic Laboratories / Laboratories Diagnostiques

CROPS: Commercial Crops - Diagnostic Laboratory Report
LOCATION: British Columbia

NAMES AND AGENCY:
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TITLE: DISEASES DIAGNOSED ON COMMERCIAL CROPS SUBMITTED TO THE BCMAL PLANT DIAGNOSTIC LABORATORY IN 2008

METHODS: The British Columbia Ministry of Agriculture and Lands (BCMAL) Plant Diagnostic Laboratory provides diagnoses and control recommendations for diseases including plant parasitic nematodes, insect pests and disorders of commercial agricultural crops grown in British Columbia. The following data reflect samples submitted to the laboratory by the ministry staff, growers, agri-businesses, parks boards, and Master Gardeners. Diagnoses were accomplished by microscopic examination, culturing onto artificial media, biochemical identification of bacteria using BIOLOG®, serological testing of viruses and some fungi and bacteria with micro-well and membrane based enzyme linked immunosorbent assay (ELISA). Molecular techniques were used for identification of some species-specific diagnoses. Some specimens were referred to other laboratories for identification or confirmation of the diagnosis.

RESULTS AND COMMENTS: The year 2008 was relatively a mild year for most diseases. After an initial wet spring, the weather was dry during the peak cropping season and many fungi and bacteria did not establish and cause crop damage. Summaries of the diseases and their causal agents diagnosed on commercial crop samples submitted to the lab are presented in Tables 1-13 by crop category. New and noteworthy findings are indicated by asterisks and footnotes in the tables. 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, drought stress, physiological response to growing conditions and genetic abnormalities, environmental and chemical stresses including herbicide damage, fruit abortion due to lack of pollination, poor samples, insect-related injury and damage where no conclusive causal factor was identified.

Table 1.0 Summary of diseases diagnosed on **bulb crop** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Narcissus	Nematode damage	*Ditylenchus* sp. and *Pratylenchus* sp.	1
		Pratylenchus sp.	1
Soil	Nematode presence	*Ditylenchus* sp.	1
		Pratylenchus sp.	4
Tulipa	Botrytis blight	*Botrytis tulipae*	1
	Bulb rot	*Penicillium* sp. and *Sclerotinia* sp.	1

DISEASED SAMPLES	9
ABIOTIC AND OTHER DISORDERS	1
TOTAL SUBMISSIONS	10

Table 2.0 Summary of diseases diagnosed on **Christmas tree** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Abies	Needle rust	*Uredinopsis* sp.	1
Abies grandis	Root rot	Oomycete	1
Pseudotsuga menziesii	Foliar blight	*Botrytis cinerea* and *Cladosporium* sp.	1
	Twig blight	*Sclerophoma* sp.	1

DISEASED SAMPLES	4
ABIOTIC AND OTHER DISORDERS	2
TOTAL SUBMISSIONS	6

Table 3.0 Summary of diseases diagnosed on **field crop** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Barley	Virus infection	Suspect barley yellow dwarf virus	1
Wheat	Sharp eye spot	*Rhizoctonia* sp.	1

DISEASED SAMPLES	2
ABIOTIC AND OTHER DISORDERS	1
TOTAL SUBMISSIONS	3

Table 4.0 Summary of diseases diagnosed on **greenhouse floriculture** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Alstroemeria	Grey mould	*Botrytis* sp.	1
Andropogon	Powdery mildew	*Erysiphe* sp.	1
Begonia	Powdery mildew	*Microsphaeria begoniae*	1
Bellis	Crown rot	Oomycete	1
	Leaf blight	*Ascochyta* sp.	1
Brugmansia	Virus	*Colombian datura virus**	1
Centaurea cineraria	Root rot	Oomycete and *Rhizoctonia* sp.	1
Cheiranthus	Web blight	*Rhizoctonia solani*	1
Cymbidium	Leaf mottling	*Odontoglossum ring spot virus*	1
	Leaf mottling	*Tobacco mosaic virus*	1
Datura	Leaf spot	*Impatiens necrotic spot virus*	1
Draceana	Crown / root rot	*Phytophthora* sp.	1
Helichrysum	Grey mould	*Botrytis cinerea*	1
Heuchera	Foliar blight	*Botrytis cinerea*	1
	Rust	*Puccinia heucherae*	1
Jasminum	Damping off	*Fusarium* sp.	1
Lilium	Foliar blight	*Botrytis* sp.	2
	Root rot	*Rhizoctonia* sp. and Oomycete	1
Narcissus	Rust	*Puccinia* sp.	1
	Smoulder	*Sclerotinia* sp.	1
Oncydium	Leaf spotting	*Cymbidium mosaic virus*	1
Ophiopogon	Leaf spot/blight	*Colletotrichum* sp.	1
Pelargonium	Root rot	*Pythium* sp.	1
Petunia	Leaf mottle	*Tobacco mosaic virus*	1
Phlox	Anthracnose	*Colletotrichum* sp.	1
Physocarpus	Leaf spot	*Phyllosticta* sp.	1
Poinsettia	Root rot	*Pythium* sp.	1
Rosa	Blossom blight	*Botrytis cinerea*	1
	Downy mildew	*Peronospora sparsa*	1
Rosamarinus	Root rot	*Thielaviopsis basicola*	1
	Stem canker	*Phoma* sp.	1
Salvia	Damping off	Oomycete and *Thielaviopsis* sp.	1
	Leaf and stem spot	*Cylindrocladium* sp	1
Schlumbergera	Leaf spot	*Impatiens necrotic spot virus*	1
Zinnia	Leaf spot	*Alternaria* sp.	1
	Stem canker	*Botrytis cinerea*	1

DISEASED SAMPLES	37
ABIOTIC AND OTHER DISORDERS	16
TOTAL SUBMISSIONS	64

* First report of this virus in Canada

Table 5.0 Summary of diseases diagnosed on **greenhouse vegetable** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Pepper	Fruit mottling	*Pepper mild mottle virus* and *Tobacco mosaic virus*	1
		Pepper mild mottle virus	1
Tomato	Bacterial canker	*Clavibacter michiganensis* subsp. *michiganensis*	17*
	Bacterial stem rot	*Pectobacterium carotovorum* subsp. *carotovorum*	1
	Fruit rot	*Penicillium* sp.	1
	Leaf mould	*Cladosporium fulvum*	1

DISEASED SAMPLES	22
ABIOTIC AND OTHER DISORDERS	19
TOTAL SUBMISSIONS	41

* All cuttings from one greenhouse

Table 6.0 Summary of diseases diagnosed on **mushroom** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Mushroom	Green mould	*Trichoderma aggresivium*	2

DISEASED SAMPLES	2
ABIOTIC AND OTHER DISORDERS	1
TOTAL SUBMISSIONS	3

Table 7.0 Summary of diseases diagnosed on **herbaceous perennial** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	No.
Epimedium	Leaf mottling and lines	*Tobacco rattle virus**	1
Heuchera	Crown / root rot	Oomycete	1
Hypericum	Root rot	*Thielaviopsis basicola*	1
Lamium	Root rot	Oomycete	1
Paeonia	Crown rot	*Rhizoctonia* sp.	1
Phlox	Downy mildew	*Peronospora phlogina*	2
Populus	Damping off	*Pythium* sp.	1
	Leaf spot	*Alternaria* sp.	1
Sedum	Leaf spot	*Alternaria* sp.	1
	Powdery mildew	*Erysiphe polygoni*	1
Spiraea	Leaf spot	*Cercospora* sp.	1
Thymus	Root rot	Oomycete	1
Vinca	Leaf spot	*Cylindrocladium* sp.	1

DISEASED SAMPLES	14
ABIOTIC AND OTHER DISORDERS	2
TOTAL SUBMISSIONS	16

***** Cuttings from an infected potted plant in a greenhouse. Nematode vector was not detected in the potting soil.

Table 8.0 Summary of diseases diagnosed on **small fruit and nut** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Black Currant	Stem canker	*Nectria* sp.	1
Blueberry	Bacterial blight	*Pseudomonas syringae*	4
	Blueberry Scorch Virus	*Blueberry scorch virus*	5
	Bud blight	*Godronia cassandrae*	1
	Cane die back	*Phomopsis* sp. and *Botrytis* sp.	1
	Crown gall	*Agrobacterium tumefaciens*	1
	Crown rot	*Phytophthora* sp.	1
	Fruit rot	*Botrytis cinerea*	2
		Phomopsis sp.	1
	Godronia canker	*Godronia cassandrae*	6
	Leaf spot	*Gloeosporium* sp.	2
		Alternaria sp. and *Botrytis* sp.	1
	Mummy berry	*Monilinia vaccinii-corymbosi*	1
	Nematode contribution	*Hoplolaimid* sp.	2
		Paratrichodorus sp.	7
		Pratylenchus sp.	3
	Root rot	*Armillaria* sp.	4
		Oomycete	8
		Pratylenchus sp. and Oomycete	1
		Phomopsis sp. and *Coniothyrium* sp.	1
	Stem girdling	*Phomopsis* sp.	1
	Tip dieback	*Botrytis cinerea*	1
	Twig blight	*Godronia cassandrae* and *Phomopsis* sp.	1
		Phomopsis sp.	1
	Twig dieback	*Coniothyrium* sp.	1
Blueberry cuttings	Damping off	*Fusarium* sp. and *Cylindrocarpon* sp.	1
Cranberry	Black rot fungus	*Allantophomopsis cytisporea*	1
	Upright dieback	*Phomopsis* sp.	1
Raspberry	Anthracnose	*Elsinoe veneta*	1
	Ascospora dieback	*Coryneum* sp.	1
	Cane blight	*Botrytis cinerea* and *Phomopsis* sp.	1
	Crown gall	*Agrobacterium tumefaciens*	2
	Nematode contribution	*Pratylenchus* sp.	4
	Nematode damage	*Pratylenchus* sp. and *Xiphinema* sp.	1
	Root rot	*Phytophthora* sp.	3
	Spur blight	*Didymella applanata*	1
Strawberry	Fruit rot	*Mucor* sp.	1
Hazelnut	Bacterial blight	*Xanthomonas campestris* pv. *corylina*	1
	Root rot	*Cylindrocarpon* sp.	1
	Eastern Filbert blight	*Anisogramma anomala*	1

DISEASED SAMPLES	82
ABIOTIC AND OTHER DISORDERS	180
TOTAL SUBMISSIONS	266

Table 9.0 Summary of diseases diagnosed on **specialty crop** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Basil	Vascular wilt	*Fusarium oxysporum*	1
Garlic	Bulb rot	*Botrytis* sp.	1
Kiwi	Stem canker	*Nectria cinnabarina*	1
Oregano	Root rot	Oomycete	1
Sage	Root rot	*Fusarium* sp. and *Pythium* sp.	1
Tarragon	Nematode damage	*Pratylenchus* sp.	1
Thyme	Root rot	Oomycete & *Rhizoctonia* sp.	1
DISEASED SAMPLES			7
ABIOTIC AND OTHER DISORDERS			4
TOTAL SUBMISSIONS			11

Table 10.0 Summary of diseases diagnosed on **tree fruit** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Apple	Nectria Canker	*Cylindrocarpon* sp.	1
	Nematode contribution	*Pratylenchus* sp.	12
		Pratylenchus sp. and *Criconemella* sp.	1
		Pratylenchus sp. and *Xiphinema* sp.	1
	Root rot	Oomycete	1
Apricot	Storage rot	Multiple fungi (*Penicillium* spp., *Fusarium* spp. and *Monilinia* spp)	1
Cherry	Nematode contribution	*Pratylenchus* sp.	8
		Pratylenchus sp. and *Criconemella* sp.	4
		Pratylenchus sp. and *Xiphinema* sp.	1
		Xiphinema sp.	3
Grape	Root rot	*Armillaria* sp.	1
		Oomycete and *Rhizoctonia* sp.	1
Nectarine	Nematode damage	*Pratylenchus* sp.	1
Pear	Leaf spot	*Phyllosticta* sp. and *Alternaria* sp.	1
DISEASED SAMPLES			37
ABIOTIC AND OTHER DISORDERS			30
TOTAL SUBMISSIONS			67

Table 11.0 Summary of diseases diagnosed on **turfgrass** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Bentgrass	Poor roots	Parasitic Nematodes and *Pythium* sp.	1
Bent/Poa	Black layer	Algae	1
	Brown patch	*Rhizoctonia solani*	1
	Downy mildew	*Sclerophthora* sp.	1
	Nematode damage	*Meloidogyne* sp. /*Helicotylenchus* sp.	1
Golf	Brown patch	*Rhizoctonia solani*	1
Green	Downy mildew	*Sclerophoma* sp.	2
	Foliar Anthracnose	*Colletotrichum graminicola*	1
	Fusarium patch	*Microdochium nivale*	2
	Nematode contribution	*Meloidogyne* sp.	2
	Nematode damage	*Aphelenchoides* sp.	2
		Helicotylenchus sp.	1
		Helicotylenchus sp. and *Meloidogyne* sp.	3
		Tylenchorhynchus sp.	1
	Root rot	*Pythium* sp.	1
	Rust	*Puccinia* sp.	1
	Yellow patch	*Rhizoctonia cerealis*	4
Lawn	Foliar damage	*Fusarium* sp.	1
Poa annua	Dollar spot	*Sclerotinia* sp.	2
	Nematode damage	*Subanguina radicicola* and *Tylenchorhynchus* sp.	1
Sod	Basal anthracnose	*Colletotrichum* sp.	1
	Foliar blight	*Curvularia* sp. and *Leptosphaerulina* sp.	1
	Leaf blight	*Leptosphaerulina* sp.	3
	Nematode contribution	*Tylenchorhynchus* sp.	1
	Nematode damage	*Subanguina radicicola* and *Tylenchorhynchus* sp.	3
	Root rot	*Pythium* sp.	2
Turfgrass	Brown patch	*Rhizoctonia solani*	3
	Fairy ring	Basidiomycete	1
	Foliar anthracnose	*Colletotrichum graminicola*	1
	Foliar blight	*Curvularia* sp. and *Drechslera* sp.	1
	Fusarium patch	*Microdochium nivale*	1
	Leaf and sheath blight	*Rhizoctonia zeae*	3
	Leaf blight	*Leptosphaerulina* sp.	1
	Nematode contribution	*Helicotylenchus* sp.	1
		Meloidogyne sp.	1
		Tylenchorhynchus sp.	1
	Nematode damage	*Aphelenchoides* sp. and *Meloidogyne* sp.	2
		Helicotylenchus sp.	2
		Helicotylenchus sp. and *Meloidogyne* sp.	1
		Meloidogyne sp. and *Paratrichodorus* sp.	1
		Subanguina radicicola	1
		Subanguina radicicola and *Tylenchorhynchus* sp.	3
		Tylenchorhynchus sp	1
	Poor roots	*Pythium* sp.	6
	Rust	*Puccinia* sp.	1
	Yellow patch	*Rhizoctonia cerealis*	6

DISEASED SAMPLES	93
ABIOTIC AND OTHER DISORDERS	7
TOTAL SUBMISSIONS	100

Table 12.0 Summary of diseases diagnosed on **field vegetable** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Bean	Leaf distortion	*Tobacco mosaic virus*	1
	Leaf distortion	*Arabis mosaic virus*	1
Celeriac	Root rot	Oomycete	1
Cucumber	Root rot	Oomycete	1
Garlic	Basal plate rot	*Fusarium* sp.	1
	Bulb rot	*Fusarium* sp.	1
		Sclerotinia sp. and *Penicillium* sp.	3
		Sclerotinia sp.	1
	Mushy rot	*Rhizopus* sp.	1
Pea	Ascochyta blight	*Ascochyta* sp.	1
Potato	Blackleg	*Erwinia carotovora*	1
	Foliar blight	*Ulocladium* sp.	1
	Late blight	*Phytophthora infestans*	1
	Powdery scab	*Spongospora* sp.	1
	Pythium leak	*Pythium* sp.	1
	Soft rot	*Erwinia carotovora*	1
	Stem canker	*Rhizoctonia solani*	4
	Stem rot	*Erwinia carotovora*	1
	Vascular wilt	*Fusarium oxysporum*	1
		Fusarium sp	1
		Verticillium sp.	1
Rhubarb	Crown / Root rot	Parasitic Nematodes and *Fusarium solani*	1
Soil sample	Club root	*Plasmodiophora brassicae*	1
Spinach	Leaf mottling	*Impatiens necrotic spot virus*	1
Squash	Root rot	*Thielaviopsis* sp., *Rhizoctonia* sp. and Oomycete	1
Tomato	Leaf mould	*Cladosporium* sp.	1
	Vascular wilt	*Fusarium oxysporum*	1
Watercress	Damping off	*Rhizoctonia* sp.	1
Witloof (Belgian endive)	Nematode damage	*Pratylenchus* sp.	1
Zucchini	Leaf spot	*Cladosporium* sp. and *Alternaria* sp.	1

DISEASED SAMPLES	37
ABIOTIC AND OTHER DISORDERS	26
TOTAL SUBMISSIONS	63

Table 13.0 Summary of diseases diagnosed on **woody ornamentals** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2008.

CROP	DISEASE	CAUSAL /ASSOCIATED ORGANISM	No.
Abies	Botrytis blight	*Botrytis cinerea*	1
	Swiss needle cast	*Phaeocrytopus gaeumannii*	1
Acer	Leaf spot	*Didymosporina* sp.	1
	Anthracnose	*Discula* sp.	1
	Anthracnose	*Kabatiella apocrypta*	1
	Canker	*Phomopsis* sp.	1
	Leaf spot	*Marssonina* sp.	1
	Root rot	Oomycete	1
	Stem canker	*Botryodiplodia* sp.	1
	Stem canker	*Phytophthora* sp.	2
	Twig dieback	*Phomopsis* sp.	1
	Twig dieback	*Botryosphaeria (Diplodia)* sp.	1
	Verticillium wilt	*Verticillium* sp.	1
Acer rubrum	Stem canker	*Botryosphaeria dothidea*	1
Arctostaphylos	Stem canker	*Phomopsis* sp.	1
Caragana	Root rot	Oomycete	1
Cedrus	Foliage damage	*Sclerophoma* sp.	1
Cercidiphyllum	Stem canker	*Phomopsis* sp.	1
Cornus	Anthracnose	*Discula destructiva*	1
	Root rot	Oomycete	1
Crataegus	Fire blight	*Erwinia amylovora*	1
Euonymus	Anthracnose	*Gloeosporium* sp.	1
	Leaf spot	*Phyllosticta* sp.	1
Fraxinus	Stem canker	*Fusicoccum* sp.	1
Hydrangea	Root rot	Oomycete	1
Juniperus	Charcoal rot	*Macrophomina phaseolina*	1
Lavandula angustifolia	Grey mould	*Botrytis cinerea*	1
Lonicera	Root rot	Oomycete	1
	Stem canker	*Phoma* sp. and *Fusarium* sp.	1
Malus	Fire blight	*Erwinia amylovora*	3
	Stem canker	*Botryodiplodia* sp.	1
	Stem canker	*Cytospora* sp	1
	Stem canker	*Phomopsis* sp.	1
	Speckled tar spot	*Rhytisma punctatum*	1
Picea	Needle blight	*Sclerophoma* sp.	1
Picea pungens	Foliar blight	*Hormonema* sp.	1
	Needle blight	*Rhizosphaera kalkhoffii*	1
Picea glauca	Root rot	Oomycete	1
Platanus	Anthracnose	*Apiognomonia* sp.	3
Populus	Leaf blight	*Cladosporium* sp.	1
	Leaf spot/shoot blight	*Venturia* sp.	1
	Root rot	Oomycete	1
	Root rot	Oomycete and *Thielaviopsis* sp.	1
	Rust	*Melampsora* sp.	1
Prunus	Bacterial blight	*Pseudomonas syringae*	1
	Bacterial canker	*Pseudomonas syringae* pv. *syringae*	1
	Crown rot	*Fusarium solani*	1
	Root rot	*Phytophthora* sp.	1
	Crown and root damage	Oomycete	1

Table 13 (contd.)

Rhododendron	Anthracnose	*Glomerella cingulata*	1
	Foliar blight	*Phomopsis* sp. and *Pestalotia* sp.	1
	Grey blight	*Pestalotia* sp.	2
	Powdery mildew	*Microsphaera* sp. or *Erysiphe* sp.	1
	Root rot	*Phytophthora* sp.	2
Rosa	Foliar blight	*Botrytis cinerea*	2
Salix	Stem canker	*Cytospora* sp.	1
Salix babylonica	Crown gall	*Agrobacterium tumefaciens*	1
Sambucus	Spot anthracnose	*Sphaceloma* sp.	1
Sorbus	Fire blight	*Erwinia amylovora*	1
Syringa	Leaf spot	*Phyllosticta* sp.	1
	Root rot	Oomycete	2
Taxus	Root rot	Oomycete	3
Thuja	Coryneum blight	*Seiridium cardinale*	1
	Foliar blight	*Coryneum berckmannii*	1
	Kabatina blight	*Kabatina thujae*	1
	Root rot	*Phytophthora* sp.	1
	Stem canker	*Phomopsis* sp. and *Pestalotia* sp.	1
Tsuga canadensis	Stem canker	*Leucostoma* sp.	1
Viburnum bodnantense	Foliar blight and dieback	*Phytophthora ramorum**	1
Weigela	Anthracnose	*Colletotrichum* sp.	1
	Leaf spot	*Phoma* sp.	1
Willow	Rust	*Melampsora* sp.	1

DISEASED SAMPLES	85
ABIOTIC AND OTHER DISORDERS	61
TOTAL SUBMISSIONS	146

* From a private landscape site

CROPS: Commercial crops – Diagnostic Laboratory Report
LOCATION: Saskatchewan

NAMES AND AGENCIES:
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TITLE: DISEASES DIAGNOSED ON CROP SAMPLES SUBMITTED TO THE SASKATCHEWAN MINISTRY OF AGRICULTURE CROP PROTECTION LABORATORY IN 2008

METHODS: The Crop Protection Laboratory of the Saskatchewan Ministry of Agriculture provides diagnostic services to the agricultural industry and recommendations for crop health problems. Services include disease, insect and weed identification, as well as testing of weed seeds for herbicide resistance. The Crop Protection Laboratory also provides a Dutch elm disease (DED) service to the general public, under which American elm samples are tested for DED. Samples are submitted to the Crop Protection Laboratory by personnel from the Saskatchewan Ministry of Agriculture and the Saskatchewan Ministry of Environment and by growers, crop insurance adjustors, agribusiness representatives and market/home gardeners. Disease diagnoses are accomplished by microscopic examination, culturing on artificial media, ELISA testing and BIOLOG™.

RESULTS: From April 1 to October 31, 2008, the Crop Protection Laboratory received a total of 513 samples. Seventy-four percent were for disease diagnosis, 58% of which were American elm samples submitted for DED testing. Categories and percentage of samples received (excluding DED samples) were: cereals (31%), special crops (26%), oilseeds (12%), fruit (12%), woody ornamentals (11%) vegetables (3%) and forages (2%). Summaries of diseases and causal agents diagnosed on crop samples submitted to the Crop Protection Laboratory in 2008 are presented in Tables 1-7 by crop category. There were 295 samples of American elm submitted under the DED program (Table 8).

Table 1. Summary of plant diseases diagnosed on **vegetable** and **greenhouse crops** submitted to the Crop Protection Laboratory in 2008.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Garlic	Basal bulb rot	*Fusarium* sp.	1
	Environmental injury		1
Pepper	Fusarium soft rot	*Fusarium lactis*	1
	Gray mould	*Botrytis cinerea*	1
Potato	Blackheart		1
	Common scab	*Streptomyces scabies*	1
	Pink rot	*Phytophthora erythroseptica*	1
	Chemical injury		1
Rhubarb	Red leaf	*Erwinia rhapontici*	1
Tomato	Nutrient deficiency		1
	Chemical injury		1
	Environmental injury		1

Table 2: Summary of plant diseases diagnosed on **cereal crops** submitted to the Crop Protection Laboratory in 2008.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Barley	Head blight	*Fusarium poae, F. sporotrichioides*	10
	Net blotch	*Pyrenophora teres*	3
	Seedling blight/common root rot	*Cochliobolus sativus*	1
	Smut (true loose)	*Ustilago nuda*	1
	Environmental injury		6
	Chemical injury		1
	Halo blight	*Pseudomonas syringae* pv. *coronafaciens*	5
	Ascochyta leaf blight	*Ascochyta graminicola*	1
	Pyrenophora leaf blotch	*Pyrenophora avenae*	1
	Common root rot	*Fusarium* sp.	1
	Septoria leaf blotch	*Septoria avenae*	1
	Nutrient deficiency		1
Wheat	Common root rot/ seedling blight/ prematurity blight	*Cochliobolus sativus* / *Fusarium* spp.	10
	Tan spot	*Pyrenophora tritici-repentis*	4
	Pseudoseptoria leaf spot	*Pseudoseptoria* sp.	1
	Septoria leaf blotch	*Stagonospora nodorum*	1
	Environmental injury		18
	Chemical injury		15
	Nutrient deficiency		3
	Physiological leaf spot		1

Table 3. Summary of plant diseases diagnosed on **forage crops** submitted to the Crop Protection Laboratory in 2008.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Alfalfa	Spring black stem	*Phoma medicaginis*	3
	Root/crown rot	*Fusarium* sp., *Phoma* sp., *Pythium* sp., *Rhizoctonia* sp.	3
	Chemical injury		1
	Environmental injury		1
Corn	Environmental injury		1
Grass	Head smut	*Ustilago bullata*	1

Table 4. Summary of plant diseases diagnosed on **fruit crops** submitted to the Crop Protection Laboratory in 2008.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Chokecherry	Leaf spot	*Phyllosticta* sp.	1
Saskatoon	Environmental injury		2
	Chemical injury		1
Strawberry	Lesion nematode	*Pratylenchus neglectus*	5
	Spiral nematode	*Helicotylenchus* sp.	4
	Pin nematode	*Paratylenchus* sp.	5
	Stunt nematode	*Tylenchorhynchus* sp.	4
	Nematode	*Tylenchus sp.*	2
	Crown/root rot	*Cylindrocarpon* sp., *Fusarium* sp., *Pythium* sp., *Rhizoctonia* sp.	2
	Anthracnose	*Colletotrichum* sp.	1

Table 5. Summary of plant diseases diagnosed on **oilseed crops** submitted to the Crop Protection Laboratory in 2008.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Canola	Root/foot rot/seedling blight	*Fusarium* sp. / *Pythium* sp ./ *Rhizoctonia* sp.	1
	Alternaria black spot	*Alternaria sp.*	1
	Chemical injury		10
	Environmental injury		6
	Nutrient deficiency		3
	Physiological stress		1
Flax/linola	Root rot	*Fusarium* sp.	1
	Pasmo	*Septoria linicola*	1
	Environmental injury		4
	Chemical injury		1

Table 6. Summary of plant diseases diagnosed on **woody ornamentals** submitted to the Crop Protection Laboratory in 2008.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Cedar	Environmental injury		1
Juniper	Phomopsis twig blight	*Phomopsis juniperovora*	1
	Environmental injury		1
Maple	Chemical injury		1
	Marssonina leaf/twig blight	*Marssonina* sp.	11
	Venturia twig blight	*Venturia* sp.	4
	Melampsora rust	*Melampsora* sp.	3
	Phyllosticta leaf spot	*Phyllosticta* sp.	3
	Septoria leaf/twig blight	*Septoria musiva*	3
	Cytospora canker	*Cytospora* sp.	1
	Botryosphaeria canker	*Botryosphaeria* sp.	1
Spruce	Chemical injury		1
Willow	Phyllosticta leaf spot	*Phyllosticta* sp.	1
	Environmental injury		1

Table 7. Summary of plant diseases diagnosed on **special crops** submitted to the Crop Protection Laboratory in 2008.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Arabidopsis	Root rot	*Pythium* sp.*, Rhizoctonia*	1
Bean	Common bacterial blight	*Xanthomonas axonopodis* pv. *phaseoli*	1
Canaryseed	Ascochyta blight	*Ascochyta* sp.	1
Coriander	Blossom blight	*Aureobasidium* sp.	1
Cumin	Blossom/seed blight	*Alternaria* sp.	1
	Root rot	*Fusarium* sp.	1
	Seed rot	*Fusarium* sp.	1
Faba bean	Chocolate spot	*Botrytis cinerea*	1
Lentil	Seedling blight/root rot	*Fusarium* sp.*, Rhizoctonia* sp.*, Pythium* sp.	6
	Anthracnose	*Colletotrichum truncatum*	4
	Septoria leaf spot	*Septoria* sp.	3
	Stemphylium blight	*Stemphylium botryosum*	2
	Secondary stem rot	*Fusarium* sp.	2
	Sclerotinia stem rot	*Sclerotinia sclerotiorum*	1
	Environmental injury		6
	Chemical injury		5
	Nutrient deficiency		2
Mustard	Environmental injury		1
Pea	Root rot/seedling blight	*Fusarium* sp., *Rhizoctonia* sp.	10
	Ascochyta/Mycosphaerella blight	*Ascochyta* spp., *Mycosphaerella pinodes*	3
	Downy mildew	*Peronospora viciae*	3
	Septoria leaf spot	*Septoria pisi*	3
	Environmental injury		12
	Chemical injury		5
	Nutrient deficiency		3
Soybean	Root rot	*Fusarium* sp.*, Rhizoctonia* sp.	1
	Alternaria leaf spot	*Alternaria* sp.	1

Table 8. Summary of plant diseases diagnosed on **American elm** by the Crop Protection Laboratory in 2008 (total of 295 submissions).

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES*
Elm	Dutch elm disease	*Ophiostoma nova-ulmi*	183
	Dothiorella wilt	*Dothiorella ulmi*	31
	Verticillium wilt	*Verticillium* spp.	2

* The remaining American elm submissions were negative for disease organisms.

CROP: Diagnostic Laboratory Report
LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: 2008 MANITOBA CROP DIAGNOSTIC CENTRE LABORATORY SUBMISSIONS

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

RESULTS: Summaries of diseases diagnosed on plants in different crop categories are presented in Tables 1-11 and cover the time period from January 1 to November 27, 2008. Two noteworthy occurrences were tobacco rattle virus in potato and cercospora blight in soybean, not previously documented through our laboratory. In addition specimens were received of several leaf spot diseases in corn including northern corn leaf blight, northern corn leaf spot and yellow leaf blight. Fungal leaf spots of corn are not commonly observed at damaging levels in Manitoba.

Table 1. Summary of diseases diagnosed on **forage legume crops** submitted to the MAFRI Crop Diagnostic Centre in 2008.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Alfalfa	Downy mildew	*Peronospora trifoliorum*	1
	Leaf spot	*Leptosphaerulina briosiana*	1
	Spring black stem and leaf spot	*Phoma medicaginis*	3
	Stemphylium leaf spot	*Stemphylium* sp.	1
	Yellow leaf blotch	*Leptotrochila medicaginis*	1
	Environmental injury		1
	Nutrient deficiency		2

Table 2. Summary of diseases diagnosed on **greenhouse crops** submitted to the MAFRI Crop Diagnostic Centre in 2008.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Geranium	Stem rot	*Botrytis cinerea*	1
Petunia	Stem rot	*Botrytis cinerea*	1
	Stem rot	*Sclerotinia sclerotiorum*	1
	Nutrient deficiency		1
Tomato	Nutrient deficiency		1

Table 3. Summary of diseases diagnosed on **cereal crops** submitted to the MAFRI Crop Diagnostic Centre in 2008.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Wheat	Bacterial blight	*Pseudomonas syringae*	2
	Black head moulds	*Alternaria spp., Cladosporium spp., Epicoccum sp.*	2
	Common root rot	*Cochliobolus sativus*	18
	Fusarium head blight	*Fusarium* spp.	5
	Powdery mildew	*Erysiphe graminis*	3
	Root rot	*Fusarium* spp.	6
	Root rot	*Rhizoctonia solani*	7
	Septoria leaf spot	*Septoria* spp.	12
	Spot blotch	*Cochliobolus sativus*	1
	Take-all	*Gaeumannomyces graminis*	2
	Tan spot	*Pyrenophora tritici-repentis*	23
	Wheat streak mosaic	Wheat Streak Mosaic Virus (WSMV)	5
	Physiological leaf spot	undetermined	20
	Environmental injury		25
	Herbicide injury		19
	Nutrient deficiency		3
Barley	Common root rot	*Cochliobolus sativus*	5
	Fusarium head blight	*Fusarium* spp.	1
	Net blotch	*Drechslera teres*	3
	Root rot	*Fusarium* sp.	1
	Speckled leaf blotch	*Septoria passerinii*	2
	Spot blotch	*Cochliobolus sativus*	5
	Environmental injury		8
	Herbicide injury		5
	Nutrient deficiency		1
Oat	Bacterial blight	*Pseudomonas syringae*	14
	Black head moulds	*Alternaria spp., Cladosporium spp., Epicoccum sp.*	2
	Common root rot	*Cochliobolus sativus*	1
	Fusarium head blight	*Fusarium avenaceum*	3
	Pyrenophora leaf blotch	*Pyrenophora avenae*	9
	Stagonospora leaf spot	*Stagonospora avenae*	1
	Root rot	*Fusarium* sp.	1
	Environmental injury		7
	Herbicide injury		1
	Nutrient deficiency		2
Rye	Root rot	*Fusarium* sp., *Pythium* sp.	1
	Herbicide injury		1

Table 4. Summary of diseases diagnosed on **vegetable crops** submitted to the MAFRI Crop Diagnostic Centre in 2008.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Bok choy	Blackleg	*Leptosphaeria maculans*	1
Cabbage	Blackleg	*Leptosphaeria maculans*	1
	Root rot	*Fusarium* sp., *Pythium* sp.	1
Carrot	Aster yellows	Aster yellows phytoplasma	1
	Cottony rot	*Sclerotinia sclerotiorum*	1
	Storage rot	*Fusarium* sp., *Alternaria* sp.	1
Cauliflower	Grey mould	*Botrytis cinerea*	1
	Root rot	*Fusarium* sp., *Pythium* sp.	1
Corn	Root rot	*Fusarium avenaceum*	1
Garlic	Fusarium basal plate rot	*Fusarium oxysporum*	2
Onion	Blue mould	*Penicillium* sp.	3
	Fusarium basal plate rot	*Fusarium oxysporum*	3
	Neck rot	*Botrytis allii*	7
	Pink root	*Phoma terrestris*	1
Pak choy	Blackleg	*Leptosphaeria maculans*	1
Parsnip	Aster yellows	Aster yellows phytoplasma	1
Pepper, Green Bell	Stem rot	*Fusarium solani*	1
	Sun scald	Environmental injury	1
Rhubarb	Leaf spot	*Ascochyta rhei*	3
Tomato	Fusarium wilt	*Fusarium oxysporum*	1
	Pith necrosis	*Pseudomonas corrugata*	1
	Root rot	*Fusarium* sp., *Rhizoctonia solani*	1
	Septoria leaf spot	*Septoria lycopersici*	4

Table 5. Summary of diseases diagnosed on **potato crops** submitted to the MAFRI Crop Diagnostic Centre in 2008.

SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Bacterial ring rot	*Clavibacter michiganensis* subsp. *sepedonicus*	1
Bacterial soft rot	Erwinia carotovora subsp. *carotovora*	4
Blackleg	*Erwinia carotovora* subsp. *atroseptica*	4
Black dot, on tubers	*Colletotrichum coccodes*	5
Black dot, on stems	*Colletotrichum coccodes*	5
Black pit	*Alternaria alternata*	1
Black scurf	*Rhizoctonia solani*	5
Brown spot	*Alternaria alternata*	1
Early blight, foliar	*Alternaria solani*	1
Early blight, tuber	*Alternaria solani*	2
Fusarium dry rot	*Fusarium sambucinum*	3
Fusarium dry rot	*Fusarium solani*	1
Fusarium wilt	*Fusarium avenaceum*	1
Late blight, tuber	*Phytophthora infestans*	1
Leaf spot	*Alternaria sp.*	2
Rhizoctonia stem and stolon canker	*Rhizoctonia solani*	2
Root rot	*Fusarium* spp., *Pythium* spp.	3
Rubbery rot	*Geotrichum candidum*	1
Scab, common	*Streptomyces* spp.	3
Silver scurf	*Helminthosporium solani*	13
Tobacco rattle virus	Tobacco rattle virus (TRV)	1
Verticillium wilt	*Verticillium dahliae*	5
Physiological disorders		9
Herbicide injury		6
Environmental injury		1

Table 6. Summary of diseases diagnosed on **grasses** submitted to the MAFRI Crop Diagnostic Centre in 2008.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Turf grasses	Anthracnose	*Colletotrichum graminicola*	3
	Fusarium blight	*Fusarium* spp.	1
	Leaf spot	*Septoria* sp.	1
	Melting out	*Drechslera* sp.	2
	Pythium blight	*Pythium* sp.	1

Table 7. Summary of diseases diagnosed on **shelterbelt trees** and **woody ornamentals** submitted to the MAFRI Crop Diagnostic Centre in 2008.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Ash	Anthracnose	*Gloeosporium aridum*	9
(*Fraxinus* sp.)	Canker	*Fusicoccum* sp.	1
	Leaf spot	*Phyllosticta* sp.	2
	Verticillium wilt	*Verticillium dahliae*	2
	Environmental injury		2
	Herbicide injury		4
Caragana	Environmental injury		1
Chokecherry, Schubert (*Prunus virginiana*)	Canker	*Fusicoccum* sp.	1
Cotoneaster	Canker	undetermined	1
Crabapple	Scab	*Venturia inaequalis*	2
Elder	Leaf spot	*Septoria* sp.	1
Elm, American	Canker	*Botryodiplodia* sp.	4
(*Ulmus americana*)	Canker	*Botryosphaeria* sp.	1
	Canker	*Coniothyrium* sp.	2
	Canker	undetermined	2
	Dothiorella wilt	*Dothiorella ulmi*	4
	Dutch elm disease	*Ophiostoma ulmi*	23
	Herbicide injury		1
Lilac	Bacterial blight	*Pseudomonas syringae*	1
	Environmental injury		3
	Herbicide injury		1
Maple (*Acer negundo*)	Environmental injury		2
	Herbicide injury		3
Maple, Norway (*Acer platanoides*)	Canker	*Sphaeropsis* sp.	2
Mountain ash (*Sorbus* spp.)	Canker	*Cytospora* sp.	1
Oak	Canker	*Cytospora* sp.	1
(*Quercus macrocarpa*)	Canker	*Phoma* sp.	1
Pine	Tip blight	*Sphaeropsis* sp.	1
	Western gall rust	*Peridermium harknessii*	1
	Environmental injury		5
	Nutrient deficiency		1
Poplar	Anthracnose	*Colletotrichum* sp.	1
(*Populus* spp.)	Bronze leaf disease	*Apioplagiostoma populi*	1
	Canker	*Cytospora* sp.	1

Table 7 (contd.)

Poplar (contd.) (*Populus* spp.)	Canker	*Discosporium populeum*	1
	Leaf spot	*Septoria* sp.	1
	Leaf spot	*Phyllosticta* sp.	1
	Root rot	*Fusarium solani, F. oxysporum*	1
	Herbicide injury		1
Spruce	Cytospora canker	*Leucostoma kunzei*	1
	Lirula needle blight	*Lirula* sp.	3
	Needle rust	*Chrysomyxa* sp.	1
	Rhizosphaera needlecast	*Rhizosphaera kalkhoffi*	1
	Stigmina needle blight	*Stigmina lautii*	9
	Tip blight	*Phomopsis* sp.	1
	Environmental injury		6
	Herbicide injury		1
Thuja sp.	Rust	*Gymnosporangium* sp.	1
Virginia creeper	Leaf spot	*Phyllosticta* sp.	1
Willow	Herbicide injury		7

Table 8. Summary of diseases diagnosed on **oilseed crops** submitted to the MAFRI Crop Diagnostic Centre in 2008.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Camelina	Root rot	*Fusarium* sp., *Pythium* sp.	1
Canola	Alternaria black spot	*Alternaria* spp.	2
	Blackleg	*Leptosphaeria maculans*	18
	Fusarium wilt	*Fusarium oxysporum*	1
	Oedema	physiological disorder	9
	Root rot	*Fusarium* spp., *Rhizoctonia solani*	10
	Sclerotinia stem rot	*Sclerotinia sclerotiorum*	4
	Environmental injury		7
	Herbicide injury		23
	Nutrient deficiency	sulphur deficiency	3
Flax	Brown stem blight	*Alternaria linicola*	2
	Fusarium wilt	*Fusarium oxysporum*	2
	Root rot	*Pythium* sp.	1
	Environmental injury		1
	Herbicide injury		4
Sunflower	Downy mildew	*Plasmopara halstedii*	3
	Leaf spot	*Alternaria* sp.	1
	Root rot	*Rhizoctonia solani, Pythium* sp., *Fusarium* spp.	1
	Rust	*Puccinia helianthi*	4
	Herbicide injury		7

Table 9. Summary of diseases diagnosed on **fruit crops** submitted to the MAFRI Crop Diagnostic Centre in 2008.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Apple	Canker	*Botryosphaeria* sp.	2
	Canker	*Cytospora chrysosperma*	1
	Fire blight	*Erwinia amylovora*	1
	Frogeye leaf spot	*Diplodia seriata**	1
	Nectria twig canker	*Nectria cinnabarina*	1
	Scab	*Venturia inaequalis*	2
	Watercore	physiological disorder	1
	Environmental injury		2
	Herbicide injury		1
Cherry	Brown rot	*Monilinia* sp.	1
Grape	Downy mildew	*Plasmopara viticola*	1
Pear	Bacterial blight	*Pseudomonas syringae*	1
Plum	Plum pockets	*Taphrina communis*	1
Raspberry	Anthracnose	*Elsinoë veneta*	1
	Bacterial blight	*Pseudomonas syringae*	1
	Cane blight	*Coniothyrium fuckelii*	2
	Grey mould	*Botrytis cinerea*	1
	Root rot	*Fusarium solani*	1
	Spur blight	*Didymella applanata*	2
	Verticillium wilt	*Verticillium dahliae*	2
Saskatoon	Entomosporium leaf and berry spot	*Entomosporium mespili*	6
	Fire blight	*Erwinia amylovora*	1
	Fruit rot	*Botrytis cinerea*	1
	Iron chlorosis	iron deficiency	1
	Herbicide injury		3
Strawberry	Angular leaf spot	*Xanthomonas fragariae*	1
	Leaf scorch	*Marsonnina fragariae*	1
	Root rot	*Rhizoctonia solani*	2
	Herbicide injury		1
	Nutrient deficiency		3

*known as *Botryosphaeria obtusa* prior to nomenclature changes.

Table 10. Summary of diseases diagnosed on **herbaceous ornamentals** submitted to the MAFRI Crop Diagnostic Centre in 2008.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Lily	Bulb rot	*Rhizoctonia solani*, *Rhizopus* sp.	1
Marigold	Root rot	*Fusarium* sp.	1

Table 11. Summary of diseases diagnosed on **special field crops** submitted to the MAFRI Crop Diagnostic Centre in 2008.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Corn	Holcus spot	*Pseudomonas syringae*	5
	Leaf spot	*Colletotrichum* sp.	2
	Northern corn leaf blight	*Exserohilum turcicum*	3
	Northern corn leaf spot	*Bipolaris zeicola*	7
	Yellow leaf blight	*Phyllosticta maydis*	1
	Environmental injury		2
	Herbicide injury		2
	Nutrient deficiency		1
Faba bean	Chocolate spot	*Botrytis fabae*	1
	Leaf spot	*Septoria* sp.	1
	Root rot	*Fusarium* spp., *Rhizoctonia solani*	8
	Environmental injury		1
Field bean	Anthracnose	*Colletotrichum lindemuthianum*	2
	Brown spot	*Pseudomonas syringae* pv. *syringae*	4
	Common blight	*Xanthomonas axonopodis* pv. *phaseoli*	7
	Halo blight	*Pseudomonas syringae* pv. *phaseolicola*	8
	Root rot	*Fusarium* spp*., Rhizoctonia solani*	4
	Herbicide injury		4
Field pea	Anthracnose	*Colletotrichum pisi*	5
	Aphanomyces root rot	*Aphanomyces euteiches*	1
	Bacterial blight	*Pseudomonas syringae* pv. *pisi*	1
	Downy mildew	*Peronospora viciae*	12
	Mycosphaerella blight	*Mycosphaerella pinodes*	10
	Root rot	*Fusarium* spp.	16
	Herbicide injury		1
Hemp	Environmental injury		2
	Herbicide injury		1
Soybean	Bacterial blight	undetermined	3
	Brown spot	*Septoria glycines*	4
	Cercospora blight	*Cercospora kikuchii*	4
	Downy mildew	*Peronospora manshurica*	2
	Leaf spot	*Phyllosticta* sp.	1
	Root rot	*Fusarium oxysporum*, *F. solani*, *Pythium* spp*., Rhizoctonia solani*	10
	Root rot	*Phytophthora* sp.	1
	Stem rot	*Phomopsis longicolla*	1
	Environmental injury		5
	Herbicide injury		2
	Nutrient deficiency		2

CULTURES : Cultures commerciales reçues au Laboratoire de diagnostic
RÉGION : Québec

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TITRE: MALADIES DIAGNOSTIQUÉES SUR DES ÉCHANTILLONS DE CULTURES COMMERCIALES SOUMIS AU LABORATOIRE DE DIAGNOSTIC EN PHYTOPROTECTION DU MAPAQ EN 2008

MÉTHODES : Le Laboratoire de diagnostic en phytoprotection du MAPAQ fournit un service d'identification des maladies parasitaires et non parasitaires pour les cultures commerciales produites au Québec. Les données rapportées présentent les maladies identifiées sur les échantillons de plantes soumis par les conseillers agricoles du MAPAQ, de la Financière agricole du Québec, de l'Institut québécois du développement de l'horticulture ornementale (IQDHO) et par ceux de l'industrie. Tous les échantillons font l'objet d'un examen visuel préalable suivi d'un examen à la loupe binoculaire. Selon les symptômes, un ou plusieurs tests diagnostiques sont réalisés dans le but de détecter ou d'identifier l'agent pathogène. Tous les tests de diagnostic utilisés au laboratoire sont issus de protocoles largement reconnus; voici les principaux : les nématodes sont extraits par l'entonnoir de Baermann et identifiés par microscopie; les champignons sont isolés sur les milieux de culture artificiels, identifiés par microscopie et le pouvoir pathogène de certains genres est vérifié; les bactéries sont aussi isolées sur des milieux de culture artificiels (généraux et différentiels) puis identifiées par les tests biochimiques classiques, API-20E, Biolog^{R}, ELISA ou PCR; les phytoplasmes sont détectés par PCR et les virus par le test sérologique ELISA. Les références consultées pour les noms des maladies et des microorganismes sont «Noms des maladies des plantes au Canada», 4e édition (2003) et "Maladies des grandes cultures au Canada" 1re édition (2004).

RÉSULTATS ET DISCUSSION : Les Tableaux 1 à 13 présentent le sommaire des maladies identifiées sur les cultures commerciales. Depuis le 1er janvier 2008, à peu près 2000 maladies parasitaires et non parasitaires ont été diagnostiquées. On retrouve près de 70% de ce nombre sur les plantes maraîchères et les petits fruits. Les infections fongiques demeurent encore très importantes parmi tous les grands groupes de cultures, surtout les infections fongiques racinaires, mais moins de problèmes viraux ont été diagnostiqués. *Pseudomonas syringae* a été détecté dans les dommages de plusieurs espèces pour lesquelles peu ou pas d'informations existaient.

Cette année encore, plusieurs demandes de détection ont été traitées au laboratoire, mais les résultats négatifs ne seront désormais plus rapportés dans ce rapport. Ces demandes concernaient ***Clavibacter michiganensis* subsp*. michiganensis*** dans les plants de tomate, ***Clavibacter michiganensis* subsp*. sepedonicus*** dans les tubercules de pomme de terre, la résistance de *Botrytis* aux fongicides, la résistance des bactéries au cuivre et divers virus dans les plantes maraîchères et ornementales.

Les totaux ne tiennent pas compte des causes indéterminées et des diagnostics incertains. Lorsque non précisés, les agents non infectieux regroupent les déséquilibres minéraux, les pH inadéquats, les sols asphyxiants et salins, les insolations, le froid, le gel et l'excès de chaleur, les polluants atmosphériques, l'intumescence (œdème), les phytotoxicités causées par le mauvais usage des pesticides, l'excès ou le manque d'eau et les désordres génétiques.

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Tableau 1. Sommaire des maladies diagnostiquées parmi les **cultures maraîchères** de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Ail	*Botrytis* sp.	Pourriture du col	1
	Embellisia sp.	Anomalie de coloration des feuilles	1
	Fusarium moniliforme	Fusariose du plateau	4
	Potyvirus		1
	Pratylenchus sp.	Lésions des racines	1
	Rhizoctonia solani	Rhizoctone	2
Asperge	*Botrytis cinerea*	Moisissure grise	1
	Fusarium moniliforme / F. oxysporum	Pourriture fusarienne	2
	Puccinia asparagi	Rouille	1
	Stemphylium sp.	Tache stemphyllienne	1
Aubergine	*Alternaria solani*	Alternariose	1
	Fusarium oxysporum	Pourriture des racines	1
	Phoma sp	Tache ascochytique	1
	Phomopsis sp.	Brûlure phomopsienne	1
	Phytophthora capsici	Pourriture des fruits	1
	Verticillium dahliae	Flétrissement verticillien	2
	Salinité élevée du sol		3
Betterave/ poirée	*Aphanomyces* sp.	Fonte des semis	2
	Fusarium sp.	Pourriture fusarienne des racines	2
	Pythium sp.	Pourridié pythien	2
	Rhizoctonia solani	Rhizoctone	1
	Agents non infectieux		1
Brocoli	*Alternaria brassicicola*	Tache noire	4
	Pseudomonas syringae	Pourriture molle bactérienne	1
	Pseudomonas marginalis	Pourriture molle bactérienne	1
	Pythium polymastum	Pourridié pythien	2
	Rhizoctonia solani	Rhizoctone	1
	Xanthomonas campestris pv. *campestris*	Nervation noire	3
	Agents non infectieux variés		12
Cantaloup	*Erwinia tracheiphila*	Flétrissement bactérien	2
	Fusarium oxysporum	Pourriture des racines	2
	Pseudomonas syringae	Tache angulaire	1
	Pythium sp.	Pourriture du collet	2
	Agents non infectieux		4
Carotte	*Cercospora* sp.	Tache cercosporéenne	1
	Fusarium oxysporum	Pourriture du collet	8
	Geotrichum sp.	Pourriture acide	1
	Pythium sp.	Pourridié pythien	1
	Rhizoctonia solani	Rhizoctone	7
	Thielaviopsis basicola	Pourriture noire des racines	1
	Xanthomonas campestris	Brûlure bactérienne	2
	Agents non infectieux		6
Céleri	*Cercospora* sp.	Tache cercosporéenne	3
	Pseudomonas syringae	Tache bactérienne	2
	Pseudomonas viridiflava	Pourriture molle bactérienne	1

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CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Céleri	*Rhizoctonia solani*	Rhizoctone	1
	Septoria apiicola	Tache septorienne	1
	Agents non infectieux		8
Chou / chou de Bruxelles	*Albugo* sp.	Rouille blanche	1
	Alternaria brassicae	Tache grise	1
	Alternaria brassicicola	Tache noire	1
	Botrytis cinerea	Moisissure grise	1
	Fusarium spp.	Pourriture fusarienne des racines	3
	Pseudomonas syringae	Moucheture bactérienne	1
	Pythium sp.	Pourridié pythien	1
	Rhizoctonia solani	Rhizoctone	1
	Xanthomonas campestris pv. *armoraciae*	Tache bactérienne	1
	Xanthomonas campestris pv. *campestris*	Nervation noire	7
	Faible fertilité du sol		3
	Autres agents non infectieux		4
Chou chinois	*Alternaria brassicae*	Tache grise	7
	Pseudomonas syringae	Moucheture bactérienne	2
Chou-fleur	*Alternaria brassicae*	Tache grise	1
	Alternaria brassicicola	Tache noire sur feuille	1
	Carences minérales		4
	Autres agents non infectieux		6
Citrouille	*Erwinia carotovora*	Pourriture molle bactérienne	3
	Fusarium graminearum	Pourriture des fruits	1
	Phoma sp.	Pourriture noire	2
	Phytophthora capsici	Pourridié phytophthoréen	7
	Pseudomonas syringae	Tache angulaire	4
	Pythium ultimum	Pourridié pythien	1
	Septoria sp.	Tache septorienne	4
	Sphaerotheca sp. (*Oïdium*)	Blanc	2
	Stress climatiques		7
	Stress culturaux		1
Concombre	*Alternaria radicina*	Tache foliaire	1
	Colletotrichum sp.	Anthracnose	3
	Erwinia tracheiphila	Flétrissement bactérien	1
	Fusarium equiseti / F.solani / F. sporotrichioides	Pourriture des racines et du collet	5
	Phytophthora capsici / P. megasperma	Pourriture des fruits	5
	Potyvirus	Anomalie de coloration du feuillage	6
	Pseudomonas syringae	Tache angulaire	4
	Pseudoperonospora cubensis	Mildiou	1
	Pyrenochaeta sp.	Pourriture des racines	4
	Pythium spp.	Pourriture de racines et de fruits	1
	ToRSV	Anomalie de coloration du feuillage	1
	Ulocladium sp.	Tache foliaire	2
	Stress climatiques		1
	Stress culturaux		1
Courge	*Cladosporium* spp.	Gale / tache foliaire	5
	Erwinia carotovora	Pourriture molle bactérienne	8
	Erwinia tracheiphila	Flétrissement bactérien	13

Tableau 1. Sommaire des maladies diagnostiquées parmi les **cultures maraîchères** de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Courge	*Fusarium* spp.	Pourriture de fruits / de racines	7
	Geotrichum candidum	Pourriture laiteuse	5
	Phoma cucurbitacearum	Pourriture noire	15
	Phyllosticta sp.	Pourriture de fruits	1
	Phytophthora capsici	Pourriture des fruits	12
	Pseudomonas marginalis / P. viridiflava	Pourriture molle bactérienne	13
	Pseudomonas syringae	Tache angulaire	4
	Pythium sp.	Pourriture de fruits	4
	Pythium sp.	Pourriture de racines	1
	Septoria sp.	Tache septorienne	3
	Sphaerotheca fuliginea	Blanc	1
	Xanthomonas campestris	Tache bactérienne sur fruit	1
	Stress climatiques		4
	Stress culturaux		4
Épinard	Carence P		1
	Carence K		2
	Chaleur		1
	Luminosité élevée		1
Haricot / Pois / Gourgane	*Fusarium oxysporum / F. solani*	Pourriture fusarienne	8
	Meloidogyne sp.	Nodosité des racines	1
	Phoma sp.	Tache ascochytique	1
	Pratylenchus sp.	Lésions des racines	1
	Pseudomonas syringae	Graisse bactérienne	2
	Pythium sp.	Pourriture pythienne des racines	3
	Rhizoctonia solani	Rhizoctone commun	2
	Sclerotinia sclerotiorum	Pourriture sclérotique	2
Laitue / Scarole / Chicorée	*Alternaria dauci*	Tache foliaire	2
	Erwinia carotovora	Pourriture molle bactérienne	1
	Microdochium panattonianum	Anthracnose	1
	Pseudomonas cichorii	Tache luisante	3
	Pseudomonas syringae	Pourriture molle bactérienne	7
	Pseudomonas viridiflava	Pourriture molle bactérienne	1
	Pythium splendens	Pourridié pythien	1
	Pythium ultimum	Pourridié pythien	3
	Rhizoctonia solani	Rhizoctone commun	1
	Septoria sp.	Tache septorienne	1
	Xanthomonas campestris	Tache bactérienne	6
	Phytotoxicité par pesticides		4
	Salinité du sol trop élevée		3
	Transpiration excessive du feuillage		3
	Autres agents non infectieux		3
Maïs sucré	*Exserohilum* sp.	Desséchement	1
	Fusarium equiseti	Piétin fusarien	1
	Fusarium graminearum	Fusariose de l'épi	1
	Fusarium oxysporum	Piétin fusarien	2
	Fusarium solani	Piétin fusarien	1
	Pythium sp.	Piétin brun	1
	Agents non infectieux		4
Melon	*Alternaria alternata*	Tache foliaire	1
	Erwinia carotovora	Pourriture molle bactérienne	1
	Fusarium oxysporum	Fusariose vasculaire	4

Tableau 1. Sommaire des maladies diagnostiquées parmi les **cultures maraîchères** de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Melon	*Geotrichum candidum*	Pourriture laiteuse	1
	Phoma cucurbitacearum	Tache foliaire	1
	Phytophthora capsici	Pourriture des fruits	2
	Pseudomonas syringae	Tache angulaire	2
	Pythium ultimum	Pourridié pythien	3
	Agents non infectieux		1
Oignon /	*Alternaria porri*	Alternariose	1
Échalote /	*Botrytis allii*	Brûlure des feuilles	1
Poireau	*Botrytis* spp.	Tache foliaire / pourriture du bulbe	3
	Burkholderia cepaciae	Pourriture bactérienne	1
	Erwinia carotovora	Pourriture molle bactérienne	1
	Fusarium moniliforme	Pourriture du bulbe et des racines	1
	Fusarium oxysporum	Fusariose du plateau	19
	Fusarium solani	Pourriture rose	2
	Levures	Pourriture du bulbe	13
	Penicillium sp.	Pourriture du bulbe	3
	Peronospora destructor	Mildiou	4
	Stemphylium sp.	Moisissure noire des feuilles	3
	Acidité / salinité inadéquate du sol		3
	Déséquilibres minéraux		4
	Phytotoxicité par les herbicides		2
	Autres agents non infectieux		9
Piment / Poivron	*Colletotrichum* sp.	Anthracnose	2
	Erwinia carotovora	Pourriture molle bactérienne	2
	Fusarium oxysporum	Fusariose des racines et du collet	3
	Phytophthora capsici	Pourriture de fruits	1
	Phytophthora sp.	Pourriture des racines et du collet	2
	Pseudomonas syringae	Moucheture bactérienne	2
	Pythium ultimum	Pourridié pythien	6
	Pythium sp.	Pourridié pythien	1
	Rhizoctonia solani	Rhizoctone	2
	Sclerotinia sclerotiorum	Sclérotiniose	2
	Agents non infectieux		5
Pomme de terre	*Alternaria alternata*	Tache foliaire	1
	Alternaria solani	Alternariose	1
	AMV	Mosaïque	2
	Botrytis cinerea	Moisissure grise	3
	Clavibacter michiganensis ssp. *sepedonicus*	Flétrissement bactérien	2
	Colletotrichum coccodes	Dartrose	8
	Erwinia carotovora ssp. *carotovora*	Pourriture molle bactérienne	5
	Fusarium oxysporum	Fusariose vasculaire / pourriture fusarienne	2
	Fusarium solani	Pourriture du semenceau	2
	Helminthosporium solani	Tache argentée	2
	Phytophthora erythroseptica	Pourriture rose	1
	Phytophthora infestans	Mildiou	8
	Potyvirus	Mosaïque	4
	Pseudomonas fluorescens	Pourriture molle bactérienne	1
	PVX	Mosaïque	1
	Pythium sp.	Pourriture des racines	2
	Rhizoctonia solani	Rhizoctonie	1
	Sclerotinia sclerotiorum	Pourriture sclérotique	1
	Spongospora sp.	Gale poudreuse	6

Tableau 1. Sommaire des maladies diagnostiquées parmi les **cultures maraîchères** de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Pomme de terre	ToRSV	Anomalie de coloration	1
	Verticillium dahliae	Verticilliose	4
	Nécrose vasculaire au défanage		8
	Ozone		4
	Stress climatiques		9
	Stress culturaux		9
	Autres agents non infectieux		1
Tomate	*Botrytis cinerea*	Moisissure grise	3
	Clavibacter michiganensis ssp. *michiganensis*	Chancre bactérien	5
	Colletotrichum coccodes	Anthracnose	2
	Fusarium oxysporum	Fusariose des racines	6
	Geotrichum candidum	Pourriture laiteuse	2
	Phomopsis sp.	Pourriture de fruits	1
	Phytophthora capsici / P. nicotiana	Pourriture de fruits et de tiges	4
	Phytophthora infestans	Mildiou	2
	Potyvirus	Mosaïque	2
	Pseudomonas syringae	Moucheture bactérienne	10
	Pyrenochaeta sp.	Racine liégeuse	1
	Pythium spp.	Pourriture pythienne	5
	Sclerotinia sclerotiorum	Sclérotiniose	4
	Xanthomonas campestris	Tache bactérienne	3
	Grêle		3
	Phytotoxicité par des herbicides		6
	Stress climatiques divers		3
	Stress culturaux divers		1
Zucchini	*Cladosporium cucumerinum*	Gale	2
	Erwinia tracheiphila	Flétrissement bactérien	1
	Pythium sp.	Pourriture de fruits	1
	Pseudomonas syringae	Tache angulaire	2
	Rhizopus sp.	Pourriture de fruits	1
Total			**659**

Tableau 2. Sommaire des maladies diagnostiquées parmi les **légumes d'entrepôt** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Carotte	*Sclerotinia sclerotiorum*	Sclérotiniose	1
Échalote	*Burkholderia gladioli*	Pourriture du bulbe	1
	Urocystis sp.	Charbon	1
Pomme de terre	*Botrytis cinerea*	Moisissure grise	1
	Colletotrichum coccodes	Dartrose	2
	Erwinia carotovora ssp. *carotovora*	Pourriture molle	1
	Fusarium spp.	Pourriture fusarienne	5
	Helminthosporium solani	Tache argentée	2
	PMTV		4
	Pseudomonas fluorescens	Pourriture molle	1
	Pythium spp.	Pourriture aqueuse	2
	Rhizoctonia solani	Rhizoctonie	7
	Spongospora sp.	Gale poudreuse	5
	Verticillium dahliae	Verticilliose	1
	Blessure défanage		2
	Cœur creux / cœur brun		4
	Cœur noir		3
	Gel		2
	Autres agents non infectieux		5
Total			**50**

Tableau 3. Sommaire des maladies diagnostiquées parmi les **plantes maraîchères de serres** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Concombre	*Botrytis cinerea*	Moisissure grise	1
	Erwinia tracheiphila	Flétrissement bactérien	1
	Fusarium oxysporum	Fusariose vasculaire	2
	Pseudoperonospora cubensis	Mildiou	3
	Potyvirus	Mosaïque, marbrure	5
	Pythium aphanidermatum	Pourriture des tiges et du collet	1
	Pythium irregulare	Pourriture des tiges et du collet	1
	Pythium spp.	Pourriture des tiges et du collet	3
	Rhizoctonia solani	Pourriture des racines	1
Laitue	*Botrytis cinerea*	Moisissure grise	2
	Bremia lactucae	Mildiou	2
	Erwinia carotovora	Pourriture molle bactérienne	1
	Phytophthora drechsleri	Pourriture des racines	10
	Pseudomonas cichorii	Tache luisante	2
	Pseudomonas syringae	Tache foliaire	1
	Pythium spp.	Pourriture des racines	3
	Blessure par pluie forte		2
	pH élevé du sol		16
	Phytotoxicité par des herbicides		13
	Salinité élevée du sol		2
	Autres agents non infectieux		5
Tomate	*Acremonium strictum*	Chancre sec	1
	Clavibacter michiganensis ssp. *michiganensis*	Chancre bactérien	13
	Erwinia carotovora ssp. *carotovora*	Pourriture molle bactérienne	2
	Erysiphe orontii	Blanc	1
	Fusarium oxysporum	Pourriture des racines et du collet	8
	Phytophthora nicotiniana	Pourriture de la tige	1
	Potyvirus	Mosaïque foliaire	1
	Pseudomonas fluorescens	Pourriture molle bactérienne	1
	Pythium irregulare	Pourriture pythienne	2
	Pythium ultimum	Pourriture pythienne	1
	Pythium spp.	Pourriture pythienne	1
	Sclerotinia sclerotiorum	Sclérotiniose	1
	Carences minérales (P, K, Mg, B)		15
	Manque d'eau		5
	Maturité inégale		3
	Phytotoxicité pesticide		6
	Salinité du sol élevée		4
	Toxicité en manganèse		2
	Transpiration excessive		4
	Autres agents non infectieux		12
Total			**161**

Tableau 4. Sommaire des maladies diagnostiquées parmi les **petits fruits** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Bleuetier en corymbe / nain	*Aureobasidium* sp.	Brûlure des rameaux	1
	Botrytis cinerea	Moisissure grise	3
	Cercospora sp.	Tache foliaire	1
	Exobasidium vaccinii	Rouge	1
	Fusicoccum sp.	Chancre	1
	Gibbera vaccinicola (Protoventuria)	Gale de tige	2
	Guignardia sp.		1
	Monilinia sp.	Pourriture sclérotique	2
	Phomopsis vaccinii	Brûlure phomopsienne	2
	Pucciniastrum goeppertianum	Rouille-balai de sorcière	2
	Pseudomonas syringae	Brûlure bactérienne	1
	Seimatosporium sp.	Chancre et tache de la tige	1
	Grands écarts de températures		3
	Gel hivernal		5
	pH inadéquat		2
	Salinité du sol inadéquate		3
	Autres agents non infectieux		6
Canneberge	Agents non infectieux		6
Cassissier / Gadellier /Groseillier	Agents non infectieux		3
Fraisier	*Botrytis cinerea*	Moisissure grise	4
	Colletotrichum acutatum	Anthracnose	3
	Diplocarpon earlianum	Tache pourpre	3
	Hainesia lythri	Pourriture bistre	1
	Myxomycètes		2
	Phytophthora cactorum	Pourriture de cuir	6
	Phytophthora spp.	Stèle rouge, pourriture des racines	18
	Pratylenchus spp.	Lésions des racines	8
	Pythium/*Rhizoctonia*/*Cylindrocarpon*/*Fusarium*	Pourriture noire des racines	122
	Ramularia brunnea	Tache commune	1
	Sphaerotheca macularis (Oïdium)	Blanc	1
	Verticillium dahliae	Verticilliose	5
	Zythia fragariae	Brûlure des pétioles et tache foliaire	2
	Asphyxie racinaire		12
	Gel hivernal		13
	Insolation		9
	pH du sol inadéquat		4
	Phytotoxicité herbicide		5
	Salinité inadéquate du sol		6
	Autres agents non infectieux		13
Framboisier rouge	*Agrobacterium* ssp.	Tumeur du collet ou de la tige	1
	Botrytis cinerea	Moisissure grise	4
	Colletotrichum spp.	Brûlure et chancre de la tige	4
	Didymella applanata	Brûlure des dards	1
Framboisier rouge / noire	*Didymella* sp.	Brûlure des dards	1
	Erwinia amylovora	Brûlure bactérienne	3
	Phomopsis sp.	Brûlure et chancre sur tige	1
	Phytophthora spp.	Pourridié phytophthoréen	5

Tableau 4. Sommaire des maladies diagnostiquées parmi les **petits fruits** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Framboisier rouge / noire	*Pratylenchus* sp.	Détection dans le sol	2
	Pseudomonas syringae	Brûlure bactérienne	1
	Pythium/*Rhizoctonia*/*Cylindrocarpon*/*Fusarium*	Pourriture noire des racines	11
	Septoria rubi	Tache septorienne	2
	Sphaceloma necator	Anthracnose	2
	ToRSV	Fruits grumeleux	1
	Verticillium dahliae	Verticilliose	1
	Xiphinema spp.	Détection dans le sol	1
	Gel hivernal		14
	Phytotoxicité herbicide		7
	Autres agents non infectieux		11
Vigne	*Agrobacterium tumefaciens*	Tumeur du collet	3
	Botrytis cinerea	Moisissure grise	6
	Burkholderia andropogonis	Tache foliaire	1
	Elsinoe (Sphaceloma) ampelina	Anthracnose	3
	Phomopsis viticola	Excoriose	5
	Phyllosticta ampelicida	Pourriture noire des baies	11
	Plasmopara viticola	Mildiou	5
	Pseudomonas spp.	Brûlure de fleurs, de feuilles	2
	Pseudopezicula sp.	Rougeot parasitaire	18
	Rhizoctonia sp.	Pourriture de racines	1
	Septoria sp.	Tache septorienne	4
	Carence minérale		8
	Grêle		4
	Phytotoxicité pesticide		10
	Autres stress climatiques		10
	Autres stress culturaux		11
Total			**460**

Tableau 5. Sommaire des maladies diagnostiquées parmi les **céréales** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Avoine	*Alternaria alternata*	Moisissure noire	1
	Bipolaris sp.	Tache helminthosporienne	6
	BYDV	Feuille rouge	1
	Colletotrichum graminicola	Anthracnose	1
	Drechslera sp.	Tache brune	1
	Pythium spp.	Piétin brun	1
	Rhizoctonia sp.	Rhizoctone commun	1
	Stagonospora avenae	Tache ovoïde	2
	Phytotoxicité herbicide		1
Orge	*Bipolaris sorokiniana*	Tache helminthosporienne	6
	BYDV	Jaunisse nanisante	2
	Drechslera teres	Rayure réticulée	3

Tableau 5. Sommaire des maladies diagnostiquées parmi les **céréales** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Orge	*Fusarium avenaceum / F. graminearum*	Fusariose de l'épi	2
	Gaeumannomyces graminis	Piétin-échaudage	2
	Pythium sp.	Piétin brun	2
	Rhizoctonia solani	Rhizoctone commun	1
	Stagonospora avenae	Tache ovoïde	1
	Carence minérale		3
	Autres agents non infectieux		4
Blé	*Alternaria alternata*	Moisissure noire	1
	Bipolaris sorokiniana	Tache helminthosporienne	3
	BYDV	Jaunisse nanisante	1
	Cladosporium spp.	Moisissure noire	1
	Colletotrichum sp.	Anthracnose	1
	Erysiphe sp.	Blanc	1
	Fusarium graminearum	Piétin fusarien; fusariose de l'épi	4
	Gaeumannomyces graminis	Piétin échaudage	2
	Puccinia sp.	Rouille	1
	Rhizoctonia solani	Rhizoctone commun	1
	Agents non infectieux		2
Total			**60**

Tableau 6. Sommaire des maladies diagnostiquées parmi les **cultures industrielles** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Canola	*Alternaria* spp.	Tache sur tige	4
	Cladosporium spp.	Chute des gousses	1
	Colletotrichum sp.	Brûlure de la tige	1
	Fusarium spp.	Pourriture fusarienne	6
	Plasmodiophora brassicae	Hernie	18
	Pythium spp.	Pourriture pythienne	5
	Rhizoctonia solani	Rhizoctone commun	10
	Sclerotinia sclerotiorum	Sclérotiniose	5
Houblon	*Bipolaris* sp.	Tache helminthosporienne	1
	Agents non infectieux		2
Maïs	*Aureobasidium zeae*	Kabatiellose	1
	Bipolaris sp.	Tache helminthosporéenne	1
	Fusarium spp.	Piétin fusarien	2
	Gaeumannomyces graminis	Piétin-échaudage	2
	Phialophora sp.	Pourriture des racines	1
	Pyrenochaeta terrestris	Pourriture des racines	1
	Pythium spp.	Piétin brun	2
	Ustilago zeae	Charbon commun	1
	Phytotoxicité herbicide		7
	Stress climatiques		5

Tableau 6. Sommaire des maladies diagnostiquées parmi les **cultures industrielles** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Soya	*Alternaria alternata*	Alternariose	1
	Corynespora cassiicola	Pourriture des racines	1
	Fusarium spp.	Pourriture fusarienne	8
	Peronospora manshurica	Mildiou	3
	Phoma sp.	Pourriture des graines	1
	Phomopsis sp.	Brûlure phomopsienne	1
	Phytophthora spp.	Pourriture phytophthoréenne	4
	Pratylenchus sp.	Lésion des racines	1
	Pythium spp.	Pourriture pythienne	6
	Rhizoctonia solani	Rhizoctone commun	4
	Sclerotinia sclerotiorum	Sclérotiniose	1
	Septoria glycines	Tache septorienne	1
	Ozone		5
	Phytotoxicité herbicide		3
	Autres agents non infectieux		4
Total			**120**

Tableau 7. Sommaire des maladies diagnostiquées parmi les **plantes fourragères** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Luzerne	*Leptosphaerulina* sp.	Tache de poivre	1
	Pseudopeziza medicaginis	Tache commune	1
Millet perlé	*Dreschlera* sp.	Tache foliaire	1
	Fusarium sp.	Fusariose de l'épi	1
	Agents non infectieux		3
Vesce	*Colletotrichum* sp.	Anthracnose	2
	Pythium sp.	Pourriture pythienne	1
Total			**10**

Tableau 8. Sommaire des maladies diagnostiquées parmi les **arbres et arbustes fruitiers** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Cerisier	*Podosphaera* sp.	Blanc	1
	Septoria sp.	Tache septorienne	1
	Gel hivernal		1

Tableau 8. Sommaire des maladies diagnostiquées parmi les **arbres et arbustes fruitiers** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Poirier	Gel hivernal		1
	Phytotoxicité par pesticides		1
	Plomb		1
Pommier	*Alternaria* sp. / *Aspergillus* sp. / *Aureobasidium* sp. / *Botrytis cinerea* / *Cladosporium* sp. / *Fusarium* spp. / Hainesia sp. / levures / *Microsphaeropsis* sp. / *Penicillium* sp. / *Phoma* sp.	Moisissure du coeur	30
	Cytospora leucosperma	Chancre cytosporéen	1
	Erwinia amylovora	Brûlure bactérienne	1
	Nectria cinnabarina	Maladie du corail	1
	Phlyctema vagabunda	Anthracnose	1
	Phomopsis mali	Chancre phomopsien	1
	Pseudomonas syringae	Chancre bactérien	2
	Sphaeropsis malorum	Chancre sur rameau	1
	Spaerotheca macularis	Blanc	1
	Spilocea pomi	Tavelure	2
	Gel hivernal		4
	Phytotoxicité par les pesticides		4
	Autres agents non infectieux		7
Prunier	Gel hivernal		1
Total			**63**

Tableau 9. Sommaire des maladies diagnostiquées parmi les **graminées à gazon** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Vert de golf (Agrostide / pâturin annuel)	*Colletotrichum graminicola*	Anthracnose	8
	Curvularia sp.	Tache foliaire	2
	Drechslera sp.	Tache helminthosporienne	1
	Fusarium equiseti / F. avenaceum / F. graminearum / F. nivale	Tache fusarienne, pourriture fusarienne des racines	7
	Gaeumannomyces graminis	Piétin-échaudage	4
	Pythium splendens	Piétin brun	3
	Pythium sylvaticum	Piétin brun	1
	Pythium torulosum	Piétin brun	16
	Pythium ultimum	Piétin brun	4
	Pythium sp.	Piétin brun	1
	Rhizoctonia sp.	Rhizoctone brun, tache ocellée	1
	Scutellonema sp.	Brunissement des racines	1
	Tylenchorhynchus sp.	Brunissement des racines	1
	Typhula sp.	Brûlure des feuilles	1
	Agents non infectieux		3
Total			**54**

Tableau 10. Sommaire des maladies diagnostiquées parmi les **arbres** et **arbustes ornementaux** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Abies sp.	*Cylindrocarpon* sp.	Pourriture des racines	3
	Fusarium spp.	Pourriture des racines	3
	Phytophthora spp.	Pourriture des racines	2
	Gel hivernal		1
	Salinité élevée du sol		1
Acer	*Aureobasidium* sp.	Anthracnose	1
	Phytotoxicité dicamba		1
Physocarpus	*Sphaerotheca macularis*	Blanc	1
Picea sp.	*Chrysomyxa* sp.	Rouille des aiguilles	1
	Rhizosphaera sp.	Rouge	1
	Stress climatiques		3
Pinus sp.	Polluant SO_2		1
	Salinité élevée du sol		1
Rhododendron	*Phyllosticta*	Tache foliaire	1
	Pythium sp.	Brunissement des racines	2
	Rhizoctonia solani	Pourriture du collet	2
	Gel hivernal		1
Spirea	*Pythium ultimum*	Pourriture pythienne	1
Syringa reticulata	Froid		1
Thuja sp.	*Cylindrocarpon* sp.	Pourriture des racines	1
	Fusarium spp.	Pourriture des racines	2
	Pestalotiopsis sp.	Brûlure des aiguilles	2
	Phyllosticta sp.	Brûlure phyllostictienne	1
	Rhizoctonia solani	Pourriture des racines	1
	Agents non infectieux		3
Tilia sp.	*Microsphaeropsis* sp.	Tache sur tige	1
	Pseudomonas syringae	Brûlure de tige	1
Sambucus sp.	Salinité élevée du sol	Brûlure au feuillage	1
Weigela	*Aphelenchoides* sp.	Jaunissement et brûlure foliaire	1
	Pseudomonas syringae	Tache foliaire	1
Total			**43**

Tableau 11. Sommaire des maladies diagnostiquées parmi les **plantes ornementales** produites en **serres** et reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Agapanthus	TRSV		1
Anemia	*Pythium* sp.		1
	Asphyxie racinaire		1
Anthurium	*Phytophthora nicotiana*	Pourriture du collet	1
Astilbe	TSV	Mosaïque	1
Begonia	*Fusarium oxysporum*	Pourriture des tiges	1
	Phytophthora cinnamomi	Pourriture des racines	1
Calibrachoa	ArMV	Mosaïque	2
	Botrytis cinerea	Moisissure grise	2
	Fusarium spp.	Pourriture des racines	3
	Phytophthora spp.	Pourriture des racines et du collet	3
	Pythium spp.	Pourriture des racines et du collet	3
	Rhizoctonia solani	Racines brunes	1
	pH inadéquat	Anomalie de coloration du feuillage	5
	Phytotoxicité pesticide		2
	Autres agents non infectieux		4
Dianthus	*Fusarium moniliforme / Fusarium oxysporum*	Pourriture fusarienne	14
Dracaena	*Colletotrichum* sp.	Anthracnose	1
	Agents non infectieux		2
Euphorbia pulcherrima	*Erwinia carotovora*	Pourriture molle bactérienne	1
	Pythium spp.	Pourriture pythienne	6
	Thielaviopsis basicola	Pourriture noire des racines	1
	Agents non infectieux		2
Hedera	*Xanthomonas hortorum*	Tache bactérienne	2
	Phytophthora capsici	Pourriture es racines	1
Impatiens	INSV	Tache nécrotique	1
	Rhizoctonia solani	Rhizoctone commun	1
	Agent non infectieux		2
Lewisia	*Alternaria* sp.	Tache alternarienne	1
Pelargonium	*Botrytis cinerea*	Moisissure grise	2
	PFBV		2
	Potyvirus		1
	Thielaviopsis basicola	Pourriture noire	1
	Xanthomonas hortorum pv. *pelargonii*	Brûlure bactérienne	8
	Asphyxie racinaire		3
	Carence minérale		4
	Œdème		4
	Autres agents non infectieux		6
Petunia	Stress climatiques		1
	Stress culturaux		4
Rudbeckia	*Fusarium moniliforme*	Pourriture des racines	1
	Pythium ultimum	Pourriture pythienne	1

Tableau 11. Sommaire des maladies diagnostiquées parmi les **plantes ornementales** produites en **serres** et reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Rudbeckia	TSV		1
	Asphyxie racinaire		1
	pH élevé		1
Sanvitalia	Carence de bore		1
Scabiosa	Carence		1
Syngonium	Salinité élevée du sol		1
Total			**111**

Tableau 12. Sommaire des maladies diagnostiquées parmi les **plantes ornementales extérieures** (jardins et pépinières) reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Aegopodium	*Ascochyta* sp.	Brûlure des feuilles	1
	Septoria sp.	Tache septorienne	1
	Xanthomonas campestris	Tache bactérienne	1
Agapanthus	TRSV	Mosaïque	1
Ajuga	AMV	Mosaïque	1
Althaea	*Septoria sp.*	Tache septorienne	1
Aquilegia	*Thielaviopsis basicola*	Pourriture noire des racines	1
Arenaria	*Rhizoctonia solani*	Rhizoctone	1
Aschwagandha	*Pythium* sp.	Pourriture pythienne	1
	pH élevé du sol		1
Athyrium	*Urediopsis* sp.	Rouille	1
Brunnera	Transpiration excessive du feuillage		1
Centaurea	*Phytophthora* sp.	Pourriture du collet	1
	Rhizoctonia solani	Rhizoctone	1
Chelone	Déséquilibre minéral		1
	Phytotoxicité par des herbicides		1
Chrysanthemum	*Pseudomonas cichorii*	Tache bactérienne	1
Cimicifuga	*Xanthomonas campestris*	Tache bactérienne	1

Tableau 12. Sommaire des maladies diagnostiquées parmi les **plantes ornementales extérieures** (jardins et pépinières) reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Coleus	*Peronospora* sp.	Mildiou	1
Dahlia	*Pythium* sp.	Pourriture pythienne	1
	Salinité élevée du sol		1
Delphinium	*Pythium* spp.	Pourriture pythienne	2
	Rhizoctonia solani	Rhizoctone	1
	Agents non infectieux		2
Dicentra	TRV	Anomalie de coloration des feuilles	1
Echinacea	*Aphelenchoides* sp.	Tache et brûlure foliaire	2
	Botrytis cinerea	Moisissure grise	1
	CMV	Anomalie de coloration des feuilles	5
	Fusarium oxysporum	Pourriture des racines	1
	Pythium sp.	Pourriture pythienne	3
	Rhizoctonia solani	Rhizoctone	1
	Septoria sp.	Tache septorienne	1
	TSV		1
	Salinité élevée du sol		1
Gaillardia	*Thielaviopsis basicola*	Pourriture noire des racines	1
	Froid		1
	Ozone		1
Helianthus	Phytotoxicité pesticides		1
	Salinité élevée du sol		1
Hemerocallis	*Rhizoctonia solani*	Rhizoctone	1
	TRSV	Tache foliaire	1
	Agents non infectieux		3
Heuchera	*Phytophthora* sp.	Pourriture des racines	1
Hosta	*Fusarium oxysporum*	Pourriture du collet	3
	HVX	Mosaïque	4
	Froid		2
	Autres agents non infectieux		2
Hydrangea	Carence minérale		1
Lamium	*Pythium* sp.	Pourriture pythienne	1
	Rhizoctonia solani	Rhizoctone	2
Leucanthemum	*Colletotrichum* sp.	Ànthracnose	1
	Pythium ultimum	Pourriture pythienne	2
	Salinité élevée du sol		1
Liatris	*Septoria* sp.	Tache septorienne	1
	Agents non infectieux		2
Lilium	*Botrytis* sp.	Brûlure botrytique	1
	Cylindrocarpon sp.	Pourriture des racines	1

Tableau 12. Sommaire des maladies diagnostiquées parmi les **plantes ornementales extérieures** (jardins et pépinières) reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Lilium	*Fusarium oxysporum*	Pourriture fusarienne	1
	Pratylenchus sp.	Lésions des racines	1
Lupinus	*Botrytis cinerea*	Moisissure grise	1
	Fusarium oxysporum	Pourriture fusarienne	1
	Pythium sp.	Pourriture pythienne	1
Lysimachia	*Fusarium oxysporum*	Pourriture fusarienne	1
	Rhizoctonia solani	Rhizoctone	1
	Stress culturaux		3
Myrica	*Fusarium oxysporum*	Pourriture fusarienne	1
	Salinité élevée du sol		1
Paeonia	*Botrytis cinerea*	Moisissure grise	1
	Rhizoctonia solani	Rhizoctone	2
	Stress culturaux		3
Phlox paniculata	*Fusarium oxysporum*	Pourriture fusarienne	1
	Potyvirus	Anomalie de coloration du feuillage	2
	Phytotoxicité par des pesticides		2
	Salinité élevée du substrat		2
	Autres agents non infectieux		4
Platycodon	*Stemphylium lycopersici*	Brûlure de tige	1
Polemonium	*Colletotrichum* sp.	Anthracnose	1
	Fusarium oxysporum	Pourriture fusarienne	1
	Pythium sp.	Pourriture pythienne	1
Polygonatum	Stress culturaux		2
Pulmonaria	AMV	Marbrure, malformation	1
Rudbeckia	*Fusarium moniliforme*	Pourriture fusarienne	1
	Pythium ultimum	Pourriture pythienne	1
	TSV	Anomalie de coloration du feuillage	1
	Agents non infectieux		2
Salvia	*Xanthomonas campestris*	Tache bactérienne	2
	Pseudomonas syringae	Dépérissement des feuilles	1
	Phytotoxicité par herbicides		1
Sedum	*Rhizoctonia solani*	Rhizoctone	1
Solidago	*Puccinia* sp.	Rouille	1
Tulipa	*Botrytis cinerea*	Moisissure grise	3
	Fusarium oxysporum	Pourriture fusarienne	1
	Penicillium sp.	Pourriture du bulbe	3
	Pythium irregulare	Pourriture pythienne	1
	Excès d'eau		1

Tableau 12. Sommaire des maladies diagnostiquées parmi les **plantes ornementales extérieures** (jardins et pépinières) reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Veronica	*Sphaerotheca* sp.	Blanc	1
Total			**135**

Tableau 13. Sommaire des maladies diagnostiquées parmi les **plantes aromatiques et les fines herbes** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2008.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Basilic	*Fusarium oxysporum*	Pourriture des racines et du collet	1
	Pseudomonas syringae	Tache foliaire	1
	Pythium sp.	Pourriture des racines	1
	TSWV	Anomalie de coloration du	1
	Salinité élevée du sol	feuillage	1
Origan	Salinité élevée du sol		1
Persil	*Fusarium oxysporum*	Pourriture fusarienne	1
	Pseudomonas syringae	Tache bactérienne	1
	Pythium ultimum	Pourriture pythienne	1
	Rhizoctonia solani	Rhizoctone	2
	Septoria petroselini	Tache septorienne	1
Total			**12**
GRAND TOTAL			**1938**

CROP: Diagnostic Laboratory Report - All Crops
LOCATION: Prince Edward Island

NAMES AND AGENCIES:
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TITLE: DISEASES DIAGNOSED ON COMMERCIAL CROPS IN PRINCE EDWARD ISLAND, 2008

METHODS: The Prince Edward Island (PE) Department of Agriculture's Plant Disease Diagnostic Service (PDDS) provides diagnosis and control recommendations primarily for diseases of commercial crops produced on PE. The PDDS also provides a Dutch elm disease (DED) service for the PE Department of Environment, Energy and Forestry and for local cities. Samples are submitted to the laboratory by agriculture extension staff, producers, growers, agri-business crop insurance agents and the general public. Diagnoses are based on a combination of a visual examination of symptoms, microscopic observation and culturing onto artificial media. The diagnoses reported may not necessarily reflect the major disease problems encountered during the season in the field, but rather those most prevalent within the samples submitted. This season, environmental conditions were conducive for the development of such pathogens *as Sclerotinia*, *Rhizoctonia*, *Phytophthora* and *Pseudomonas*. Excessive moisture substantially increased the incidence of potato late blight.

RESULTS AND COMMENTS: A total of 568 samples were processed for the 2008 growing season including 47 DED samples. Categories of samples received (excluding DED) were: cereals (14.7%), potato (64.8%), small fruits (4.6%), vegetables (4.0%) and other crops (1.0%). The percentage of samples received from provincial crop insurance agents was 43.0 %. A total of 708 pathology identifications and 14 insect identifications were completed during the period November 4, 2007 to December 24, 2008.

Table 1: Summary of diseases diagnosed on commercial crop samples submitted to the Plant Disease Diagnostic Laboratory, Prince Edward Island Department of Agriculture, Prince Edward Island in 2008.

CROP	DISEASE	CAUSAL AGENT / PLANT PATHOGEN	NO. OF TIMES AGENTS WERE IDENTIFIED
Brussels sprouts	Alternaria leaf spot	*Alternaria* sp.	1
	Bacterial soft rot	*Erwinia* sp.	1
	Black speck	Physiological disorder	1
	Sclerotinia rot	*Sclerotinia sclerotiorum*	1
Cabbage	Black rot	*Xanthomonas* sp.	1
	Bacterial soft rot	*Erwinia* sp.	1
	Pepper spot	Physiological disorder	1
Carrot	Alternaria leaf spot	*Alternaria* sp.	1
	Environmental disorder	Spray drift injury	1
Cauliflower	Bacterial soft rot	*Erwinia* sp.	1
		Pseudomonas sp.	1
	Clubroot	*Plasmodiophora brassicae*	1
	Physiological disorder	Nutritional imbalance	1
	Wirestem	*Rhizoctonia* sp.	1
Corn	Gibberella ear rot	*Gibberella zeae*	1
Cucumber	Downy mildew	*Pseudoperonospora cubensis*	1
	White mould	*Sclerotinia sclerotiorum*	1
Potato	Bacterial soft rot	*Clostridium* sp.	11
		Erwinia sp.	19
		Pseudomonas sp.	11
	Black dot	*Colletotrichum coccodes*	3
	Blackleg	*Erwinia* sp.	12
	Black scurf	*Rhizoctonia solani*	25
	Botrytis grey mould	*Botrytis cinerea*	7
	Brown spot	*Alternaria alternata*	3
	Common scab	*Streptomyces scabies*	7
	Early blight	*Alternaria* spp.	5
	Early dying	*Colletotrichum coccodes*	7
		Erwinia sp.	1
		Fusarium oxysporum	3
		Fusarium sp.	4
		Rhizoctonia solani	6
		Verticillium albo-atrum	2
		Verticillium dahliae	4

CROP	DISEASE	CAUSAL AGENT / PLANT PATHOGEN	NO. OF TIMES AGENTS WERE IDENTIFIED
Potato (cont'd)	Fusarium dry rot	*Fusarium coeruleum*	2
		Fusarium oxysporum	1
		Fusarium roseum	1
		Fusarium sambucinum	5
		Fusarium solani	4
		Fusarium spp.	6
	Fusarium wilt	*Fusarium avenaceum*	1
		Fusarium oxysporum	5
		Fusarium roseum	1
		Fusarium solani	1
		Fusarium spp.	3
	Late blight	*Phytophthora infestans*	147
	Leak	*Pythium* sp.	5
	Physiological disorder	Blackheart	1
		Brown centre	3
		Bruising	2
		Burn	9
		Cracking	5
		Elephant hide	4
		Enlarged lenticels	10
		Frost damage	5
		Greening	4
		Hairy sprout	1
		Herbicide damage	1
		Hollow heart	19
		Jelly end rot	5
		Lightning injury	1
		Off-type	4
		Skinning	2
		Tip-burn	1
	Pink rot	*Phytophthora erythroseptica*	75
	Pink eye	*Pseudomonas* sp.	22
	Stem canker	*Rhizoctonia solani*	16
	Seed piece decay	*Cladosporium* sp.	1
		Clostridium sp.	3
		Erwinia sp.	2
	Silver scurf	*Helminthosporium solani*	1
	Verticillium wilt	*Verticillium albo-atrum*	1
		Verticillium dahliae	2
	White mould	*Sclerotinia sclerotiorum*	2
Rutabaga	Bacterial soft rot	*Erwinia* sp.	1
		Pseudomonas sp.	1
	Bottom rot	*Rhizoctonia solani*	1
	Damping-off	*Rhizoctonia* sp.	1
	Downy mildew	*Peronospora* sp.	1
	Clubroot	*Plasmodiophora brassicae*	1
	Sclerotinia rot	*Sclerotinia sclerotiorum*	1

CROP	DISEASE	CAUSAL AGENT / PLANT PATHOGEN	NO. OF TIMES AGENTS WERE IDENTIFIED
Tomato	Botrytis vine rot	*Botrytis cinerea*	1
	Early blight	*Alternaria* sp.	1
	Physiological disorder	Burn	
		Sunscald	1
		Wind damage	1
FIELD CROPS:			
Barley	Leaf stripe	*Pyrenophora* sp.	4
	Black point	*Alternaria* sp.	1
		Bipolaris sp.	1
	Common root rot	*Cochliobolus sativus*	2
	Fusarium head blight	*Fusarium graminearum*	2
	Net blotch	*Pyrenophora* sp.	1
	Physiological disorder	Nutritional disorder	4
	Powdery mildew	*Blumeria graminis*	4
	Root rot	*Cochliobolus* sp.	7
		Fusarium sp.	2
	Scald	*Rhynchosporium* sp.	6
	Seedling blight	*Bipolaris* sp.	1
		Cladosporium sp.	1
		Cochliobolus sp.	2
		Fusarium sp.	1
	Smut	*Ustilago* sp.	1
	Black moulds	*Alternaria* sp.	2
		Cladosporium sp.	1
		Pyrenophora sp.	1
	Spot blotch	*Bipolaris* sp.	6
		Cochliobolus sp.	6
Oat	Leaf blotch	*Pyrenophora* sp.	1
Soybean	Anthracnose	*Colletotrichum* sp.	1
	Downy mildew	*Peronospora* sp.	1
	Seedling blight	*Fusarium* sp.	2
		Phomopsis sp.	1
	Sudden death syndrome	*Fusarium oxysporum*	1
		Fusarium solani	1
	Target spot	*Corynespora* sp.	1
	White mould	*Sclerotinia sclerotiorum*	3
Wheat	Black moulds	*Alternaria* sp.	4
		Bipolaris sp.	5
		Cladosporium sp.	3
		Cochliobolus sp.	2
	Common root rot	*Bipolaris* sp.	1
	Fusarium head blight	*Fusarium graminearum*	9
	Physiological disorder	Herbicide damage	1
	Powdery mildew	*Blumeria graminis*	1
	Root rot	*Fusarium* sp.	1

CROP	DISEASE	CAUSAL AGENT / PLANT PATHOGEN	NO. OF TIMES AGENTS WERE IDENTIFIED
Wheat (cont'd)	Seedling blight	*Cochliobolus* sp.	2
		Fusarium sp.	1
	Septoria blotch	*Septoria* sp.	1
	Take-all	*Gaeumannomyces graminis*	1
SMALL FRUITS			
Apple	Bitter rot	*Colletotrichum gloeosporiodes*	1
	Black rot	*Botryosphaeria obtusa*	1
Blueberry (lowbush)	Botrytis blight	*Botrytis cinerea*	2
	Monilinia blight	*Monilinia* sp.	1
	Phomopsis canker	*Phomopsis* sp.	1
	Physiological disorder	Winter injury	1
Grape	Angular leaf spot	*Mycosphaerella* sp.	1
	Botrytis vine rot	*Botrytis cinerea*	1
	Downy mildew	*Plasmopara viticola*	
Pear	Leaf spot	*Entomosporium* sp.	1
Strawberry	Black root rot	*Pythium* sp,	1
		Rhizopus sp.	1
	Crown and root rot	*Fusarium* sp.	1
		Rhizoctonia solani	1
		Rhizopus sp.	1
	Fusarium wilt	*Fusarium* sp.	1
	Leaf blight	*Phomopsis* sp.	1
	Leaf scorch	*Diplocarpon* sp.	1
	Leaf spot	*Phomopsis* sp.	1
	Physiological disorder	Winter injury	1
	Root rot	*Pythium* sp.	2
		Rhizoctonia sp.	2
OTHER CROPS:			
Elm	Dutch elm disease	*Ophiostoma* sp.	19
	Negative test results		28

TOTAL: 708

Cereals / Céréales

CROP / CULTURE: Barley
LOCATION / RÉGION: Central Alberta

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TITLE / TITRE: 2008 BARLEY DISEASE SURVEY IN CENTRAL ALBERTA

INTRODUCTION AND METHODS: A survey to document diseases of barley (30 fields) was conducted in Central Alberta from July 21 to August 9, 2008. Growers were contacted for permission to evaluate their fields, with the evaluation being done at the late milk to soft dough stage. The fields were traversed in a diamond pattern starting at least 25 m from the field edge, with visual analysis made of 5 plants at each of 5 locations. Leaf diseases were scored on a 0-9 scale, with a 5 rating equal to more than one percent of leaf area diseased (PLAD) on the upper leaf canopy, 10-25 PLAD in the middle canopy and 25-50 PLAD in the lower-canopy. Common root rot (CRR) was assessed on sub-crown internodes using a 0-4 scale where 1=trace and 4=severe infection. Other diseases, if present, were rated as a percentage of the plants affected. After the survey, a representative tissue sub-sample of the diseased plant parts collected at each location was cultured in the laboratory for pathogen isolation and identification.

RESULTS AND COMMENTS: Survey results are presented in Table 1. Growing conditions in Central Alberta were relatively good in 2008. A wet May and June was followed by a drier July and August. This led to a long seeding period and crop development tended to be varied and delayed even for earlier-seeded crops. Disease development was variable throughout the region.

Scald (*Rhynchosporium secalis*) severity was low to moderate in most of the fields, although 20% of crops had high levels. There was also less net blotch (*Pyrenophora teres* f. *teres*) than normally observed throughout the survey area. However, other barley leaf spots, primarily spot form of net blotch (*P. teres* f. *maculata*) and some alternaria leaf spot (*Alternaria spp*.) were found at significant levels in most of the fields surveyed.

Common root rot (*Cochliobolus sativus* and *Fusarium* spp.) occurred in most of the surveyed fields; however, severity levels were generally low.

Stripe rust (*Puccinia striiformis)* was noted in one commercial barley crop at a trace level.

Table 1. Disease incidence and severity in 30 barley crops in Central Alberta, 2008.

		Average disease rating and range	
Barley Disease	**% Crops Affected**	**Mean**	**Range**
Scald (0-9)	70	4.4	0-8
Net blotch (0-9)	36	3.3	0-5
Other leaf spots (0-9)	97	2.8	0-6
Common root rot (0-4)	97	1.0	0-3

CROP / CULTURE: Barley
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: MONITORING FUSARIUM HEAD BLIGHT OF BARLEY IN MANITOBA IN 2008

INTRODUCTION AND METHODS: A total of 33 barley fields (25 two-rowed, 8 six-rowed) in southern Manitoba were monitored for the visible presence of fusarium head blight (FHB) from July 28 to August 7, 2008, when crops were at the late-milk to hard-dough (ZGS 77-88) stages of growth. The fields were selected at random along the survey routes, depending on crop frequency. The area of southern Manitoba sampled was bounded by Highways # 17, 67, 26 and 16 to the north, the Manitoba/North Dakota border to the south, Hwy #83 to the west (south-west portion of the province not sampled), and Hwy #12 to the east. FHB incidence (the percentage of heads with typical symptoms) was assessed in each crop by sampling 80-100+ spikes at 3 locations and averaging the results. The average spike proportion infected (SPI) was estimated for each field. Several affected heads were collected at each survey site and stored in paper envelopes. Subsequently, a total of 50 discoloured and putatively infected kernels, or those of normal appearance to make up the remainder, were removed from five heads per location. The kernels were surface sterilized in 0.3% NaOCl (Javex brand) and plated on potato dextrose agar in Petri dishes (10 seeds per dish) to quantify and identify *Fusarium* spp. on kernels, based on morphological traits described in standard taxonomic keys.

RESULTS AND COMMENTS: Conditions were generally favourable for early planting of spring crops, but cool weather throughout May and June generally delayed crop development. Seasonal (April 1 to September 30) moisture was at normal to slightly above normal levels for most of the province except the Interlake region which received excessive rain, leading to standing water and the drowning some crops. The cool spring conditions likely curtailed development of *Fusarium* inoculum on overwintered straw and stubble. This, plus low levels of FHB in the previous two years (Tekauz et al. 2008, 2007) probably reduced overall inoculum amounts, resulting in relatively low levels of infection and subsequent FHB development in cereal crops.

Fusarium head blight symptoms were evident in all 33 fields surveyed. Average incidence of FHB in two-rowed crops was 7.0% (range 0.3 - 21.5%), while the spike proportion infected (SPI) averaged 9.0% (range 5 - 20%); in six-rowed crops incidence was 11.1% (range 1.0 - 28.0%) and the SPI 8.6% (range 6 - 12%). The resulting average fusarium head blight index or FHB-I (%incidence X %SPI / 100) for 2-row barley was 0.8% (range <0.1 - 4.3%), and that for 6-row barley 1.2% (range 0.1 - 3.4%). The mean FHB-I for all barley was 0.9%. This level would have resulted in a minimal yield loss to FHB in 2008. The highest (4.0%) and lowest (0.4%) FHB-I levels in the past 5 years occurred in 2005 and 2006, respectively (Tekauz et al, 2006, 2007).

Fusarium colonies developed from 29% of the kernels plated on potato dextrose agar, a similar level to that reported for 2007 (Tekauz et al. 2008). The *Fusarium* species isolated from kernels are listed in Table 1. As found in Manitoba in most years, *F. graminearum* was the predominant pathogenic species on kernels, followed by *F. poae.* Levels of other species remained low.

REFERENCES:
Tekauz, A., Gilbert, J., Mueller, E., Stulzer, M., Beyene, M., and Kaethler, R. 2008. Survey for fusarium head blight of barley in 2007 in Manitoba. Can. Plant Dis. Surv. 88: 45-46. (http://www.cps-scp.ca/cpds.htm)

Tekauz, A., Gilbert, J., Mueller, E., Stulzer, M., Beyene, M., Kaethler, R., and Gozé, P. 2007. 2006 Survey for fusarium head blight of barley in Manitoba. Can. Plant Dis. Surv. 87: 53-54. (http://www.cps-scp.ca/cpds.htm)

Tekauz, A., Gilbert, J., Mueller, E., Stulzer, and Beyene, M. 2006. Survey for fusarium head blight of barley in Manitoba in 2005. Can. Plant Dis. Surv. 85: 37-38. (http://www.cps-scp.ca/cpds.htm)

Table 1. *Fusarium* spp. isolated from fusarium head blight-affected kernels of barley in Manitoba in 2008.

***Fusarium* spp.**	**Percent of fields**	**Percent of kernels**
F. avenaceum	12	0.7
F. culmorum	3	0.2
F. graminearum	91	70.7
F. poae	64	25.7
F. sporotrichioides	21	2.7

CROP / CULTURE: Barley
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: LEAF SPOT DISEASES IN MANITOBA BARLEY CROPS IN 2008

INTRODUCTION AND METHODS: For 2008, leaf spot diseases of barley in Manitoba were assessed by surveying 33 farm fields (25 two-rowed, 8 six-rowed) from July 28 to August 7 when most crops were at the late-milk to hard-dough stage of growth (ZGS 77-88). Fields were sampled at regular intervals along the survey routes, depending on availability. The area of southern Manitoba sampled was bounded by Highways # 17, 67, 26 and 16 to the north, the Manitoba/North Dakota border to the south, Hwy #83 to the west (south-west portion of the province not sampled), and Hwy #12 to the east. Disease incidence and severity were recorded by averaging their occurrence on approximately 10 plants along a diamond-shaped transect of about 50 m per side, beginning near the field edge. Disease ratings were taken on both the upper (flag and penultimate leaves) and lower leaf canopies, using a six-category 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 at each site, dried, and stored in paper envelopes. Subsequently, surface-sterilized pieces of infected leaf tissue were placed on filter paper in moist chambers for 3-5 days to promote sporulation, identify the causal agent(s), and thereby determine the disease(s) present.

RESULTS AND COMMENTS: Conditions in spring (May and June) 2008 were generally cooler than normal, delaying crop development. Subsequently, temperatures rose to typical levels for July and August. Seasonal (April 1 to September 30) moisture was at normal to slightly above normal levels for most of the province except the Interlake region which received excessive rain, leading to standing water and the drowning of some crops. Relatively good cereal crops were harvested in most districts. The dry conditions in 2006, which resulted in minimal leaf spot development in barley (Tekauz et al. 2007) and subsequent low levels of disease observed in 2007 (Tekauz et al. 2008) likely resulted in lower levels of overwintering pathogen inoculum. As has often been reported for barley, the field history, i.e., presence or absence of barley stubble from the previous year, appeared to be the main factor influencing the severity of leaf spotting observed.

Leaf spots were observed in the upper and/or lower leaf canopies of all the barley fields surveyed. Disease levels in the upper canopy were trace, very slight or slight in 82% of fields, moderate in 12%, and severe in 6%. Respective severity categories in the lower canopy were tabulated as 70%, 6%, and 18%, with 6% being senescent. Since most crops had relatively low amounts of leaf spotting in both the upper lower leaf canopies, leaf spot diseases likely caused average yield losses of 2-3% in barley in 2008. This level of damage was lower than reported for 2007 (Tekauz et al. 2008), but is in the 'normal' range reported for the province in the past several years.

Pyrenophora teres (net blotch) and *Cochliobolus sativus* (spot blotch) were again both prevalent in 2008, with the former being more universal and causing a somewhat greater (56% vs. 40%) amount of the total foliar damage observed (Table 1). *Septoria passerinii* (speckled leaf blotch) and other species of *Septoria/Stagonospora* were detected in a few barley fields, as reported in most years, but appear to have had a minimal impact when present.

REFERENCES:
Tekauz, A., Gilbert, J., Mueller, E., Stulzer, M., Beyene, M. and Kaethler, R. 2008. Survey for leaf spot diseases of barley in Manitoba in 2007. Can. Plant Dis. Surv. 87: 47-48. (http://www.cps-scp.ca/cpds.htm)

Tekauz, A., Gilbert, J., Mueller, E., Stulzer, M., Beyene, M., Kaethler, R. and Gozé, P. 2007. Survey for leaf spot diseases of barley in Manitoba in 2006. Can. Plant Dis. Surv. 86: 55-56. (http://www.cps-scp.ca/cpds.htm)

Table 1. Incidence and isolation frequency of leaf spot pathogens of barley in Manitoba in 2008

Pathogen	Incidence (% of fields)	Frequency (% of isolations)*
Pyrenophora teres	97	55.5
Cochliobolus sativus	82	40.3
Septoria passerinii	12	2.3
Septoria/*Stagonospora* spp.	12	2.0

*indicative of the relative foliar damage caused

CROP / CULTURE : Barley
LOCATION / RÉGION: Ontario

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: DISEASES OF BARLEY IN EASTERN ONTARIO IN 2008

INTRODUCTION AND METHODS: A survey for diseases of barley was conducted in eastern Ontario in the third week of July when plants were at the soft dough stage of development. Nineteen fields were chosen at random in regions of eastern Ontario where most of the spring barley is grown. Foliar disease severity was determined on 10 flag and penultimate leaves sampled at each of three random sites per field using a rating scale of 0 (no disease) to 9 (severely diseased). Diseases were identified by visual symptoms. Average severity scores of <1, <3, <6, and ≥6 were considered trace, slight, moderate, and severe levels, respectively. Severity of leaf stripe, ergot, loose smut, and take-all was estimated as the percentage of plants infected. Fusarium head blight (FHB) was rated for both incidence (percent of infected spikes) and severity (percent of infected spikelets in affected spikes), based on approximately 200 spikes sampled at each of three random sites per field. A FHB index (% incidence x % severity)/100 was determined for each field. Index values of <1, <10, <20, and ≥20% were considered slight, moderate, severe, and very severe infections, respectively.

Determination of the causal species of FHB was based on 10 infected heads collected from each field. The heads were air-dried at room temperature, and subsequently threshed. Thirty discolored kernels per sample were chosen at random, surface sterilized in 1% NaOCl for 30 seconds, and plated in 9-cm diameter petri dishes onto modified potato dextrose agar (10 g dextrose per liter) amended with 50 ppm streptomycin sulfate. Plates were incubated for 10-14 days at 22-25 C, with a 14-hour photoperiod using fluorescent and long wave ultraviolet tubes. *Fusarium* species isolated from the kernels were identified by microscopic examination using standard taxonomic keys.

RESULTS AND COMMENTS: The surveyed fields consisted of 2 two-rowed and 17 six-rowed barley crops. Fourteen diseases or disease complexes were observed in the surveyed fields (Table 1). Spot blotch (*Cochliobolus sativus*) and net blotch (*Pyrenophora teres*) were the most common foliar diseases, observed in 16 and 18 fields at mean disease severities of 5.0 and 3.5, respectively. Severe spot blotch and net blotch levels were observed in 6 and 3 fields, respectively. Yield reductions due to both diseases were estimated to average more than 10% in surveyed fields.

Septoria complex [including speckled leaf blotch (*Septoria avenae* f. sp. *triticea),* leaf blotch (*S. passerinii*), and glume blotch (*S. nodorum*)] and leaf rust (*Puccinia hordei*) were observed in 10 and 9 fields at mean severities of 2.2 and 2.1, respectively. Severe infection with the septoria complex or leaf rust was not observed. Other foliar diseases observed included barley yellow dwarf (BYDV), powdery mildew (*Blumeria graminis* f. sp. *hordei*), scald (*Rhynchosporium secalis*), and stem rust (*Puccinia graminis* f. sp. *tritici* and f. sp. *secalis*). These diseases were observed in 4, 4, 6, and 6 fields, at mean severities of 1.0, 1.4, 3.4, and 1.4, respectively. Except for a severe level of scald found in two fields, all affected crops had only trace to slight levels of infected plants. None of these diseases would have caused significant damage.

Ergot (*Claviceps purpurea*) was found in 11 fields (Table 1). The disease was more common and severe in 2008 than in 2007 (Xue and Chen. 2008), with 5 of the 11 affected crops having greater than 1% incidence. Covered smut (*Ustilago hordei*), leaf stripe (*Pyrenophora graminea*), loose smut (*U. nuda*), and take-all (*Gaeumannomyces graminis*) were observed in 2, 10, 6, and 10 fields, at mean incidences of 1.0, 0.9, 1.8, and 1.3%, respectively. These four diseases likely resulted in minimal damage.

Fusarium head blight was observed in 16 fields (Table 1). The FHB index ranged from 0.7-6.0%, with a mean of 1.2%. Eight *Fusarium* species were isolated from infected kernels (Table 2). *Fusarium graminearum* predominated, occurring in 94% of the crops and on 22% of the infected kernels. *Fusarium equiseti, F. poae,* and *F. sporotrichioides* also were common, occurring in more than 50% of the crops and on up to 5% of infected kernels. Other species found included *F. acuminatum, F. avenaceum, F. oxysporum,* and *F. verticillioides,* all at less than 1% of the kernels.

The relative prevalence and severity of foliar diseases and FHB in 2008 were generally greater than found in 2007 (Xue et al. 2008). Spot blotch and ergot caused significant yield reductions in 2008 but were minor diseases in the previous year. The relatively low temperatures and frequent rainfall in June, July, and August were likely responsible for the increase in leaf spots, ergot, and FHB in 2008.

REFERENCE:

A.G. Xue, and Y. Chen. 2008. Diseases of barley in eastern Ontario in 2007. Can. Plant Dis. Surv. 87:49-50. (http://www.cps-scp.ca/cpds.htm)

Table 1. Prevalence and severity of barley diseases in eastern Ontario in 2008.

	NO. CROPS	DISEASE SEVERITY IN AFFECTED CROPS*	
DISEASE	**AFFECTED (n=22)**	**Mean**	**Range**
Barley yellow dwarf	4	1.0	1.0
Leaf rust	9	2.1	1.0-4.0
Net blotch	18	3.5	1.0-7.0
Powdery mildew	4	1.4	1.0-2.0
Scald	6	3.4	1.0-8.0
Septoria complex	10	2.2	1.0-5.0
Spot blotch	16	5.0	1.0-8.7
Stem rust	6	1.4	1.0-3.0
Covered smut (%)	2	1.0	1.0
Ergot (%)	11	1.3	1.0-2.5
Leaf stripe (%)	10	0.9	0.5-1.0
Loose smut (%)	6	1.8	1.0-4.0
Take-all (%)	10	1.3	1.0-2.0
Fusarium head blight**	16		
Incidence (%)		12.2	0.7-40.0
Severity (%)		7.2	0.7-16.7
Index (%)		1.2	0.7-6.0

*Foliar disease severity was rated on a scale of 0 (no disease) to 9 (severely diseased), except for barley stripe, ergot, covered smut, loose smut, and take-all, for which severity was rated as the % plants infected
**FHB index = (% incidence x % severity)/100

Table 2. Frequency of *Fusarium* species isolated from fusarium damaged kernels of barley in eastern Ontario in 2008.

***Fusarium* spp.**	**% FIELDS**	**% KERNELS**
Total *Fusarium*	100	34.2
F. acuminatum	17	0.2
F. avenaceum	28	0.7
F. equiseti	50	1.3
F. graminearum	94	22.8
F. oxysporum	6	0.1
F. poae	83	4.3
F. sporotrichioides	89	4.8
F. verticillioides	6	0.1

CROPS / CULTURES: Barley and Oat
LOCATION / RÉGION: Saskatchewan

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
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TITLE / TITRE: FUSARIUM HEAD BLIGHT IN BARLEY AND OAT IN SASKATCHEWAN IN 2008

INTRODUCTION AND METHODS: Fusarium head blight (FHB) incidence and severity were assessed in 50 barley crops (40 two-rowed; 10 six-rowed) and 16 oat crops in Saskatchewan in 2008. Fields and results were grouped according to soil zone (SZ) (SZ 1 = Brown; SZ 2 = Dark Brown; SZ3 = Black/Grey), and fields under irrigation were considered separately and referred to as the Irrigation Zone (fields located along the South Saskatchewan River in west-central and central regions of the province).

Crop adjustors with Saskatchewan Crop Insurance Corporation and irrigation agrologists with Saskatchewan Ministry of Agriculture collected 50 random spikes or panicles from the barley and oat crops at the late milk to early dough growth stages (Lancashire et al. 1991). Spikes were analyzed for visual FHB symptoms at the Crop Protection Laboratory in Regina. The number of infected spikes per crop and the number of infected spikelets in each spike were recorded. A FHB disease severity rating, also known as the FHB index, was determined for each barley and oat crop surveyed: FHB severity (%) = (% of spikes affected x mean proportion (%) of kernels infected) / 100. Mean FHB severity values were calculated for each soil/irrigation zone and for the entire province. Glumes or kernels with visible FHB symptoms were surface sterilized in 0.6% NaOCl solution for 1 min and cultured on potato dextrose agar and carnation leaf agar for subsequent identification and quantification of *Fusarium* species.

RESULTS AND COMMENTS: Approximately 3.3 million acres (1.3 million ha) of barley and 1.6 million acres (0.6 million ha) of oat were seeded in Saskatchewan in 2008 (Saskatchewan Ministry of Agriculture, 2008). Seeding, emergence and early crop development were delayed due to cold weather across the province. Seeding delays were also attributed to dry soils in the south and slow snow melt and/or wet soils in other areas of the province. Precipitation was below normal in most areas in May, but by mid-June rain occurred in the south. Hail, strong winds, and rainfall occurred in many areas during July and early August, followed by a few days of record-breaking heat. Second growth resulting from uneven crops and recovery from hail damage subsequently delayed harvest in some regions.

FHB was detected in 73% and 70% of the two-rowed and six-rowed barley crops surveyed, respectively (Table 1). The provincial mean FHB severities for two-rowed barley (0.7%) and six-rowed barley (0.4%) were similar to those of previous years (Pearse et al. 2008). The incidence and severity of FHB in two-rowed barley were lowest in SZ1 and highest in SZ3. Three two-rowed barley crops had severities higher than 3% and, as found in 2007, the most frequently isolated causal pathogen in these crops was *F. poae* (75 to 100% of the total *Fusarium* isolated). *Fusarium poae* was also the most frequently isolated *Fusarium* species from all barley crops surveyed, accounting for 82% of total *Fusarium* isolations; this was followed by *F. avenaceum* (9%) and *F. sporotrichioides* (6%). *Fusarium graminearum* was isolated from only two crops of six-rowed barley. Other fungi found infrequently on barley included *Cochliobolus, Pyrenophora,* and *Septoria* spp. Secondary moulds were isolated from 80% of barley samples in 2008.

In oat, FHB was identified in 81% of crops surveyed, at a mean severity of 0.5% (data not shown). *Fusarium poae* was the most frequently isolated *Fusarium* species, accounting for 44% of total *Fusarium* isolations; this was followed by *F. avenaceum* (32%), and *F. sporotrichioides* (19%). No *F. graminearum* was isolated from affected oat samples in 2008. Secondary moulds were isolated from 94% of the surveyed oat samples.

ACKNOWLEDGEMENTS:
We gratefully acknowledge the participation of Saskatchewan Crop Insurance Corporation staff and Saskatchewan Ministry of Agriculture irrigation agrologists for the collection of cereal samples for this survey.

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Table 1. Prevalence and severity of fusarium head blight (FHB) in barley crops grouped by soil or irrigation zones in Saskatchewan, 2008.

Soil Zones	Two-Row Barley		Six-Row Barley	
	No. crops affected / total crops surveyed (% of crops infected)	**Mean FHB severity[1] (range)**	**No. crops affected / total crops surveyed (% of crops infected)**	**Mean FHB severity[1] (range)**
Zone 1 Brown	1/6 (17%)	Trace[2] (0 - 0.2%)	---	---
Zone 2 Dark Brown	13/17 (76%)	0.2% (0 - 1.3%)	1/2 (50%)	0.5% (0 - 1%)
Zone 3 Black/Grey	15/15 (100%)	1.5% (0.1-6.8%)	6/8 (75%)	0.3% (0 - 0.9%)
Irrigation Zone	0/2	0%	---	---
Overall Total/Mean	29/40 (73%)	0.7%	7/10 (70%)	0.4%

[1]Percent FHB severity = (% of spikes affected x mean proportion (%) of kernels infected) / 100
[2]FHB severity values less than 0.1% reported as trace

CROPS / CULTURES: Wheat, barley, oat
LOCATION / RÉGION: Saskatchewan

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
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TITLE /TITRE: SEED-BORNE FUSARIUM ON CEREALS IN SASKATCHEWAN IN 2008

INTRODUCTION AND METHODS: The results of agar plate tests on cereal seed samples from Saskatchewan provided by four companies are summarized. The tests were conducted between early September and mid- or late December, 2008. It was assumed that the majority of samples were from the 2008 crop. The tests were conducted either to determine the frequency of each species of *Fusarium* present or simply to detect *F. graminearum.* The data were tabulated only for all species combined (total *Fusarium*) and for *F. graminearum*. Mean percent seed infection with *F. graminearum* and with total *Fusarium* were calculated for each crop district [CD] in Saskatchewan (8). In addition, the percentage of samples in which *F. graminearum* was not detected was calculated for each CD. Only 5% of all samples tested were free of all *Fusarium* spp.; as there was little variation among crop districts in % samples with no *Fusarium* spp., these data were not tabulated.

The tests were performed on random seed samples, with no attempt to select fusarium-damaged kernels. Plating techniques varied among companies. All tests were done using potato dextrose agar and the petri dishes in which seed was plated were incubated for 5 to 7 days. Illumination was with either fluorescent or a mixture of fluorescent and near UV (black) light and the dishes were arranged either singly or in stacked pairs under the light source. The number of seeds tested per sample was usually 200, but occasionally 400 or 1000. Thus, the probability of obtaining false negative results varied among tests.

RESULTS AND COMMENTS: In Saskatchewan the 2008 growing season started with cool dry weather in all except the most northerly agricultural areas, where some flooding occurred after rapid runoff. Completion of seeding was timely in most regions, but crop growth was delayed (8). Some of the driest areas in the south received plentiful rain in late May or mid-June. Other areas remained drier than normal until storms occurred in mid- or late July. In the period April 1-August 31 precipitation ranged from 60% to 150% of normal in different regions. Second growth occurred in crops in areas where late-season rainfall followed earlier moisture shortage. Harvest started in late July in the most southerly areas, but progress was delayed by slow ripening in most regions until mid-September. Excellent weather then resulted in rapid completion of the harvest.

Fusarium head blight was a conspicuous problem on wheat and barley in some eastern and south-eastern regions by mid-August (2, 3). However, no data are available on the proportion of cereal crops that were sprayed with fungicides to control head blight. Favourable harvest weather in September was not conducive to saprophytic spread of *Fusarium* spp. in ripening floral tissues, which also can lead to infection of cereal grains. Overall, crop quality was above the 10-year average (8).

The data compiled are based on 626 samples (38% wheat [all classes of spring and winter combined], 44% durum, 15% barley, 3% oat). Mean levels of *F. graminearum* and of total *Fusarium* varied among CDs (Table 1). Values for total *Fusarium* were generally higher than those in 2007(4). However, *F. graminearum* was found in only 13 of 20 districts, slightly fewer than in 2007. This species was detected in only a small percentage of samples and percent seed infection was usually low (Table 1); the overall mean percent infection was similar to 2007 (4). As in previous years (4, 5, 6), *F. graminearum* was most prevalent in regions close to Manitoba or North Dakota, i.e. CDs 1, 2, 5 and 8A. In CD 5A *F.*

graminearum was found in all 30 samples tested, consistent with observations of fusarium head blight in the field in that region (2, 3). Furthermore, the highest levels of infection in individual samples of all four cereal types were found in CD 5A. For *F. graminearum* infection the highest levels were wheat 6.0%, durum 13.0%, barley 8.5%, and oat 0.5% and for total *Fusarium* spp. the highest levels were wheat 21.5%, durum 44.0%, barley 41.5%, and oat 31.5%.

Fusarium acuminatum, *F. avenaceum*, *F. culmorum*, *F. equiseti*, *F. graminearum*, *F. poae* and *F. sporotrichioides* accounted for most of the *Fusarium spp.* isolated. As in 2006 and 2007 (4, 6), *F. poae* was the most common species on all cereals and *F. avenaceum* was the second most common on wheat. *Fusarium poae* has replaced *F. avenaceum* as the commonest species of *Fusarium* on cereal seed from Saskatchewan (1, 7).

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Table 1. Number of cereal seed samples tested from September to December 2008 by four commercial companies, and levels of infection with *Fusarium graminearum* or total *Fusarium* spp. in relation to Saskatchewan Crop Districts

		Fusarium graminearum		**Total *Fusarium****
Crop District	**No. of samples tested**	**Mean % infection**	**Samples with no infection detected**	**Mean % infection**
1A	20	1.0	25%	4.6
1B	10	0.8	50%	7.9
2A	60	0.8	32%	4.2
2B	73	0.9	30%	3.0
3AN	1	0	100%	3.5
3AS	50	0.4	54%	2.7
3BN	41	<0.1	98%	1.3
3BS	1	0	100%	0.5
4A	5	0	100%	0.1
4B	5	0	100%	0.8
5A	30	2.8	0%	16.7
5B	54	0.6	65%	6.1
6A	30	0.6	53%	5.5
6B	50	0.7	78%	5.4
7A	30	0	100%	2.0
7B	14	0	100%	2.0
8A	75	0.4	65%	5.8
8B	25	0.1	72%	11.8
9A	24	0.1	88%	4.1
9B	24	0	100%	4.4
TOTAL	626	0.6	60%	4.9

*Number of samples tested for total *Fusarium* from all crop districts was only 400.

CROP / CULTURE: Barley, Oat and Wheat
LOCATION / RÉGION: Manitoba and Saskatchewan

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TITLE / TITRE: **CEREAL VIRUS DISEASE SITUATION IN MANITOBA IN 2008**

INTRODUCTION AND METHODS: Virus diseases on cereals in Manitoba monitored in 2008 were barley yellow dwarf (BYD), wheat streak mosaic (WSM) and oat necrotic mottle (ONM). Collaborators identified and collected samples from mid-May to early September in cereal crops in Manitoba and parts of eastern Saskatchewan (1). The proportion of plants with (suspected) virus symptoms in surveyed fields was estimated and specimens with and without symptoms collected for testing. Infection with BYDV, WSMV and ONMV (2) was evaluated by transmission to indicator hosts and confirmed by serological tests (ELISA). Transmission to indicator host plants also served to assess the virulence of the isolates against historical benchmarks. For WSMV, transmission was by mechanical inoculation to a range of susceptible spring bread and durum wheat hosts. Oat specimens with symptoms that resembled those of ONM or of WSM on oat were assayed by mechanical inoculation to a differential set of susceptible bread wheat and oat hosts. For BYDV, transmission was by cereal aphids to sets of seedlings of a susceptible oat host.

RESULTS AND COMMENTS:
Barley Yellow Dwarf (BYD) – In 2008, seeding was delayed in some of the principal cereal-producing regions of the eastern Prairies by excessive moisture. Viruliferous aphid inoculum arrived later than average (early to mid-June). There were a few outbreaks of disease, particularly in barley in south-western Manitoba. Economic losses due to BYD appear to have been less extensive than in 2007. All isolates that were collected from cereal crops were similar to the PAV strain (non-specifically transmitted by the oat bird-cherry aphid).

Wheat Streak Mosaic (WSM) – Outbreaks of WSM in spring wheat crops are especially severe when plants are infected with the virus at early seedling stages. Although fewer severe outbreaks of WSM in spring wheat crops in Manitoba were observed in 2008 than in recent years, more disease was seen in late season. Plants affected in late season were not colonized by the wheat curl mite, the vector of WSM virus (WSMV). In 2008, WSM was again sufficiently widespread that it could be found at some point in the growing season in almost all winter and spring wheat crops in southern Manitoba at trace levels or higher. This is in contrast to the situation that prevailed until 2001 when almost all crops were completely disease-free. Naturally-occurring outbreaks of WSM on oat were observed in 2008, but economic losses were observed only on wheat. Virus isolates obtained from oat and assayed on susceptible wheat seedlings were not more virulent than WSMV isolates from wheat in Manitoba.

Oat Necrotic Mottle (ONM) – The mild streak mosaic symptoms of WSM and ONM on oat are difficult to distinguish so occurrences of oat crops displaying such symptoms should be tested for both WSMV and ONMV. In 2008, as has been observed since 2006, oat plants with putative WSM or ONM symptoms were identified at a small number of sites in south-eastern Manitoba that were within a few hundred metres of stands of winter wheat. In all cases, infection with WSMV was confirmed while transmission and serological assays failed to detect ONMV.

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CROPS / CULTURES: Barley, Oat, Wheat
LOCATION / RÉGION: Manitoba and Saskatchewan

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TITLE / TITRE: **CEREAL SMUT SURVEYS, 2008**

INTRODUCTION AND METHODS: In July 2008, cereal crops in Manitoba and Saskatchewan were surveyed for the presence of smut diseases caused by *Ustilago hordei, U. nigra, U. nuda, U. tritici, U. avenae* and *U. kolleri*. The area sampled was covered by routes from Winnipeg - Weyburn - Moose Jaw - Saskatoon - Melfort - Wadena - Canora - Yorkton - Roblin - Dauphin - Neepawa - Winnipeg, as well as one-day trips around Winnipeg, MB, in the Red River Valley, Brandon, MB, and Manitoba's Interlake region. Fields were selected at random at approximately 10 - 15 km intervals, depending on the frequency of the crops in the area. An estimate of the percentage of infected plants (i.e., plants with sori) was made while walking an ovoid path of approximately 100 m in each field. Levels of smut greater than trace (<0.01%) were estimated by counting plants in a one m^2 area at a minimum of two sites on the path.

An isolate of smut was collected from each infested field and compared with a carboxin-sensitive isolate, '72-66', from Canada, and a carboxin-resistant isolate, 'Viva' (Newcombe and Thomas, 1991) from France. The teliospore germination assay of Leroux (1986) and Leroux and Berthier (1988) was used to determine if resistance to the fungicide carboxin was present. Teliospores of each isolate were streaked onto half-strength potato dextrose agar amended with 0 or 1.0 µg ml^{-1} of carboxin. The cultures were incubated at 20°C in a controlled environment chamber and examined for spore germination after 24 h.

RESULTS AND COMMENTS: Loose smut (*U. tritici*) was found in 15 (19%) of the 79 fields of awnless, common wheat surveyed. One crop had an incidence of 0.4% infection, two crops had an incidence of 0.2% infection, two had an incidence of 0.1% infection, and the incidence of smutted plants in the remainder of the infested crops was at trace levels (<0.01%). In awned, common wheat, loose smut was found in 16 (31%) of 51 fields. Two crops had an incidence of 0.5% infection, one had 0.2% infection, one had 0.1% infection, and the rest showed trace levels of infection. In durum wheat, loose smut was found in 15 (45%) of the 33 fields surveyed. One crop had 1% infection, two had 0.5% infection, one had 0.3% infection, three had 0.1% infection and the rest of the infested crops had trace levels of infection.

One (2%) of 41 fields of oat surveyed was found to have 0.3% smutted plants. The isolate recovered from the field was *U. avenae*. Loose smut (*U. nuda*) was found in 10 (45%) of 22 fields of six-row barley. Two crops had an incidence of 1.0% infection, three an incidence of 0.5% infection, one an incidence of 0.2% infection and two an incidence of 0.1% infection, while the incidence in the remainder of infested crops was at trace levels. Nine (17%) of the 52 fields of two-row barley surveyed were found to have smutted plants. Incidences of loose smut infection of 1.5%, 0.5%, 0.3% and 0.1% were found in one crop each; the remainder of the infested crops were infected at trace levels. False loose smut (*U. nigra*) and covered smut (*U. hordei*) were not found in 2008. Two isolates of *U. nuda* collected from six row barley were able to germinate and grow on medium amended with carboxin. The data suggest that they may be resistant to carboxin, but further studies must be done to confirm these preliminary findings.

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CROPS / CULTURES: Barley, Oat and Wheat
LOCATION / RÉGION: Manitoba and eastern Saskatchewan

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TITLE / TITRE: **STEM RUSTS OF CEREALS IN WESTERN CANADA IN 2008**

INTRODUCTION AND METHODS: Surveys of producer crops and trap nurseries of barley, oat and wheat for incidence and severity of stem rust *(Puccinia graminis* Pers. f. sp. *tritici* Eriks. & E. Henn. and *P. graminis* Pers. f. sp. *avenae* Eriks. & E. Henn.) were conducted in July, August, and September 2008. Infected stem tissue samples were collected from fields and trap nurseries. Urediniospores were obtained from collections and evaluated for virulence specialization on appropriate sets of host differential lines (Fetch 2005).

RESULTS AND COMMENTS: Cool weather in April and May resulted in delayed planting of cereal crops. Temperature and precipitation was near normal for the 2008 growing season across most of the eastern Prairie region, with cool nights providing good dew, particularly in the Red River Basin. While this provided excellent environmental conditions for stem rust infection, incidence and severity on susceptible lines in trap nurseries and in commercial oat and barley fields was at trace levels across western Canada. This indicated that very low levels of stem rust inoculum came in from the USA. In addition, the vast majority of commercial grain crops were sprayed with foliar fungicides because of good yield potential and high grain prices in the spring, thus limiting the number of nontreated fields for rusts to affect.

All spring wheat cultivars recommended for production in Manitoba and Saskatchewan have excellent resistance to stem rust, and no stem rust infection was observed in any commercial wheat fields. Stem rust was detected at trace levels on susceptible wheat lines in trap nurseries, cultivated barley, and on wild barley (*Hordeum jubatum*) in 2008. The dominant race of *P. graminis* f. sp. *tritici* in 2008 was QFCS (99%).

Stem rust in cultivated and wild oat also was at trace levels in western Canada in 2008. All oat cultivars except ‘Stainless’ are susceptible to stem rust races TJG, TJJ, and TJS (Fetch and Jin 2007). Race TGD (NA29) was dominant in 2008 (52% of total samples), followed by TJJ (17%), and TGN (12%). Race TJS, which is a highly virulent race that appeared in 2005, declined from 19% in 2007 to 4% in 2008. This is most likely explained by the lack of inoculum from the USA; the rust normally overwinters in Texas and Louisiana where the gene *Pg-a* is deployed.

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CULTURES / CROPS: Avoine(*Avena sativa*), Orge (*Hordeum vulgare*), Blé (*Triticum aestivum*)
RÉGION / LOCATION: Québec

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TITRE / TITLE: PRINCIPALES MALADIES OBSERVÉES CHEZ LES CÉRÉALES AU QUÉBEC EN 2008

MÉTHODES: Les essais d'enregistrement et de recommandation de blé de printemps, d'orge et d'avoine réalisés dans différentes localités du Québec (CÉROM 2008) ont été visités à une reprise durant la saison entre le stade de développement laiteux moyen à pâteux moyen de la céréale. L'intensité des symptômes des maladies foliaires y a été notée selon une échelle de 0 à 9 (0 = plante saine; 9 = feuille étendard présentant des symptômes sur plus de 50 % de sa surface). Des valeurs de 0 à 4 sont considérées faibles, celles de 4 à 6, moyennes, et celles de 6 à 9, élevées. Des données supplémentaires du contenu des grains en mycotoxines ont été recueillies auprès du service de mise en vente en commun du blé destiné à la consommation humaine de la Fédération des producteurs de cultures commerciales du Québec (FPCCQ). Des informations sur la présence de maladies, majoritairement la fusariose, ont également été obtenues de La Financière agricole du Québec (FADQ).

RÉSULTATS et COMMENTAIRES: La plupart des régions ont bénéficié de bonnes conditions climatiques lors des semis. En juin et en juillet toutefois la situation s'est détériorée dû à un excès de pluie. Ces conditions humides ont été très propices au développement des maladies cryptogamiques, que ce soit les maladies de racines ou les maladies des parties aériennes. L'excès d'eau en soi a causé un problème de potentiel redox trop bas, débalançant l'absorption minérale et la croissance des racines, et aggravant la verse ainsi que plusieurs maladies. L'excès d'eau a certainement pu réduire le rendement de plus du tiers dans plusieurs régions du Québec. Ainsi au site d'essais de Pintendre les rendements moyens du blé étaient de 2173 kg/ha et l'orge trop endommagée n'a même pas été récoltée, alors que ces champs peuvent produire 4000 à 5000 kg/ha certaines années.

Chez l'avoine, la tache ovoïde (*Stagonospora avenae*) a été la maladie qui s'est manifestée dans tous les essais avec une intensité de symptômes variant de moyenne à élevée. La rouille couronnée (*Puccinia coronata*) a sévi surtout en Montérégie et dans le Bas-St-Laurent-Gaspésie et l'intensité des symptômes a été plus élevée qu'à l'habitude. À La Pocatière (Bas-St-Laurent) notamment, la pression de la rouille a été très discriminante envers les lignées/cultivars à l'essai, les uns étant faiblement affectés alors que d'autres l'étant fortement. La jaunisse nanisante de l'orge (VJNO), quant à elle, bien que présente dans toutes les régions a eu très peu d'incidence.

Chez le blé, le complexe de taches foliaires (*Drechslera tritici-repentis*, *Stagonospora nodorum* et *Cochliobolus sativus*) était présent comme à chaque année dans tous les essais. L'intensité de symptôme variait de moyenne à élevée. La rouille des feuilles (*Puccinia triticina*) a été observée dans plusieurs essais, mais a eu peu d'incidence, sauf à Saint-Mathieu-de-Beloeil pour certains cultivars et lignées. L'oïdium (*Blumeria graminis* f. sp. *tritici*, syn. *Erysiphe graminis*) a été plus répandu cette année comparativement aux autres années et a eu une incidence un peu plus élevée. Dans l'essai qui a été le plus touché, soit celui de Princeville au Centre-du-Québec, l'intensité des symptômes variait de faible à élevée, dépendamment des lignées et cultivars. La fusariose de l'épi (*Fusarium graminearum*) a eu un impact très important sur la récolte de blé 2008. Les conditions humides ont grandement favorisé le développement de la maladie. Selon les résultats d'analyse de désoxynivalénol (DON) des lots de blé destinés à la consommation humaine (M. Ramzy Yelda, Fédération des producteurs de cultures commerciales du Québec, communication personnelle), 30 à 40 % des lots ont été déclassés blé fourrager. Les régions de la Mauricie et de la Montérégie-Est ont été particulièrement touchées alors que

la région du Saguenay-Lac-Saint-Jean a été plutôt épargnée. Le blé d'automne a été beaucoup plus affecté par la fusariose (*Fusarium graminearum*) que le blé de printemps et ce, dans toutes les régions du Québec, alors que plus de 90 % des lots ont été déclassés dû en grande partie à la fusariose.

Chez l'orge, les taches foliaires (*Drechslera teres*, *Rhynchosporium secalis* et *Cochliobolus sativus*) se sont manifestées dans tous les essais avec une intensité moyenne ou élevée. L'oïdium (*Blumeria graminis* f.sp. *hordei*, syn. *Erysiphe graminis*) a été évalué à Saint-Hyacinthe en Montérégie et à La Pocatière au Bas-St-Laurent, mais présentait une intensité de symptômes plutôt faible. Quant à la rouille des feuilles (*Puccinia hordei*), elle a été observée seulement chez quelques lignées à Saint-Hyacinthe. À l'assurance récolte, 424 des 2960 producteurs d'orge assurés par la FADQ, soit 14,3 %, ont avisé cette dernière que leurs cultures avaient subi des dommages causés par les maladies, dont principalement la fusariose (Bertrand Leclerc, FADQ, communication personnelle); une proportion trois fois plus élevée que la moyenne des trois années précédentes (2005-2007).

RÉFÉRENCE :

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CROP / CULTURE: Corn
LOCATION / RÉGION: Ontario

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TITLE / TITRE: SURVEY OF RED ROOT ROT OF CORN IN ONTARIO IN 2008

INTRODUCTION AND METHODS: Red root rot (RRR) of corn is caused by a complex of fungi of which *Phoma terrestris* (syn. *Pyrenochaeta terrestris*) is the most important (2). Red root rot destroys roots leading to yield losses of up to 15 to 20% (1, 3). The disease is known in onion under the name of pink root rot (5). The occurrence of *P. terrestris* on corn was first reported in 1961 in southern Ontario (9). While RRR of corn had previously been observed in Ontario (7, 10, 11) the objective of the present work was to conduct a more comprehensive survey for the disease in the province. During the 2008 season, root systems and adhering soil from three corn plants per field surveyed were collected and sent to the AAFC laboratory in Québec for analysis. Roots were washed carefully and examined for symptoms. Severity of root rotting was determined using an index of 0 to 9. Each root was assessed and a mean calculated for each field. To confirm the presence of *P. terrestris,* pieces of symptomatic root tissue were plated on potato dextrose agar (PDA) amended with benomyl, and on Spezieller-Nährstoffarmer agar (SNA) in Petri dishes. Roots on amended PDA were incubated in the dark and those on SNA under a mixture of fluorescent and NUV tubes. Growth of the pathogen was checked after 7 to 10 days on PDA and after 3 weeks on SNA. The presence of *Exserohilum pedicellatum* and *Bipolaris sorokiniana* on PDA was also noted. A second approach to pathogen identification consisted of checking for the presence of microsclerotia of *P. terrestris* inside root cells by direct observation under a compound microscope. No assessments for the pathogen were done for the 13 samples with the lowest root rot index.

RESULTS AND COMMENTS: From the beginning of August to the first week of September 2008, 61 samples were collected in 20 counties of south-western Ontario and analysed. Symptoms of root diseases appeared as a dark brown or black discolouration rather than the typical red or pink discolouration normally associated with RRR, as was seen in 2007 (7). A red or pink coloration was not observed in any sample from 2008. Severity of symptoms ranged from 0.0 to 5.3, but in general, root-disease levels were low and only 9 samples had a rot index of 4.0 or higher (Table 1). Almost half of the samples (28 / 61) had a rot index of less than 2. These observations indicate the considerable variability in root health among the fields sampled.

Microsclerotia of *P. terrestris* were detected in roots of 29 of the 48 corn crops analysed and pycnidia with setae, typical to *P. terrestris*, were observed in 47 of the 48 crops analysed; however, *P. terrestris* was isolated on PDA from only 10 of these 48 crops (Table 1). It is not clear why *P. terrestris* did not grow from root samples in which both of the typical structures associated with this pathogen were observed. One possibility is that a low level of colonization by *P. terrestris,* combined with the presence of other microorganisms in the roots, prevented the mycelia from growing on the media. Microsclerotia detected at only at low or intermediate level could be an indication that the pathogen was not abundant. This is indicated from a previous survey for RRR in Québec, when *P. terrestris* was isolated on PDA most of the time if microsclerotia were numerous and readily observed (6). It appears that *P. terrestris* is less abundant in the counties of Ontario surveyed in 2008 than in counties of Quebec previously surveyed for RRR. Based on its frequency of isolation on PDA, *P. terrestris* was the main causal agent of the root symptoms observed. Several factors could explain the difference in the frequency of recovery of *P. terrestris* between Québec and Ontario, including climate, corn hybrid sensitivity to the disease, and crop rotation.

Exserohilum pedicellatum was identified in 50 % of the samples analysed (24 / 48) (Table 1). This result confirms the presence of this pathogen in Canada, as was reported in previous surveys (6, 7, 11). In

some cases, e.g. 'field 1' in Essex County, where the rot index was high and *E. pedicellatum* was abundant, it may have been the only causal agent of the root rot symptoms observed. This pathogen causes *Helminthosporium pedicellatum* root rot of corn (4, 8). It would be useful to know if there was an impact on corn yield in cases where it was abundant and resulted in a high root rot index. At present the importance of the disease is unknown. *Bipolaris sorokiniana* was also detected in the survey but only at low levels and only in 7 of 48 samples (Table 1). In some instances where there was a high rot index, but no pycnidia present on SNA, the symptoms may have been caused by pathogens other than the three mentioned above. The media used were not appropriate for the isolation of *Rhizoctonia*, *Pythium*, or *Fusarium* spp.

The 2008 survey showed that corn roots were affected by pathogenic fungi at varying levels and severities, and confirmed the presence of *Phoma terrestris* and *Exserohilum pedicellatum* in south-western Ontario. The results also demonstrate a need for continued research to evaluate the causes and impact of root diseases on corn production in Ontario.

ACKNOWLEDGEMENTS: We thank Lucie Lévesque for her technical assistance.

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Table 1. Severity and causal agents associated with root rot of corn in Ontario in 2008.

			Isolation on culture media		
			Phoma terrestris	*Exserohilum pedicellatum*	*Bipolaris sorokiniana*
Location County / Town / Field	Root rot index (0-9)	Microsclerotia of *P. terrestris*	PDA / SNA	PDA	PDA
Brant, Canning, field 2	4.7	+	– / ++	–	–
Brant, St. George, field 3	1.3	–	– / +	–	–
Brant, Perry's Corners, field 5	4.7	+++	– / +	–	–
Bruce, Elmwood, field 1	0.3	Ne	Ne	Ne	Ne
Bruce, Solway field 2	0.3	Ne	Ne	Ne	Ne
Bruce, Walkerton, field 3	1.0	Ne	Ne	Ne	Ne
Chatham Kent, Ridgetown, field 2	2.7	+	– / +	++	–
Chatham Kent, Dresden, field 3	3.7	–	– / ++	++	–
Chatham Kent, Tilbury, field 5	3.0	+	– / ++	+	+
Dufferin, Marsville, field 1	1.0	+	– / +	–	–
Dufferin, Cardwell, field 2	0.0	Ne	Ne	Ne	Ne
Dufferin, Jessopville, field 3	4.7	–	– / +	–	–
Elgin, New Glasgow, field 1	3.7	–	– / +	++	–
Elgin, Fingal, field 2	1.7	+	– / ++	–	–
Elgin, Yarmouth Centre, field 3	0.3	Ne	Ne	Ne	Ne
Essex, Olinda, field 1	5.3	–	– / ++	+++	–
Essex, Harrow, field 3	0.3	Ne	Ne	Ne	Ne
Essex, Wheatley, field 4	0.0	Ne	Ne	Ne	Ne
Grey, Keady, field 1	1.0	Trace	– / +	–	–
Grey, Kilsyth, field 2	1.7	+	– / ++	–	–
Grey, Chatsworth, field 3	2.3	++	– / +++	–	+
Haldimand, Tyneside, field 1	3.0	++	+ / ++	+	+
Haldimand, Caledonia, field 2	0.7	Ne	Ne	Ne	Ne
Haldimand, Cranston, field 3	1.3	–	– / ++	++	–
Halton, Zimmerman, field 2	3.0	–	+ / ++	+++	–
Halton, Acton, field 3	3.3	–	++ / ++	–	–
Halton, Glenorch, field 5	0.7	–	– / ++	++	–
Hamilton, Alberton, field 2	0.7	–	– / +	–	–
Hamilton, Ancaster, field 3	1.7	–	+ / ++	++	–
Hamilton, Christie's Corner, field 4	3.0	Trace	– / +	+	+
Huron, Bayfield, field 1	3.7	++	– / +	+	–
Huron, Bayfield, field 2	3.0	Trace	– / ++	+	–
Huron, Homesville, field 3	3.0	–	– / +++	–	–
Lambton, Alvinston, field 1	3.0	–	– / +++	–	+
Lambton, Watford, field 2	2.7	+	– / ++	–	–
Lambton, Forest, field 4	2.7	+	– / ++	+	–
Lambton, Wanstead, field 5	2.0	+	– / +	+	–
Middlesex, Fanshawe, field 1	2.0	+	– / +	+++	–
Middlesex, Clandeboye, field 2	2.3	++	+ / +	+	–
Middlesex, Beechwood, field 3	2.3	Trace	– / +	–	–
Niagara, Gasline, field 1	0.7	–	– / –	–	–
Niagara, Port Colborne, field 2	1.3	–	+ / +	–	+
Niagara, Winger/Mt. Carmel, field 3	4.0	+	+ / +++	+	–
Norfolk, Marburg, field 1	2.5	–	– / ++	–	+
Norfolk, Marburg field 2	0.0	Ne	Ne	Ne	Ne
Norfolk, Renton, field 4	4.0	+	– / +	++	–

Table 1 (continued)

Oxford, Woodstock, field 1	4.0	++	+ / ++	++	–
Oxford, Burgessville, field 2	0.3	Ne	Ne	Ne	Ne
Oxford, Norwich, field 3	2.3	–	– / +++	+++	–
Peel, Caledon, field 1	0.3	Ne	Ne	Ne	Ne
Peel, Sleswick, field 2	0.7	Ne	Ne	Ne	Ne
Peel, Cheltenham, field 5	4.3	Trace	– / ++	+	–
Perth, Stratford, field 1	1.0	–	+ / +	–	–
Perth, Mitchell, field 2	0.3	Ne	Ne	Ne	Ne
Perth, Mitchell, field 3	2.3	+	– / ++	–	–
Waterloo, Kossuth, field 1	1.0	+	– / +	–	–
Waterloo, Crosshill, field 2	1.0	++	– / ++	–	–
Waterloo, St. Agatha, field 3	3.7	–	– / +	–	–
Wellington, Arkell, field 1	1.0	++	– / +++	–	–
Wellington, Metz, field 2	3.0	+	– / ++	+	–
Wellington, Elora, field 5	4.3	+	+ / +	+	–

‘– ‘ no microslerotia or other diagnostic fungal structures
‘+’ to ‘+++’ evidence of increasing microslerotia levels or other diagnostic fungal structures
‘Ne‘ : Not evaluated.

CROP / CULTURE: Corn
LOCATION / RÉGION: Ontario and Québec

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TITLE / TITRE: SURVEY OF DISEASES AND PESTS OF CORN IN EASTERN ONTARIO AND WESTERN QUÉBEC, 2008

INTRODUCTION AND METHODS: A survey for diseases and pests of corn was conducted in eastern Ontario and western Québec from September 4 to 18, 2008. As in previous years, the emphasis was to determine the distribution and severity of the bacterial disease Stewart's wilt (*Pantoea stewartii = Erwinia stewartii*). The distribution and severity of other diseases and insects including eyespot (*Aureobasidium zeae*), common rust (*Puccinia sorghi*), northern leaf blight (*Exserohilum turcicum*), anthracnose leaf blight (*Colletotrichum graminicol*a), common smut (*Ustilago maydis*), head smut (*Sporisorium holci-sorghi = Sphacelotheca reiliana*), ear rot (*Fusarium* spp.), stalk rot (*Fusarium* spp., and *C. graminicol*a), European corn borer (*Ostrinia nubilalis*), corn rootworm (*Diabrotica longicornis* and/or *D. virgifera*), and corn flea beetle (*Chaetocnema pulicaria*) were also recorded. In addition, scouting for any newer pests in Canada was done, especially for grey leaf spot (*Cercospora zeae-maydis*) in Ontario.

At each of 66 fields in eastern Ontario and 11 fields in western Québec, the incidence of each disease or pest and the severity (nil, light, intermediate, high) of those that were predominant were recorded.

RESULTS AND COMMENTS:
Fungal leaf diseases: Eyespot was detected in 41 fields in Ontario and 10 in Québec (Table 1). It was more common in more northerly-located fields. One sweet corn and two grain crops in Renfrew and Ottawa-Carleton counties had intermediate severities of eyespot. Common rust was found in 52 fields in Ontario and 7 in Québec; however, only one crop in Frontenac county, Ontario had an intermediate level of disease. Typical symptoms of grey leaf spot were noted in two crops in Lanark and Ottawa-Carleton counties in Ontario. This is the second year that grey leaf spot has been seen in eastern Ontario. No grey leaf spot was found in Québec in 2008. Anthracnose leaf blight (ALB) was found in 24 fields in Ontario and 10 in Québec and was less common and severe in 2008 than in 2007 (Zhu et al. 2008). Northern leaf blight (NLB) was found in 40 fields in Ontario and 8 in Québec. Two crops in Ontario had intermediate and high severities of NLB. The disease was found in many more fields (62%) in 2008 than in 2007 (28%) in the region. These data confirm that NLB is becoming a serious problem in Canada, that losses are increasing, and that it may pose a significant risk in the future (Zhu et al. 2008).

Fungal Ear and Stalk diseases: Gibberella/Fusarium ear rots were observed in only 7 fields in Ontario (Table 1) and in all of these symptom development was limited at the time of the survey. Disease incidence and severity was much lower than usual, possibly because plant development in 2008 was 2-3 weeks slower than normal, due to an abundance of rainy days (and accompanying lack of sun) during the summer. Common smut was distributed across 18 fields in Ontario and 4 fields in Québec. One crop in Ontario had more than 5% smutted plants. No head smut was found in the region in 2008. As reported in previous surveys, bird and/or insect damage resulted in ears with black mould/spores on kernels.

Stalk rots, including anthracnose stalk rot/top-die back, fusarium stalk rot, and pythium stalk rot were noted in 16 fields in Ontario and 10 fields in Québec (Table 1). Because of late plant maturity, the incidence of stalk rot/top-die back was much lower than usual; however, near the end date, more than 90% of the crops surveyed at the time showed symptoms of top-die back**.**

Bacterial diseases: No Stewart's wilt-like leaf symptoms were observed in 2008.

Viral diseases: No symptoms of maize dwarf mosaic or of other virus diseases were seen in 2008.

Insects: European corn borer (ECB) damage was observed in 16 fields in Ontario and 2 in Québec (Table 1). The number of crops with damage in 2008 was much lower than in 2007 when ECB was found in 50 of 75 fields surveyed (Zhu et al. 2008). However, one crop in Frontenac county, Ontario, had more than 80% damaged plants. Corn rootworm (CRW) damage was observed in 39 fields in Ontario and 11 in Québec. As in previous years, damage in most fields resulted from leaf feeding and silk pruning. Similar to ECB, fewer crops were affected by CRW in 2008 than in 2007 when damage occurred in most (72 of 75) crops surveyed (Zhu et al. 2008). One field in Renfrew county, Ontario, had more than 70% plants showing ECB damage on silks, leaves, and kernels. Grasshoppers, most likely red-legged grasshopper [*Melanoplus femur-rubrum* (De Geer)], populations appeared lower than usual in 2008, and only 26% of crops were rated as damaged in comparison to 49% in 2007 (Zhu et al. 2008). Corn blotch leaf miner (*Agramyza parvicornis* Loew) was not found as frequently as previously in either Ontario or Québec.

Mites: Two-spotted spider mite (*Tetranychus urticae* Koch = *T. bimaculatus* Harvey) populations were much lower in 2008 than in 2007; however, the number of crops damaged by mites in 2008 (38%) was slightly higher than in 2007 (31%).

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Other: As reported in other years, bird and other animal damage were severe in many corn fields in both Ontario and Québec.

Summary: High rainfall levels, and several particularly wet days, were a major problem in 2008 and, as expected, had a significant impact on corn growth and levels of diseases and pests. Plants were 2-3 weeks late in maturing compared to other years. Northern leaf blight incidence was higher than normal, but the incidence of other leaf diseases, such as anthracnose leaf blight, common rust, and eyespot was lower. Stewart's wilt was not found in the region at all in 2008. Stalk rot, ear rot and other pests, such as European corn borer, corn rootworm, and mites were also less prevalent and severe in 2008.

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Table 1: Fields surveyed and distribution of diseases and pests of corn in Ontario and Québec, 2008

Field Location (County)	# of Fields	Eyespot	Rust	GLS	ALB	NLB	Wilt	Smut	Head smut	Ear rot	Stalk rot	ECB	CRW	Grasshopper	Mites
Ontario															
Frontenac	5		5		1	3		1		2		2	3	2	1
Lanark	6	4	5	1	3	6		3			1	2	3	1	2
Leeds & Grenville	11	6	8		6	7		4		1	1	4	6	3	6
Ottawa-Carleton	9	8	6	1		3		3		3	1		9	2	3
Prescott & Russell	3	3	2		2	3		1			1	1	1	2	1
Renfrew	22	11	19		6	11		5			3	3	10	3	10
Stormont, Dundas & Glengarry	10	9	7		6	7		1		1	9	4	7	3	2
Québec															
Vaudreuil-Soulanges	11	10	7		10	8		4			10	2	11	1	4
Total	**77**	**51**	**59**	**2**	**34**	**48**	**0**	**22**	**0**	**7**	**26**	**18**	**50**	**17**	**29**

Rust = common rust. GLS = Grey leaf spot. ALB = Anthracnose leaf blight, NLB = northern leaf blight, Wilt = Stewart's wilt, Smut = Common smut. Ear rot: including Gibberella ear rot and Fusarium ear rot. Stalk rot: including Fusarium stalk rot, Anthracnose stalk rot, and top-die back. ECB = European corn borer. CRW = Corn rootworm, including both western and northern corn rootworm.

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba and eastern Saskatchewan (eastern prairie region)

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TITLE / TITRE: CROWN RUST OF OAT IN WESTERN CANADA IN 2008

INTRODUCTION AND METHODS: Surveys for incidence and severity of oat crown rust (caused by *Puccinia coronata* Cda f. sp. *avenae* Eriks.) were conducted in Manitoba from July 17 to August 29 in 2008. Surveys for the rust in Saskatchewan were conducted from August 26 to 28. All locations surveyed were recorded on a handheld global-positioning device (Garmin GPS model 60C). Crown rust collections were obtained from: susceptible wild oat (*Avena fatua* L.), common oat (*A. sativa* L.) in commercial farm fields, and susceptible and resistant oat lines and cultivars grown in uniform rust nurseries. The nurseries were located at Brandon, Emerson, and Morden, MB, and at Indian Head and Regina, SK. For virulence studies, single-pustule isolates were established from the rust collections. Races were identified using 16 standard oat crown rust differentials (Table 1) as described by Chong et al. (2000). In addition, single *Pc*-gene lines with *Pc91, Pc94*, or *Pc96* were used as supplemental differentials. Oat lines with putative new crown rust resistance genes, *temp_pc97*, *temp_Pc98,* and *temp_Pc101* were included in the differential sets to determine their reactions to the single-pustule isolates established from the rust collections.

RESULTS AND COMMENTS: The outbreak of crown rust in southern Manitoba was the latest and lightest seen over the past two decades. The month of June was unusually cool with overnight temperatures often below 10°C, too low for the rust fungus to infect. This was followed by a very warm July, further hindering development of the rust. As a result, only traces of crown rust were found on wild oat and in commercial oat crops in southern Manitoba on August 11. By this time much of the oat crop in southern Manitoba was at or near maturity. Wild oat and commercial oat fields in eastern Saskatchewan also seemed to have escaped from the rust in 2008, as only trace levels of crown rust were found in late-planted oat fields during the last week of August.

The unusually low incidence of crown rust in the eastern prairie region in 2008 could also be explained partly by other factors. In recent years, there has been an increased use by farmers of Tilt® fungicide to control diseases or simply for a perceived yield boost. Another factor is that the acreage of new rust-resistant cultivars has increased to such a level that it could have a significant effect in reducing the overall inoculum level for the region. For instance, cv. Leggett, which has the *Pc68* and *Pc94* gene combination, and cv. HiFi, which has *Pc91*, accounted for 13.3% and 1.9%, respectively, of the oat acreage in 2008 (Manitoba Crop Insurance Report – 2008). These two genes currently provide a high level of resistance to prevalent isolates of crown rust in the eastern prairies (Chong et al. 2008). With less inoculum produced in the region rust incidence would be lower.

To date, 232 single-pustule isolates have been established from the rust collections obtained from the eastern prairie region in 2008. Using the 19 crown rust differentials listed in Table 1, a total of 155 races were identified from these isolates. Of these, 120 races were identified in isolates from wild oat, 34 in isolates from cultivated oat in farm fields, and 27 in isolates from cultivars and oat lines in the uniform rust nurseries. Frequencies of virulence of the isolates to the genes in the crown rust differentials are shown in Table 1. The frequency of virulence to *Pc68* was 42.9% in isolates from wild oat and 81.6% in isolates from cultivated oat in farm fields. The virulence frequencies to this gene in isolates from wild oat and cultivated oat were similar to those observed in 2007. The widespread use of *Pc68* in the eastern prairie region (85.8% of the oat acreage in 2008) continued to exert strong selection pressure on the rust population for virulence to this gene. Virulence frequencies of the isolates to *Pc38* and *Pc39* remained at high levels (over 90%) in the rust population. This gene combination has been deployed in the Canadian eastern prairie region, North Dakota, and Minnesota since the 1980s. In 2008 over 80% of the cultivars grown in the eastern prairie region still carried these two genes. Frequency of virulence to *Pc48*, a gene in 'Triple Crown', was 14.1% in isolates from wild oat and 12.2% in isolates from cultivated oat. In 2008,

none of the isolates from the eastern prairie region was virulent to *Pc91* (a gene in 'HiFi') or to *Pc94* (a gene in 'Leggett'). However, virulence to *Pc91* or to *Pc94* has been detected in this region in surveys from previous years.

Isolates obtained from annual oat crown rust surveys in the eastern prairie region are invaluable for identifying resistance genes which have potential for deployment in resistance breeding. *Temp_pc97*, a putative new gene obtained from the wild relative, *Avena sterilis*, was resistant to all the isolates in 2005 and 2006, and to over 97% of the isolates in 2007 and 2008. *Temp_Pc98* was resistant to over 99% of the isolates in 2007 and 2008. *Temp_100* and *temp_102*, first tested in 2007, were dropped for further testing in 2008, because seedling reactions indicated that these two putative genes are most likely *Pc45*. *Temp_100, temp_102,* and *Pc45* were obtained from different accessions of *A. sterilis* collected from Israel. *Temp_Pc101* was resistant to all the isolates in 2007 and to 99% of the isolates in 2008. Linkage studies are underway to determine if *temp_pc97, temp_Pc98,* and *temp_102* can be combined with each other or used in combination with *Pc91* or *Pc94* to develop oat cultivars with new resistance gene combinations.

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Table 1. Frequencies (%) of virulence of isolates of *Puccinia coronata* f. sp. *avenae* from wild oat, commercial oat and the uniform rust nursery in the eastern Prairie region on 16 standard and three supplemental crown rust differential oat lines, and on three lines each with a putative new crown rust resistance gene in 2008.

Oat lines and gene	Wild oat		Commercial oat field		Uniform rust nursery	
***Pc* gene present**	**# isolates**	**%**	**# isolates**	**%**	**# isolates**	**%**
Standard						
Pc38	145	93	48	98	24	89
Pc39	146	93	47	96	25	93
Pc40	76	49	28	57	12	44
Pc45	30	19	0	0	6	22
Pc46	73	47	17	35	9	33
Pc48	22	14	6	12	5	19
Pc50	11	7	1	2	2	7
Pc51	77	49	17	35	14	52
Pc52	24	15	6	12	5	19
Pc54	4	3	1	2	1	4
Pc56	102	65	29	59	11	41
Pc58[a]	7	5	3	6	0	0
Pc59[a]	27	17	6	12	4	15
Pc62	11	7	0	0	4	15
Pc64	41	26	8	16	6	22
Pc68	67	43	40	82	10	37
Supplemental						
Pc91	0	0	0	0	0	0
Pc94	0	0	0	0	0	0
Pc96	8	5	0	0	2	7
Putative new gene[b]						
Temp_pc97	3	2	3	6	0	0
Temp_Pc98	0	0	1	2	0	0
Temp_Pc101	2	1	0	0	0	0
Total	156		49		27	

[a]The *Pc58*-differential was shown to carry three linked genes, and the *Pc59*-differential three unlinked genes (see Chong et al. 2008).
[b]*Temp_pc97, temp_Pc98,* and *temp_Pc101,* are temporary designations for genes recently obtained from *Avena sterilis* (J. Chong, unpublished).

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: MONITORING OF FUSARIUM HEAD BLIGHT OF OAT IN MANITOBA IN 2008

INTRODUCTION AND METHODS: The occurrence of fusarium head blight (FHB) in oat in southern Manitoba was assessed by monitoring 37 commercial fields from July 28 to August 7 when crops were at the early-milk to hard-dough (ZGS 73-89) stage of growth. The fields were selected at random along the survey routes, depending on crop frequency. The area of southern Manitoba sampled was bounded by Highways # 17, 67, 26 and 16 to the north, the Manitoba/North Dakota border to the south, Hwy #83 to the west (south-west portion of the province not sampled), and Hwy #12 to the east. Fusarium head blight in each field was assessed by sampling a minimum of 80-100 plants gathered as a clump, at each of 3 locations, and determining the presence of infected spikelets (disease incidence), and the average spike proportion infected (SPI) in those panicles putatively affected by FHB. Fusarium head blight severity was calculated as the 'FHB Index' (% incidence x % SPI) / 100. Several affected panicles, or 'normal' ones, as necessary, closest to each of the clumps sampled were collected from each location, placed in plastic bags and frozen. Subsequently, 50 putatively infected seeds per field were surface-sterilized in 0.3% NaOCl for 3 min., air-dried, and plated on potato dextrose agar in Petri dishes (10 seeds per dish) to identify and quantify the *Fusarium* spp. present based on morphological traits described in standard taxonomic keys.

RESULTS AND COMMENTS: Conditions were generally favourable for early planting of spring cereals, but cool weather throughout May and June delayed crop development. Seasonal (April 1 to September 30) moisture was at normal to slightly above normal levels for most of the province except the Interlake region which received excessive rain, leading to standing water and the drowning of some crops. The cool spring conditions likely curtailed development of *Fusarium* inoculum on overwintered straw and stubble, and this, combined with generally low levels of FHB in the previous two years (Tekauz et al. 2008, 2007), probably reduced the levels of primary inoculum. However, the higher mid-July to late August temperatures and favourable moisture levels could have led to additional inoculum production, and promoted late-season infection.

Of the 37 oat crops monitored, 35 had putative visible FHB symptoms (one or more light orange-pink discoloured spikelets) on some panicles. But, because of the open type of inflorescence (panicle) in oat and the general paucity of FHB-distinctive symptoms, FHB was difficult to assess accurately, as has normally been the case in this crop. Overall, incidence of FHB was estimated as 1.1% (range 0 - 4.5%), SPI as 5.0% (range 0 - 10%) and the calculated FHB Index (%incidence x % SPI / 100) as 0.06% (range 0 - 0.33%). As such, FHB was estimated to have caused no yield loss in Manitoba oat crops in 2008. This low level of mid-season disease is typical for oat; since 2003 the FHB Index has been <0.1%, and always much lower than that in wheat or barley.

Fusarium colonies developed from 16.2% of the oat kernels plated on potato dextrose agar. This is the highest level reported since surveys for FHB in oat were initiated in 2002. The *Fusarium* spp. isolated and their presence in crops and on kernels are listed in Table 1. Levels of *F. graminearum* were particularly high in 2008, and the other five species were found only on 6% or fewer kernels, and in 1/3 or fewer fields; levels of *F. poae* were much lower than usual.

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Tekauz, A., Stulzer, M., Mueller, E. and Beyene, M. 2008. Fusarium head blight of oat in Manitoba in 2007. Can. Plant Dis. Surv. 88: 73-74. (http://www.cps-scp.ca/cpds.htm)

Table 1. *Fusarium* spp. isolated from fusarium head blight affected oat kernels from Manitoba in 2008.

***Fusarium* spp.**	**Percent of fields**	**Percent of kernels**
F. avenaceum	32	5.7
F. culmorum	3	0.3
F. equiseti	3	0.3
F. graminearum	92	84.2
F. poae	32	6.0
F. sporotrichioides	24	3.5

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba and East-Central Saskatchewan

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TITLE / TITRE: LEAF SPOT DISEASES IN MANITOBA AND SASKATCHEWAN OAT CROPS IN 2008

INTRODUCTION AND METHODS: Leaf spot diseases of oat in 2008 were assessed in 37 commercial crops in Manitoba, and 13 in Saskatchewan, during surveys done from July 28 to August 7 (MB) and August 1 - 14 (SK) at which time plants were at the early milk to hard dough (ZGS 73-89) stages of growth. Crops were sampled at regular intervals along the survey routes, depending on availability. The area of southern Manitoba sampled was bounded by Highways # 17, 67, 26 and 16 to the north, the Manitoba/North Dakota border to the south, Hwy #83 to the west (south-west portion of the province not sampled), and Hwy #12 to the east. In Manitoba, disease incidence and severity were recorded by averaging their occurrence on approximately 10 plants along a diamond-shaped transect of about 50 m per side, beginning near the field edge. Disease ratings were taken on both the upper (flag and penultimate leaves) and lower leaf canopies, using a six-category scale: 0 (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 at each site and dried and stored in paper envelopes. In Saskatchewan, the area surveyed was in the central region extending from west of Melfort to Kamsack near the Manitoba border, primarily along Highways #5 and 6, and only the upper canopy was sampled for leaf spot severity. Foliar tissue with typical lesions was collected at each site, placed in paper envelopes and dried. Surface-sterilized pieces of infected leaf tissue were subsequently placed in moist chambers for 3-5 days to promote sporulation, identify the causal agent(s) and determine the disease(s) present and their relative importance.

RESULTS AND COMMENTS: In Manitoba, conditions were generally favourable for early planting of spring cereals, but cool weather throughout May and June delayed crop development. Seasonal (April 1 to September 30) moisture was at normal to slightly above normal levels for most of the province except the Interlake region which received excessive rain, leading to standing water and the drowning of some crops. Relatively good cereal crops were harvested in most districts. Early season conditions in Saskatchewan were similar to Manitoba's, and delayed emergence and crop development was widespread. Moisture was adequate to abundant from mid-June to early August, and was followed by very hot conditions. The cool spring likely curtailed early-season inoculum development on overwintered straw and stubble, and this combined with generally low disease levels in oat in recent years would have reduced the amount of inoculum available in 2008.

Leaf spots were observed in the upper or lower leaf canopies in 87% and 92% of Manitoba and Saskatchewan oat crops monitored, respectively, the same proportions found in 2007 (Tekauz et al. 2008). In Manitoba, disease levels in the upper canopy were trace to slight in 97% of affected crops and moderate in 3%. Respective severity categories in the lower canopy were evaluated as 70% and 19%, with 3% rated as severe and 8% having senescent foliage. In Saskatchewan, all crops had only trace or slight levels of leaf spots in the upper (flag and flag leaf -1) canopy. As most crops had trace to slight levels of disease in the upper or both upper and lower leaf canopies, leaf spot diseases likely caused <1% average yield loss in commercial oat crops in the region in 2008.

In Manitoba, *Pyrenophora avenae,* causal agent of pyrenophora leaf blotch (PLB) occurred in 57% of the fields monitored (Table 1), a lower level than found in previous years (Tekauz et al. 2008, 2006). It caused about half of the damage observed. *Stagonospora avenae* f.sp. *avenae* (stagonspora leaf blotch), was also prevalent, and was responsible for the other half of the damage, a higher level than reported previously. *Cochliobolus sativus* (spot blotch), usually present as a minor component, was not detected in

2008. In east-central Saskatchewan, *P. avenae* predominated, as in 2005 and 2007, and in 2008 this species caused about 75% of the leaf spot damage observed. *Stagonospora. avenae* f.sp. *avenae* was also prevalent, but resulted in less damage. The prevalence of *C. sativus* was considerably higher than reported previously (Tekauz et al. 2008, 2006); however, little damage ensued.

Based on several years of monitoring in Manitoba, and three years of monitoring in a portion of Saskatchewan, it can be concluded that PLB is the most important leaf spot disease affecting oat crops in the region.

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Table 1. Incidence and isolation frequency of leaf spot pathogens of oat in Manitoba and east-central Saskatchewan in 2008.

Pathogen	Incidence (% of fields)		Frequency (% of isolations)*	
	MB	SK	MB	SK
Pyrenophora avenae	57	85	49.0	72.3
Stagonospora avenae f. sp. *avenae*	70	77	51.0	22.8
Cochliobolus sativus	0	39	0	5.0

*indicative of the relative amount of foliar damage observed

CROP / CULTURE: Oat
LOCATION / RÉGION: Ontario

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TITLE/ TITRE: 2008 SURVEY FOR FUSARIUM HEAD BLIGHT OF OAT IN ONTARIO

INTRODUCTION AND METHODS: Four oat fields were randomly selected at harvest on farms across Ontario to assess for fusarium head blight (FHB). Presence and severity of FHB were obtained by determining levels of *Fusarium*-infected kernels and deoxynivalenol (DON). Grain from each field was obtained following harvest. To determine the percent of seed infected by *Fusarium*, 60 kernels per field were surface-sterilized in 0.16% NaOCl (dilute commercial bleach) for 3 min., air dried, and placed on acidified potato dextrose agar in four replications of 15 seeds per replicate. The kernels and agar plates were incubated for 7 days under a 12:12 hr light:dark cycle at room temperature. *Fusarium graminearum* isolates were identified using standard taxonomic keys. DON content was assessed on a 20g sub-sample of harvested seed using ELISA (commercial kits from Diagnostix-www.diagnostix.ca).

RESULTS AND COMMENTS: The highest percentage of *Fusarium*-infected kernels (62.5%) was found in a field of cv. 'AC Aylmer' oat, followed by 'Lachute' (47.5%), 'Rigodon' (12.5%) and 'Manotick' (7.5%) (Table 1). However, the highest percentage of *Fusarium graminearum* (as a percentage of total *Fusarium* spp., 66.7%) occurred it the cv. 'Manotick'. In addition, 'Manotick' also had the highest DON level (1.2 ppm). A higher level of *Fusarium* infection was identified in oat in Ontario in 2008 than in 2007, 2006 and 2005 (Tamburic-Ilincic 2008, 2007; Tamburic-Ilincic and Schaafsma 2006). In addition, the average DON level in oat in Ontario was higher in 2008 than in 2006 (0.7 ppm vs. 0.2 ppm). The DON level in winter wheat in Ontario was also higher in 2008 than in 2007, 2006 and 2005, and similar to that in 2004 when significant losses occurred (Tamburic-Ilincic et al., 2005).

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Table 1. *Fusarium* spp., *F. graminearum* , and DON levels in oat kernels, Ontario, 2008.

Cultivar	County	*Fusarium* spp. (%)	*F. graminearum* (%)*	DON (ppm)
Rigodon	Wellington	13	40	0.7
Manotick	Wellington	8	67	1.2
AC Aylmer	Wellington	63	36	0.2
Lachute	Huron	48	53	0.5
Mean		**33**	**49**	**0.7**

***** % of total *Fusarium* spp.

CROP / CULTURE: Oat
LOCATION / RÉGION: Eastern Ontario

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TITLE / TITRE: DISEASES OF OAT IN EASTERN ONTARIO IN 2008

INTRODUCTION AND METHODS: A survey for diseases of oat was conducted in the third week of July when oat plants were at the late milk to soft dough stage of development. Eleven fields were chosen at random in regions of eastern Ontario where most of the oat crops are grown. Foliar disease severity was determined on 10 flag and penultimate leaves sampled at each of three random sites per field by using a rating scale of 0 (no disease) to 9 (severely diseased). Diseases were identified by visual symptoms. Average severity scores of <1, <3, <6, and $\geq$6 were considered trace, slight, moderate, and severe levels, respectively. Severity of ergot, loose smut, and take-all was estimated as the percentage of plants infected.

Symptoms of fusarium head blight (FHB) were not commonly observed and therefore disease severity was not rated at the time of the survey. Levels of seed-borne *Fusarium* spp. that may have contributed to FHB were determined by collecting 50 heads from each field; heads were air-dried at room temperature, and subsequently threshed. Fifty randomly-selected discolored kernels per sample were surface sterilized in 1% NaOCl for 30 seconds, and plated in 9-cm diameter petri dishes onto modified potato dextrose agar (10 g dextrose per liter) amended with 50 ppm streptomycin sulfate. Plates were incubated for 10-14 days at 22-25°C, with a 14-hour photoperiod using fluorescent and long wave ultraviolet tubes. *Fusarium* species isolated from kernels were identified by microscopic examination using standard taxonomic keys.

RESULTS AND COMMENTS: Six diseases were observed in the 11 fields surveyed (Table 1). Crown rust (*Puccinia coronata* f.sp. *avenae*) was the most prevalent disease, observed in all crops at a mean severity of 7.0. Severe infections from crown rust were observed in 9 crops. Yield reductions due to crown rust were estimated to average at least 30% in the surveyed fields. Stagonospora leaf blotch (*Stagonospora avenae* f.sp. *avenaria*) was also observed in 9 crops but at a considerably lower average disease severity of 2.7. Severe infection from stagonospora leaf blotch was not observed. Pyrenophora leaf blotch (*Pyrenophora avenae*) was observed in two fields at trace levels only.

Ergot (*Claviceps purpurea),* loose smut (*Ustilago avenae*) and take-all (*Gaeumannomyces graminis* var. *avenae*) were found in 1, 2, and 3 fields at mean severities of 1.0 each (Table 1). These diseases, although not significantly affecting the crops, were not observed in eastern Ontario during the most recent previous disease survey in 2006 (Xue et al. 2007).

Five *Fusarium* species were isolated from the infected kernels (Table 2). *Fusarium poae* predominated, occurring in all crops and in 10% of discoloured kernels. *Fusarium graminearum* and *F. sporotrichioides* also were common, occurring in more than 50% of the crops and on up to 3% of the kernels. Other species identified included *F. avenaceum* and *F. equiseti,* both on less than 1% of the kernels.

REFERENCE:
A.G. Xue, Chen, Y. and Yan, W.K. 2007. Foliar diseases of oat in eastern Ontario in 2006. Can. Plant Dis. Surv. 87: 84. (http://www.cps-scp.ca/cpds.htm)

Table 1. Prevalence and severity of oat diseases in eastern Ontario in 2006.

	NO. CROPS	DISEASE SEVERITY IN AFFECTED CROPS*	
DISEASE	**AFFECTED (n=13)**	**Mean**	**Range**
Crown rust	11	7.0	1.7-8.7
Stagonospora leaf blotch	9	2.7	1.0-4.7
Pyrenophora leaf blotch	2	1.0	1.0
Ergot (%)	1	1.0	1.0
Loose smut (%)	2	1.0	1.0
Take-all (%)	3	1.0	1.0

*Foliar disease severity was rated on a scale of 0 (no disease) to 9 (severely diseased) except for ergot, loose smut, and take-all, where severity was rated as percent plants infected.

Table 2. Frequency of *Fusarium* species isolated from discoloured kernels of oat in eastern Ontario in 2008.

***Fusarium* spp.**	**% FIELDS**	**% KERNELS**
Total *Fusarium*	100	17.2
F. avenaceum	30	0.5
F. equiseti	40	0.7
F. graminearum	50	3.0
F. poae	100	10.3
F. sporotrichioides	80	2.8

CROP / CULTURE: Wheat
LOCATION / RÉGION: Saskatchewan

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TITLE / TITRE: FUSARIUM HEAD BLIGHT IN COMMON AND DURUM WHEAT IN SASKATCHEWAN IN 2008

INTRODUCTION AND METHODS: Fusarium head blight (FHB) incidence and severity were assessed in 159 wheat crops (128 common wheat - Canada Western Red Spring, Canada Prairie Spring, and Soft White Spring classes; and 31 durum wheat - Canada Western Amber Durum class) in Saskatchewan in 2008. Results for fields were grouped according to soil zone (SZ) (SZ1 = Brown; SZ2 = Dark Brown; SZ3 = Black/Grey), and fields under irrigation were considered separately and referred to as the Irrigation Zone (fields located along the South Saskatchewan River in west-central and central regions of the province).

Crop adjustors with Saskatchewan Crop Insurance Corporation and irrigation agrologists with Saskatchewan Ministry of Agriculture collected 50 random spikes from each wheat crop at the late milk to early dough growth stages (Lancashire et al. 1991). Spikes were analyzed for visual FHB symptoms at the Crop Protection Laboratory in Regina. The number of infected spikes per crop and the number of infected spikelets in each spike were recorded. A FHB disease severity rating, also known as the FHB index, was determined for each wheat crop surveyed: FHB severity (%) = (% of spikes affected x mean proportion (%) of kernels infected) / 100. Mean FHB severity values were calculated for each soil/irrigation zone and for the whole province. Glumes or kernels with visible FHB symptoms were surface sterilized in 0.6% NaOCl solution for 1 min and cultured on potato dextrose agar and carnation leaf agar for subsequent identification and quantification of *Fusarium* species.

RESULTS AND COMMENTS: Approximately 7.4 million acres (3 million ha) of spring wheat and 5.0 million acres (2 million ha) of durum wheat were seeded in Saskatchewan in 2008 (Saskatchewan Ministry of Agriculture, 2008). Seeding, emergence and early crop development were delayed due to cold weather across the province. Seeding delays were also attributed to dry soils in the south and slow snow melt and/or wet soils in other areas of the province. Precipitation was below normal in most areas in May, but by mid-June rain occurred in the south. Hail, strong winds, and rainfall occurred in many areas during July and early August, followed by a few days of record-breaking heat. Second growth resulting from uneven crops and recovery from hail damage subsequently delayed harvest in some regions.

FHB was detected in 52% and 59% of the common and durum wheat crops, respectively (Table 1). Incidence and severity of FHB in common wheat were highest in SZ3 and lowest in SZ1. The highest FHB severity (34%) was found in a CWRS wheat crop in SZ3. Overall, the provincial mean FHB severities for common wheat (0.8%) and durum wheat (0.2%) would not have been economically important. Since 2001 mean FHB severities for the province have been less than 1% (Pearse et al. 2008).

Overall, the most commonly isolated *Fusarium* species from wheat in Saskatchewan in 2008 was *F. poae*, accounting for 34% (common wheat) and 32% (durum wheat) of the total *Fusarium* spp. isolated. *Fusarium graminearum* was isolated from 33% of common wheat samples and 21% of those of durum wheat. *Fusarium avenaceum* was isolated from 22% of common wheat and 8% of durum wheat samples, while *F. acuminatum* was isolated from 19% of durum but only 1% of the common wheat. Other

Fusarium species isolated included *F. culmorum, F. equiseti,* and *F. sporotrichioides.* These results are similar to those obtained in 2007 (Pearse et al. 2008).

Fusarium graminearum occurred in 26 of the wheat crops surveyed: 2 from north-east, 10 from east-central, 12 from south-east, and 2 from irrigated regions. Nineteen of the crops affected by *Fusarium graminearum* were common wheat, 5 were durum wheat, and 2 were unknown wheat types.

Other fungal pathogens identified on wheat spikes collected in 2008 included *Septoria, Pyrenophora,* and *Cochliobolus* spp. Secondary moulds were isolated from 93% of the wheat samples and wheat midge damage was observed in 33%. Ergot (*Claviceps purpurea*) was seen in 3% of the samples from this survey. Ergot was a notable problem on wheat in Saskatchewan in 2008, and approximately 15% of harvest samples of Canadian Western Red Spring Wheat from across the province were infested with ergot at a mean level of 0.04% ergot bodies by weight (Canadian Grain Commission, personal communication).

ACKNOWLEDGEMENTS:
We gratefully acknowledge the participation of Saskatchewan Crop Insurance Corporation staff and Saskatchewan Ministry of Agriculture irrigation agrologists for the collection of cereal samples for this survey.

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Table 1. Prevalence and severity of fusarium head blight (FHB) in common and durum wheat crops grouped by soil or irrigation zones in Saskatchewan, 2008.

Soil Zones	Common Wheat		Durum Wheat	
	No. crops affected / total crops surveyed (% of crops infected)	**Mean FHB severity[1] (range)**	**No. crops affected / total crops surveyed (% of crops infected)**	**Mean FHB severity[1] (range)**
Zone 1 Brown	5 / 29 (17%)	Trace[2] (0 - 1.5%)	8 / 14 (57%)	Trace[2] (0 - 0.3%)
Zone 2 Dark Brown	11 / 31 (35%)	0.2% (0 - 1.6%)	9 / 13 (69%)	0.3% (0 - 1.5%)
Zone 3 Black/Grey	48 / 59 (81%)	1.5% (0 - 34%)	---	---
Irrigation Zones	2 / 9 (22%)	0.2% (0 - 1.4%)	2 / 4 (50%)	0.1% (0 - 0.5%)
Overall Total/Mean	66 / 128 (52%)	0.8%	19 / 31 (59%)	0.2%

[1] Percent FHB severity = (% of spikes affected x mean proportion (%) of kernels infected) / 100
[2] FHB severity values less than 0.1% reported as trace

CROP / CULTURE: Common and durum wheat
LOCATION / RÉGION: Saskatchewan

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TITLE / TITRE: **LEAF SPOTTING DISEASES OF COMMON AND DURUM WHEAT IN SASKATCHEWAN IN 2008**

INTRODUCTION AND METHODS: A survey for leaf spotting diseases of common and durum wheat grown under dryland or irrigation was conducted between the milk and dough growth stages in 2008. There were 132 common wheat and 28 durum wheat crops sampled in 20 Saskatchewan crop districts (CDs). In each field, 50 flag leaves were collected at random and air-dried at room temperature. Percentage leaf area affected by leaf spots (severity) was recorded for each leaf, and a mean percentage leaf area with symptoms was calculated for each crop and CD. For crops with 2% or higher leaf spot severity, 1-cm^2 surface-disinfested leaf pieces with lesions were plated on water agar for identification and quantification of leaf-spotting pathogens.

Information on the previous crop and the tillage regime used was obtained for most fields. A comparison of disease and fungal levels among tillage systems (conventional, minimum, or zero) or previous crop (wheat, barley, oat, canola, flax, lentil, or pea) was tabulated for dryland crops grouped by soil zone (SZ) (1: Brown, 2: Dark Brown, and 3: Black/Grey). More of the wheat crops sampled were grown under zero tillage (41%), than minimum tillage (38%) or conventional tillage (21%). Overall, over half the crops were preceded by a non-cereal (56%), more than summerfallow (23%) or a cereal crop (21%). Most (74%) wheat crops preceded by a pulse crop were grown under zero tillage. When preceded by an oilseed or another cereal crop, 50% and 47%, respectively of wheat crops surveyed were grown under zero tillage. When preceded by summerfallow, 61% of wheat crops were grown under conventional tillage.

RESULTS AND COMMENTS: Leaf spots were observed in almost all (98%) crops surveyed (Table 1). For individual crops, percentage flag leaf area affected ranged from trace (≤ 0.5%) to 25%. Overall leaf spot severity in 2008 (5.6%) was higher than in 2007 (3.5%) or 2006 (4.0%) (Fernandez and Pearse 2007, Fernandez et al. 2008). Mean leaf spot severities were highest in CDs 5A and 5B, and lowest in CDs 2A, 3B-S, 3A-S and 4A.

As found in previous years**,** *Pyrenophora tritici-repentis* (tan spot) was the most prevalent leaf spot pathogen isolated from foliar lesions (Table 1). This was followed by *Stagonospora nodorum* plus *Septoria tritici* (septoria leaf complex) and *Cochliobolus sativus* (spot blotch). For *S. nodorum*, highest mean percentage isolation occurred in CDs 8B, 9A, 3B-N, and 5A, whereas for *S. tritici* isolations were highest in CDs 5A, 5B and 1B. *Cochliobolus sativus* was not detected in the south-west. *Pyrenophora teres* was isolated from three crops at a mean percentage isolation of 37%. A *Pseudoseptoria* species was detected in a total of 5 crops in CDs 1A, 2B and 6A, but only at a low mean percent isolation of < 7%. No *Stagonospora avenae* f. sp. *triticea* was detected in any wheat crop in 2008.

Classification of results according to tillage system revealed that leaf spotting diseases were most prevalent in wheat crops from the Black/Grey Soil Zone (SZ3) and least prevalent in those from the Brown Soil Zone (SZ1) (Table 2). Highest mean leaf spotting levels in SZ1 were observed under zero-till, in SZ2 under minimum-till, and in SZ3 under conventional-till. Compared to the other soil zones, in SZ3 *P. tritici-repentis* was isolated at the lowest levels, whereas *S. nodorum* and *S. tritici* were isolated at the highest levels and in the most crops. In all three soil zones, *P. tritici-repentis* was isolated at the highest levels under zero tillage, whereas in SZ1 and SZ2 it was isolated at the lowest levels under conventional tillage.

Classification of results according to the previous year's crop did not reveal consistent differences in mean leaf spotting severities among the fields sampled in any of the three soil zones (Table 3). For all soil zones, the highest mean percentage isolation of *P. tritici-repentis*, and lowest isolation of *S. nodorum* and *S. tritici*, was observed in wheat grown after a pulse crop, whereas the lowest mean percentage isolation of *P. tritici-repentis* was observed when wheat was grown after another cereal crop or following summerfallow.

We gratefully acknowledge the participation of Saskatchewan Crop Insurance Corporation staff and Saskatchewan Ministry of Agriculture irrigation agrologists for the collection of leaf samples for this survey.

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Table 1. Incidence and severity of leaf spotting diseases and percentage fungal isolation/number of crops affected with the most common leaf spotting pathogens in common and durum wheat crops grown under dryland or irrigation surveyed in Saskatchewan in 2008.

Crop District	No. crops affected/ surveyed[1]	Mean severity[2]	*Pyrenophora tritici-repentis*[3]	*Stagonospora nodorum*	*Septoria tritici*	*Cochliobolus sativus*
			%			
1A	8/8	3.0	88/3	5/2	10/1	2/1
1B	7/7	6.9	64/7	11/5	30/6	22/1
2A	7/7	0.9	84/2	-	13/2	6/1
2B	9/9	6.9	85/9	11/8	3/2	6/3
3A-N	10/10	7.3	89/8	10/6	6/3	-
3A-S	7/9	1.6	99/2	2/1	-	-
3B-N	10/10	3.2	64/6	30/6	7/5	-
3B-S	6/6	0.8	76/1	10/1	15/1	-
4A	1/2	0.5	-	-	-	-
4B	8/8	3.6	87/6	8/1	11/6	-
5A	6/6	12.2	41/4	28/5	56/5	10/2
5B	8/8	18.8	40/8	23/7	38/8	4/4
6A	15/15	7.6	71/12	19/10	11/8	2/1
6B	9/9	4.8	66/6	24/6	10/3	7/3
7A	17/17	3.3	89/9	5/3	10/8	9/1
7B	3/3	4.3	88/2	25/1	-	-
8A	3/3	5.7	75/3	10/3	14/3	3/1
8B	3/3	7.3	59/3	43/2	19/2	-
9A	12/12	4.9	47/11	40/8	18/10	12/3
9B	8/8	5.4	89/7	24/1	12/3	19/1
All	**157/160**	**5.6**	**71/109**	**21/76**	**20/76**	**8/22**

[1]Number of crops with leaf spotting lesions on the flag leaf/total number of crops surveyed. Fourteen fields were under irrigation in various CDs: 2 in 3A-N, 3 in 3 A-S, 2 in 3B-N, and 7 in 6B.
[2]Mean percentage flag leaf area infected estimated on leaf samples that were still green when sampled.
[3]Mean percentage fungal isolation/number of crops from which a pathogen was detected.

Table 2. Incidence and severity of leaf spotting diseases, and mean percentage isolation of the most common leaf spotting pathogens in relation to tillage system in three soil zones for common and durum wheat crops surveyed in Saskatchewan in 2008

Soil Zone/ Tillage system	No. crops affected/ surveyed[1]	Mean severity[2]	*Pyrenophora tritici-repentis*[3]	*Stagonospora nodorum*	*Septoria tritici*	*Cochliobolus sativus*
			%			
Zone 1 (Brown)						
Conventional	14/15	2.6	70/7	31/5	8/6	-
Minimum	19/20	2.5	85/9	8/4	12/8	9/1
Zero	9/9	5.9	92/3	10/2	5/1	-
Zone 2 (Dark Brown)						
Conventional	6/6	3.2	58/3	33/2	19/1	5/2
Minimum	19/19	7.3	73/11	21/9	13/8	2/2
Zero	29/29	4.7	87/23	10/14	8/11	8/4
Zone 3 (Black/Grey)						
Conventional	9/9	13.7	54/9	20/8	25/9	14/2
Minimum	16/16	9.7	33/15	25/11	37/13	6/7
Zero	22/22	5.7	65/19	29/13	25/16	14/2

[1]Number of wheat crops with leaf spotting lesions on the flag leaf/total number of surveyed crops excluding fields under irrigation.
[2]Mean percentage flag leaf area affected estimated on leaf collections that were still green when sampled.
[3]Mean percentage fungal isolation/number of wheat crops from which a pathogen was detected.

Table 3. Incidence and severity of leaf spotting diseases, and mean percentage isolation of the most common leaf spotting pathogens, by rotation within each soil zone for common and durum wheat crops surveyed in Saskatchewan in 2008

Soil Zone/ Previous crop	No. crops affected/ surveyed[1]	Mean severity[2]	*Pyrenophora tritici-repentis*[3]	*Stagonospora nodorum*	*Septoria tritici*	*Cochliobolus sativus*
		%				
Zone 1 (Brown)						
Cereal	10/11	1.6	77/4	6/2	18/4	9/1
Oilseed	4/4	7.8	90/2	10/2	-	-
Pulse	8/8	3.6	97/2	-	5/1	-
Summerfallow	19/19	3.4	76/11	26/7	8/10	-
Zone 2 (Dark Brown)						
Cereal	7/7	6.7	79/4	17/3	10/3	-
Oilseed	24/24	4.3	86/14	10/10	7/7	5/3
Pulse	8/8	8.0	91/8	7/4	7/6	-
Summerfallow	19/19	3.6	80/3	18/1	15/2	2/1
Zone 3 (Black/Gray)						
Cereal	8/8	9.0	52/8	26/8	24/6	14/2
Oilseed	28/28	7.5	59/25	29/14	29/23	6/6
Pulse	2/2	7.0	94/2	6/1	6/1	-
Summerfallow	7/7	9.1	52/6	21/7	39/5	15/3

[1]Number of wheat crops with leaf spotting lesions on the flag leaf/total number of surveyed crops excluding fields under irrigation.
[2]Mean percentage flag leaf area affected estimated on leaf collections that were still green when sampled.
[3]Mean percentage fungal isolation/number of wheat crops from which a pathogen was detected.

CROP / CULTURE: Wheat
LOCATION / RÉGION: Manitoba and eastern Saskatchewan

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TITLE / TITRE: LEAF RUST AND STRIPE RUST OF WHEAT IN MANITOBA AND EASTERN SASKATCHEWAN IN 2008

INTRODUCTION AND METHODS: Trap nurseries and commercial crops of wheat in Manitoba and eastern Saskatchewan were surveyed for the incidence and severity of leaf rust (*Puccinia triticina* Eriks.) and stripe rust (*Puccinia striiformis* Westend. f.sp. tritici) during July and August 2008.

RESULTS AND COMMENTS: *Puccinia triticina* was first observed on spring wheat in Manitoba during late June in 2008. Most wheat crops in southern Manitoba were sprayed with a foliar fungicide in 2008, which controlled any rusts present. There were 35 nonsprayed fields surveyed in Manitoba and the level of leaf rust ranged from 0% to 25% of the flag leaf covered with rust pustules, with an average of 1.1%. This represents the lowest severity of leaf rust in Manitoba in the past 10 years (Table 1). There were 10 nonsprayed crops surveyed in Saskatchewan and the level of leaf rust was zero to trace amounts in all of them. However, the level was higher in trap plots of susceptible lines at Indianhead, Saskatchewan. Only a trace of stripe rust was found in eastern Saskatchewan, although stripe and leaf rust samples were collected later in the season from Regina, Saskatchewan.

Table 1. Average percentage (%) of the flag leaf infected with leaf rust in surveys from 2001 to 2008 in Manitoba and Saskatchewan

Year	Percentage (%) of flag leaf infected with leaf rust	
	Manitoba	Saskatchewan
2001	10.0	3.0
2002	18.0	5.0
2003	2.5	2.0
2004	7.0	2.0
2005	20.0	22.0
2006	10.2	5.3
2007	15.7	4.9
2008	1.1	0.1
Average	10.6	5.5

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: SURVEY OF FUSARIUM HEAD BLIGHT OF SPRING WHEAT IN MANITOBA IN 2008

INTRODUCTION AND METHODS: Thirty-nine spring wheat fields were surveyed between July 28 and August 5, 2008 in southern Manitoba to monitor the incidence and severity of fusarium head blight (FHB). Disease incidence and severity in each field were assessed at ZGS 72-84 by sampling 50 to 100 spikes at three locations for incidence and severity, and additional spikes were collected for subsequent pathogen identification. From each field collection, at least 10 spikes were threshed from which 10 kernels were selected. Kernels were surface-sterilized and incubated on potato dextrose agar under continuous cool white light for 4-5 days to isolate and identify *Fusarium* species present. When the *Fusarium* species was unknown, single spores were grown on carrot agar or water agar to facilitate identification. The FHB-index (overall severity) was calculated as follows: Average % incidence X Average % severity /100.

RESULTS AND COMMENTS: Disease levels varied widely within individual crop reporting districts (CDs) except for CD 8 in south-central Manitoba bordering the US (Table 1). The average FHB index over all CDs was 4.4 %, but this ranged from 0.9 to 9.6%. Crops in CDs 9 and 11 encompassing the Red River Valley and the Interlake regions were the most severely affected by FHB.

Fusarium species were isolated from 380/390 (97.4%) of kernels examined in 2008. *Fusarium graminearum* was the predominant species also accounting for 97.4 % of isolations. Two other species found at low levels included *F. sporotrichioides* (2.2%), and *F. equiseti*, a single isolation (Table 2). There were reports of high levels of *Fusarium*-damaged kernels (FDK) from the Grain Research Laboratory, Canadian Grain Commission, especially from the Manitoba Interlake region (CD 11). The correlation between FHB index and FDK was poor in all CDs (Fig. 1), but the dissimilar (and sometimes very small) number of fields contributing to the averages probably account for the lack of association.

Table 1. Fusarium head blight (FHB) index in surveyed crop reporting districts in Manitoba 2008

Crop Reporting District	Number of fields surveyed	Average FHB Index	Range of FHB Index
3	4	2.1	0.0 – 7.4
7	16	4.5	0.1 – 33.4
8	7	0.9	0.1 – 1.2
9	3	9.6	3.6 – 14.8
11	9	6.0	1.9 – 17.3

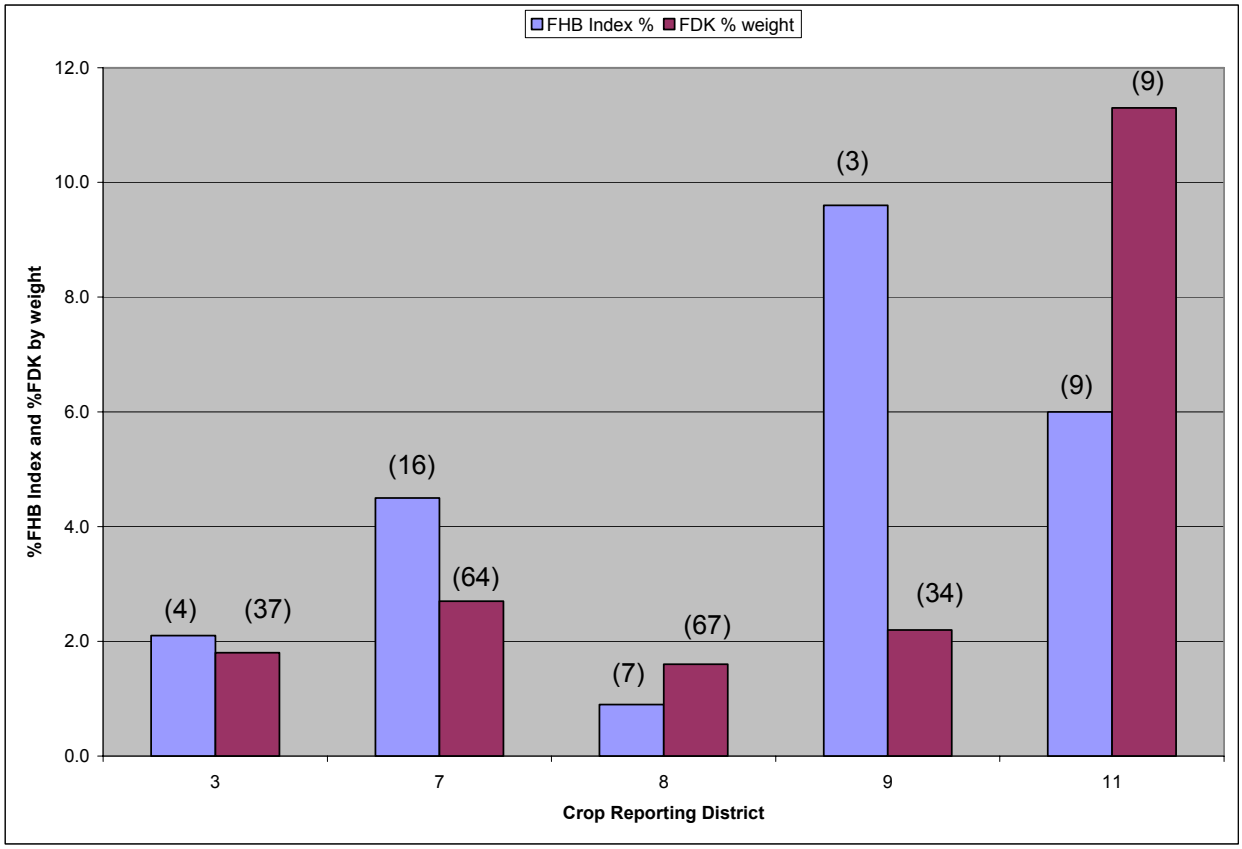

Figure 1. Comparison of FHB Index with levels of *Fusarium*-damaged kernels (FDK) assessed by the Canadian Grain Commission Grain Research Laboratory for crop reporting districts in Manitoba. Numbers in brackets represent the number of fields/samples generating mean values.

Table 2. Frequency of *Fusarium* species isolated from kernels of spring wheat in southern Manitoba in 2008.

***Fusarium* spp.**	**No. of isolations**	**Percentage**
F. graminearum	370	97.4
F. sporotrichioides	9	2.4
F. equiseti	1	0.3

CROP / CULTURE: Winter Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: MONITORING FUSARIUM HEAD BLIGHT OF WINTER WHEAT IN MANITOBA IN 2008

INTRODUCTION AND METHODS: The prevalence of fusarium head blight (FHB) in winter wheat in Manitoba in 2008 was assessed by monitoring 47 farm fields from July 15 to 21 when most crops were at the late milk to early-dough stage of growth (ZGS 79-83). Because winter wheat is not grown extensively in Manitoba (in 2008 it was harvested from about 20% of the total wheat acreage in the province - Statistics Canada, Field Crop Reporting Series, Catalogue No. 22-002-X, November Estimates, 2008) the fields were not surveyed at random; rather, information on their location was obtained by contacting Manitoba Agriculture, Food and Rural Initiatives extension personnel, or producers who normally grow the crop. The fields surveyed were located in southern Manitoba, in an area bounded by Highways # 67, 1, and 24 to the north, the Manitoba/North Dakota border to the south, Hwy #21 to the west and Hwy #12 to the east. Fusarium head blight in each field was assessed by non-destructive sampling of a minimum of 80-100 plants at each of 3 locations to determine the percentage of infected spikes (disease incidence), and the average spike proportion infected (SPI). The overall severity was expressed as the 'FHB Index' (% incidence x %SPI / 100). Several affected spikes (or, 'normal' spikes when symptoms were not evident) were collected from each monitored site and stored in paper envelopes. A total of 50 discoloured, putatively infected kernels, when available, or a combination of discoloured and 'normal' kernels, were subsequently removed from five heads per location. The kernels were surface-sterilized in 0.3% NaOCl for 3 min., air-dried, and plated on potato dextrose agar in Petri dishes (10 seeds/dish) to quantify and identify the *Fusarium* spp. present based on morphological traits described in standard taxonomic keys.

RESULTS AND COMMENTS: Conditions in spring (May and June) 2008 were generally cooler than normal, delaying crop development. Subsequently, temperatures rose to typical levels for July and August. Seasonal (April 1 to September 30) moisture was at normal to slightly above normal levels for most of the province except the Interlake region which received excessive rain, leading to standing water and the drowning of some crops. Relatively good cereal crops were harvested in most districts.

'CDC Falcon' was the predominant winter wheat cultivar planted, and was grown on 37 (82%) of the 45 fields for which cultivar information was available. The cultivars 'CDC Buteo', 'McClintock', 'CDC Clair' and 'CDC Ptarmigan' were grown on 4, 2, 1 and 1 fields, respectively. Foliar fungicides are applied routinely to many winter wheat crops in Manitoba, and in the 27 crops for which information was provided, most had been sprayed with propiconazole or tebuconazole products alone (7 each) or a combination of tebuconazole preceded by a propiconazole or pyraclostrobin-based product (7 in total).

Visible symptoms of FHB were observed in 32 (68%) of the 47 winter wheat crops sampled. Overall, incidence of FHB was 0.4% (range 0 - 1.6%), SPI 51.1% (range 0 - 90%) and the resulting FHB Index (%incidence x %SPI / 100) 0.3% (range 0 - 1.4%). As such, FHB was estimated to have caused no yield loss in commercial winter wheat in 2008. The severity of FHB in 2008 was the lowest recorded since systematic monitoring for FHB in winter wheat began in 1998. The proportion of fields with visible evidence of FHB was also the lowest recorded in the past 12 years. Despite the apparent very low levels of FHB in winter wheat, some harvested grain samples tested by the Canadian Wheat Board and the Canadian Grain Commission contained significant levels of deoxynivalenol (DON). The cool conditions in May and June, which likely delayed inoculum development and reduced its abundance, and the widespread application of foliar fungicides by winter wheat producers for control of leaf spots and FHB, were likely responsible for the very low levels of disease recorded in mid-July. Later, when inoculum was

more plentiful, and the efficacy of earlier-applied fungicides had probably diminished, late-season infections by *Fusarium* spp. and DON production may have occurred.

Fusarium colonies developed from 63.4% of the selected kernels plated on potato dextrose agar. As in 2007 (Tekauz et al. 2008), *Fusarium graminearum* was essentially the sole *Fusarium* species isolated. It was found in all crops with visible FHB symptoms, as well as 5 of the 15 asymptomatic crops, and was isolated from 99.9% of *Fusarium*-positive kernels. *Fusarium avenaceum* was the only other *Fusarium* species found on kernels in 2008

REFERENCE:

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Table 1. *Fusarium* spp. isolated from winter wheat crops in Manitoba in 2008.

***Fusarium* spp.**	**Percent of fields**	**Percent of kernels**
F. avenaceum	2.1	0.1
F. graminearum	78.7	99.9

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: SURVEY FOR LEAF SPOT DISEASES OF SPRING WHEAT IN MANITOBA IN 2008

INTRODUCTION AND METHODS: A survey of 38 spring wheat fields was conducted between 28 July and 7 August, 2008 to assess the prevalence and severity of foliar diseases in southern Manitoba. Leaves were collected between the heading and soft dough stages of crop development. Severity of leaf spots on upper (flag) and lower leaves was categorized as 0, trace, 1, 2, 3 or 4, with 4 describing dead leaves and 1 leaves lightly affected. Samples of diseased leaf tissue were collected and subsequently single lesions from each of 10 leaves were surface-sterilized and placed in moisture chambers for 5-7 days to promote sporulation for disease and pathogen identification.

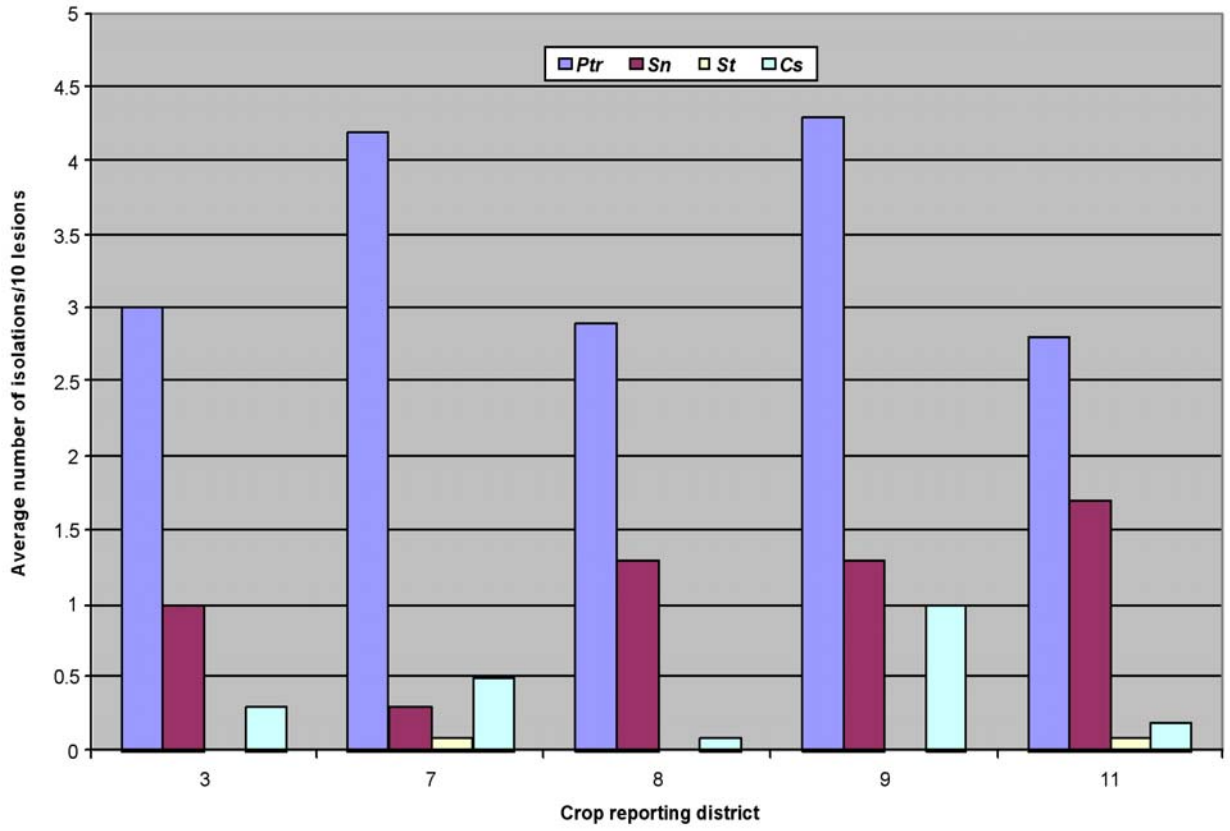
RESULTS AND COMMENTS: The average level of necrosis resulting from leaf spots was 1.9 on flag leaves and 2.7 on lower leaves. Crop reporting districts (CDs) 7, 9 and 11 had the highest levels of foliar disease. These regions also had higher than normal rainfall during the latter part of July. *Pyrenophora tritici-repentis* (tan spot) was the predominant pathogen in all CDs accounting for 71% of isolations (from 188 pathogen isolations in total) and was found in 36 of 38 crops sampled (Table 1, Fig. 1). As has been reported in recent years, levels of *Cochliobolus sativus* (spot blotch) and *Septoria tritici* (septoria tritici blotch) remained low. Stagonospora nodorum blotch (*Stagonospora nodorum*) was the second most prevalent disease, but was found at lower levels and in comparatively fewer fields than in 2007 (Gilbert et al. 2008). Stagonospora nodorum blotch and spot blotch were identified in all CDs sampled, but only at low levels, while Septoria tritici blotch was identified in only 2 fields (Table 1).

REFERENCE:
Gilbert, J., Tekauz, A., Kaethler, R., Kromer, U, Hamilton, J., Unrau, T., Mueller, E., Stulzer, M. and Beyene, M. 2008. Survey for leaf spot diseases of spring wheat in Manitoba in 2007. Can. Plant Dis. Surv. 88: 86-87. (http://www.cps-scp.ca/cpds.htm)

Table 1. Prevalence and isolation frequency of leaf spot pathogens in 38 crops of hard red spring wheat in Manitoba in 2008.

	Disease/Pathogen			
	Septoria nodorum blotch *(Stagonospora nodorum*)	**Septoria tritici blotch *(Septoria tritici)***	**Tan spot *(Pyrenophora tritici-repentis*)**	**Spot blotch *(Cochliobolus sativus)***
Wheat crops affected (Total = 38)	13	2	36	8
Isolations (%) (n = 188)	20.2	1.1	71.3	7.4

Figure 1. Isolations of foliar pathogens of wheat by crop reporting district in southern Manitoba in 2008



Ptr - Pyrenophora tritici-repentis, Sn – Stagonspora nodorum, St – Septoria tritici, Cs – Cochliobolus sativus

CROP / CULTURE: Winter Wheat
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: LEAF SPOT DISEASES OF WINTER WHEAT IN MANITOBA IN 2008

INTRODUCTION AND METHODS: The occurrence and severity of leaf spotting diseases of winter wheat in Manitoba in 2008 were assessed by surveying 47 farm fields from July 15 to 21 when most crops were at the late milk to early-dough stage of growth (ZGS 79-83). Because winter wheat is not widely grown in Manitoba (in 2008 it was harvested from about 17% of the total wheat acreage in the province - Statistics Canada, Field Crop Reporting Series, Catalogue No. 22-002-X, November Estimates) the fields were not surveyed at random; rather, information on their location was obtained by contacting Manitoba Agriculture, Food and Rural Initiatives extension personnel, and producers who normally grow the crop. The fields surveyed were located in southern Manitoba, in an area bounded by Highways # 67, 1, and 24 to the north, the Manitoba/North Dakota border to the south, Hwy #21 to the west and Hwy #12 to the east. Leaf spots were rated on approximately 10 plants along a diamond-shaped transect of about 50 m per side, beginning near the field edge. Severity of symptoms was recorded for both the upper (flag leaf) and lower leaf canopies using a six-category scale: 0 (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 symptoms were collected from each site, placed in paper envelopes and allowed to dry. Subsequently, surface-sterilized pieces of infected leaf tissue were placed in moist chambers for 3-5 days to promote sporulation, allow for identification of the causal pathogen(s), and determine the specific disease(s) present.

RESULTS AND COMMENTS: Conditions in spring (May and June) 2008 were generally cooler than normal, delaying crop development. Subsequently, conditions improved, resulting in relatively good crops of high quality cereals. 'CDC Falcon' was the predominant winter wheat cultivar planted, and was grown on 37 (82%) of the 45 fields for which cultivar information was available. The cultivars 'CDC Buteo', 'McClintock', 'CDC Clair' and 'CDC Ptarmigan' were grown on 4, 2, 1 and 1 field(s) each. Foliar fungicides are applied routinely to many winter wheat crops in Manitoba, and for the 27 crops for which information was available, most had been sprayed with propiconazole or tebuconazole products alone (7 each), or a combination of tebuconazole preceded by a propiconazole or pyraclostrobin-based product (7 in total).

Leaf spot symptoms were observed in the upper and (or) lower leaf canopies in most (81%) fields surveyed. Disease levels in the upper canopy were 0 to slight in 89% of fields, moderate in 11% and severe in none. In the lower canopy, the respective categories occurred in 49%, zero and zero fields, and in 51% of fields the lower canopy leaves had senesced. The upper canopy severity levels suggest that leaf spots caused only trace levels of damage to winter wheat in 2008, likely a yield loss of less than 1%. The widespread use of foliar fungicides as part of winter wheat management in Manitoba probably reduced the potential level for leaf spot development.

Pyrenophora tritici-repentis, causal agent of tan spot, was the predominant leaf spot pathogen (Table 1), as has been the case in Manitoba every year since 2001 (Tekauz et al. 2002). It was detected in 81% of fields and was estimated to have caused 90% of the foliar damage observed. *Stagonospora* spp. (stagonospora blotches) caused the remainder of the damage observed. In contrast to previous years, *Cochliobolus sativus* (spot blotch) was not found in 2008.

REFERENCE:
Tekauz, A., Mueller, E, Beyene, M., Stulzer, M., Schultz, D. and Reverchon, F. 2002. Leaf spot diseases of winter wheat in Manitoba in 2002. Can. Plant Dis. Surv. 82: 73-73. (http://www.cps-scp.ca/cpds.htm)

Table 1. Incidence and isolation frequency of leaf spot pathogens of winter wheat in Manitoba in 2008.

Pathogen	Incidence (% of fields)	Frequency (% of isolations)*
Pyrenophora tritici-repentis	81	79.1
Stagonospora avenae f.sp. *triticea*	15	5.6
Stagonospora nodorum	6	4.2

*indicative of the relative foliar damage caused

CROP / CULTURE: Winter wheat
LOCATION / RÉGION: Ontario

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TITLE / TITRE: 2008 SURVEY FOR FUSARIUM HEAD BLIGHT OF WINTER WHEAT IN ONTARIO

INTRODUCTION AND METHODS: Ten winter wheat field trials from the '2008 Ontario Performance Trial' were selected from different locations. At harvest samples were assessed for the presence of fusarium head blight (FHB) by determining levels of *Fusarium*-infected kernels and deoxynivalenol (DON). Grain from each of four cultivars at each location was obtained after harvest. *Fusarium*-infected kernels were obtained from two soft winter wheat cultivars, 'Superior' (SWW) and 'Emmit' (SRW), and from two hard winter wheat (HWW) cultivars, 'Warthog' and 'Harvard' at each location. 'Superior' and 'Harvard' are highly susceptible cultivars, while 'Emmit' and 'Warthog' are rated as moderately susceptible. To determine the percent seed infected by *Fusarium*, 60 kernels per field were surface-sterilized in 0.16% NaOCl (dilute commercial bleach) for 3 min., air dried, and placed on acidified potato dextrose agar in four replications of 15 seeds per replicate. The plates were incubated for 7 days under a 12:12 hr light:dark cycle at room temperature. *Fusarium graminearum* isolates were identified using standard taxonomic keys. The level of DON was determined from grain of the cvs. 'Superior' and 'Harvard' at each location. DON content was assessed on a 20g sub-sample of harvested seed using ELISA (commercial kits from Diagnostix-www.diagnostix.ca).

RESULTS AND COMMENTS: The highest average percentage of *Fusarium*-infected kernels (48.8%) was found at Palmerston, followed by Elora (39.4%) and Nairn (36.9%) (Table 1). The percentage of *Fusarium graminearum* (identified as % of total *Fusarium* spp.) was highest at Palmerston (97.2%) (Table 2). The highest level of DON (2.9 ppm) was found at Nairn, followed by Palmerston (2.5 ppm) and Elora (2. 3 ppm) (Table 3). These DON levels were similar to those found in winter wheat in SW Ontario in 2004 when significant losses occurred (Tamburic-Ilincic et al., 2005). The average level of DON was higher (2.0 ppm) in the SWW cv. 'Superior' than (0.8 ppm) in the HRW cv. Harvard' (Table 3).

REFERENCE:
Tamburic-Ilincic, L., Paul. D. and Schaafsma, A. W. 2005. Fusarium head blight survey of winter wheat in 2004 in Ontario. Can. Plant Dis. Surv. 85:53. (http://www.cps-scp.ca/cpds.html)

Table 1. *Fusarium* spp. (%) isolated from kernels of winter wheat, Ontario, 2008.

	Cultivar				
Location	**Superior* (SWW)**	**Emmit** (SRW)**	**Warthog*** (HRW)**	**Harvard**** (HRW)**	**Mean**
Nairn	45	33	28	43	37
Woodstock	40	15	35	30	30
Palmerston	55	45	50	45	48
Bath	18	13	10	15	14
Elora	38	28	43	50	39
Ridgetown	23	8	3	5	9
Inwood	5	8	3	3	4
Kemptville	23	8	5	33	17
Harrow	0	3	0	0	1
Ottawa	38	23	25	33	29
Mean	**28**	**18**	**20**	**26**	

Table 2. *Fusarium graminearum* (% of total *Fusarium* spp.) on kernels of winter wheat, Ontario, 2008.

	Cultivar				
Location	**Superior (SWW)**	**Emmit (SRW)**	**Warthog (HRW)**	**Harvard (HRW)**	**Mean**
Nairn	100	54	46	47	62
Woodstock	100	100	21	33	64
Palmerston	100	100	100	89	97
Bath	14	60	25	67	42
Elora	40	73	100	70	71
Ridgetown	78	33	100	100	78
Inwood	0	100	0	0	25
Kemptville	44	67	100	85	74
Harrow	0	0	0	0	0
Ottawa	40	44	30	39	38
Mean	**52**	**63**	**52**	**53**	

Table 3: Deoxynivalenol (DON) levels in ppm in winter wheat, Ontario, 2008.

	Cultivar		
Location	**'Superior' (SWW)**	**'Harvard' (HRW)**	**Mean**
Nairn	5.0	0.9	2.9
Woodstock	1.5	0.5	1.0
Palmerston	3.0	2.0	2.5
Bath	2.0	1.3	1.6
Elora	3.3	1.2	2.3
Ridgetown	1.3	0.6	1.0
Inwood	0.2	0.2	0.2
Kemptville	0.7	0.1	0.4
Harrow	1.0	0.3	0.7
Ottawa	1.8	0.7	1.3
Mean	**2.0**	**0.8**	

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Eastern Ontario

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: DISEASES OF SPRING WHEAT IN ONTARIO IN 2008

INTRODUCTION AND METHODS: A survey for diseases of spring wheat was conducted in Ontario in the third week of July when plants were at the soft dough stage of development. Thirty-one fields were chosen at random in regions of central and eastern Ontario where most of the spring wheat is grown. Foliar disease severity was determined on 10 flag and penultimate leaves sampled at each of three random sites per field using a rating scale of 0 (no disease) to 9 (severely diseased). Diseases were identified by visual symptoms. Average severity scores of <1, <3, <6, and ≥6 were considered trace, slight, moderate, and severe infection levels, respectively. Severity of ergot, loose smut, and take-all was estimated as the percentage of plants infected. Fusarium head blight (FHB) was rated for both incidence (percent of infected spikes) and severity (percent of spike area infected), based on approximately 200 spikes sampled at each of three random sites per field. A FHB index (%incidence x %severity)/100 was determined for each field. Index values of <1, <10, <20, and ≥20 were considered slight, moderate, severe, and very severe infection levels, respectively.

Determination of the causal species of FHB was based on 10 infected heads collected from each field. The heads were air-dried at room temperature, and subsequently threshed. Thirty random discolored kernels per sample were surface sterilized in 1% NaOCl for 30 seconds, and plated in 9-cm diameter petri dishes onto modified potato dextrose agar (10 g dextrose per liter) amended with 50 ppm streptomycin sulfate. Plates were incubated for 10-14 days at 22-25°C, with a 14-hour photoperiod using fluorescent and long wave ultraviolet tubes. *Fusarium* species isolated from the kernels were identified by microscopic examination using standard taxonomic keys.

RESULTS AND COMMENTS: Twelve diseases were observed in the 31 fields surveyed (Table 1). Septoria/stagonospora leaf blotch (normally associated with infection by *Septoria tritici* and *Stagonospora* spp.) and leaf rust (*Puccinia triticina*) were the most prevalent foliar diseases, observed in 30 and 23 crops at mean severities of 5.3 and 3.0, respectively. Severe infections from these diseases were observed in 16 and 2 fields, respectively. Yield reductions due to the two diseases were estimated to average at least 10% in the surveyed crops.

Spot blotch (*Cochliobolus sativus*) and tan spot (*Pyrenophora tritici-repentis*) were observed in 23 and 25 fields at mean severities of 3.3 and 2.7, respectively. Although these diseases were commonly observed, no crops were severely affected. Other foliar diseases observed included bacterial leaf blight (*Pseudomonas syringae* pv. *syringae*), powdery mildew (*Erysiphe graminis* f. sp. *tritici*), septoria glume blotch (*Septoria nodorum*), and stem rust (*Puccinia graminis* f. sp. *tritici*). These four diseases were found in 11, 3, 9, and 2 crops, respectively, at trace to moderate severity levels.

Ergot (*Claviceps purpurea)* and take-all (*Gaeumannomyces graminis* var. *tritici*) were found in 21 and 25 crops at mean severities of 2.0 and 1.3, respectively (Table 1). These diseases were more common and generally more severe in 2008 than in 2007 (Xue et al. 2008). All ergot-affected fields had incidence levels of more than 1%. Loose smut (*Ustilago tritici*) was observed in 7 crops at a mean severity of 1.6%. The disease did not appear to have caused significant damage.

Fusarium head blight was observed in all surveyed crops at a mean incidence of 27.3% (range 5.0-55.0%) (Table 1). Infected spikes had a mean severity of 21.0% (range 10.0-36.7%). The resulting FHB

index ranged from 0.5-14.7%, with a mean of 6.1%. Severe levels of FHB were observed in 17 crops (55% of those surveyed) in 2008. Compared to previous years (Xue et al. 2008), in 2008 FHB would have had a greater impact on grain yield and quality. Four *Fusarium* species were isolated from infected kernels (Table 2). *Fusarium graminearum* predominated, occurring in all of the fields and 74% of infected kernels. Other species found included *F. avenaceum, F. equiseti*, and *F. sporotrichioides,* at frequencies of 0.3%, 0.3%, and 3.1% of kernels, respectively.

The profile of spring wheat diseases in Ontario in 2008 was similar to that found in 2007 (Xue et al. 2008). Severities of the diseases were generally greater in 2008, except that of take-all, which was less severe in 2008 than in 2007. Fusarium head blight likely caused significant yield and quality reductions to Ontario wheat in 2008. Thus, 2008 can be considered another FHB epidemic year for Ontario, as was 2006. The relatively low temperatures and frequently rainfall in June, July, and August were likely responsible for the increase in leaf spot, ergot, and FHB severities.

REFERENCE:

Xue, A.G., Chen, Y., and Voldeng, H.D. 2008. Diseases of spring wheat in eastern Ontario in 2007. Can. Plant Dis. Surv. 87:95-96. (http://www.cps-scp.ca/cpds.htm)

Table 1. Prevalence and severity of spring wheat diseases in Ontario in 2008.

		DISEASE SEVERITY IN AFFECTED CROPS*	
DISEASE	**NO. CROPS AFFECTED (n=26)**	**Mean**	**Range**
Bacterial blight	11	2.0	1.1-5.0
Leaf rust	23	3.0	1.1-7.7
Powdery mildew	3	4.3	3.0-5.0
Septoria glume blotch	9	3.7	1.7-5.0
Spot blotch	23	3.3	1.0-5.0
Septoria/Stagonospora leaf blotch	30	5.3	1.7-7.7
Stem rust	2	1.8	1.7-2.0
Tan spot	25	2.7	1.0-4.0
Ergot (%)	21	2.0	1.0-6.7
Loose smut (%)	7	1.6	1.0-5.0
Take-all (%)	25	1.3	1.0-5.0
Fusarium head blight**	31		
Incidence (%)		27.3	5.0-55.0
Severity (%)		21.0	10.0-36.7
Index (%)		6.1	0.5-14.7

*Foliar disease severity was rated on a scale of 0 (no disease) to 9 (severely diseased) except for ergot, loose smut, and take-all, where severity was rated as percent plants infected.
** FHB index = (incidence x severity)/100

Table 2. Frequency of *Fusarium* species isolated from fusarium damaged kernels of spring wheat in eastern Ontario in 2007.

***Fusarium* spp.**	**% FIELDS**	**% KERNELS**
Total *Fusarium*	100	77.7
F. avenaceum	3.2	0.3
F. equiseti	3.2	0.3
F. graminearum	100	74.0
F. sporotrichioides	19.4	3.1

Forages / Plantes Fourragères

CROP / CULTURE: Alfalfa (*Medicago sativa*)
LOCATION / RÉGION: Saskatchewan, Alberta

NAME AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
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TITLE/TITRE: DISEASES ON ALFALFA IN SASKATCHEWAN AND ALBERTA IN 2007 AND 2008.

METHODS: Alfalfa roots were collected from nine commercial fields in northeast and north-central Saskatchewan in June 2007, with four sites per field and 5 to 10 roots per site. The top 20–30 cm of each taproot was dug by hand, washed and air-dried, then stored under cool conditions. For assessment, pieces were excised from the margin of roots lesions, surface sterilized in 0.6% NaOCl for 2.5 min and 70% ethanol for 1 min, rinsed in sterile distilled water, plated onto 1.5% water agar and incubated under continuous light at 10 °C. After 3–4 months of incubation, pycnidia with morphology characteristic of *Phoma sclerotioides* were harvested and single-conidium isolates were established on potato dextrose agar. These isolates were incubated at 10 °C under continuous light for 1.5 to 2 months and assessed for cultural and conidial morphology typical of *P. sclerotioides*.

In September 2008, alfalfa stems and leaves were collected from eight alfalfa fields in the same areas as in 2007. Stems with leaves were collected at sites along a teardrop-shaped circuit into each field and brought back to the lab for assessment. Disease identification was based on visual symptoms, with occasional isolation (where required) to confirm the identity of the pathogen.

RESULTS AND COMMENTS: Brown root rot caused by *P. sclerotioides* was found in 7 of the 9 alfalfa fields surveyed in 2007, with a mean incidence of 28% (range 11−51%) in infected crops. Brown root rot can contribute to severe winterkill of alfalfa. However, this level of incidence is low for northern Saskatchewan, where the incidence of brown rot can be near 100% in areas of fields where conditions are conducive for disease development, e.g., snow accumulation in early winter (Gossen, unpublished data). Symptoms of crown rot were also observed in almost every plant from every field, but severity was not assessed.

In 2008, hot dry weather in July was associated with low levels of foliar diseases on alfalfa and other crops across the region. In the eight fields assessed, symptoms were visible on an average of only 6% (range 2 −12%) of the leaf area on each stem, even though the mean incidence of infected stems was 49% (range 15 − 75%). Spring black stem was the dominant disease in all eight fields, but common leaf spot (*Pseudopeziza medicaginis*) was also identified at all eight sites and yellow leaf blotch (*Leptotrochila medicaginis*) was present at low levels in three fields. *Phoma medicaginis* is the predominant pathogen causing spring black stem in alfalfa, but *P. sclerotioides* can produce similar symptoms on alfalfa leaves (Wang et al. 2004). Studies are underway to assess the relative incidence of these two pathogens in the samples from Saskatchewan and compare it with relative incidence from sites in the northern USA.

In 2008, samples were also collected from a rain-fed commercial alfalfa crop in the Peace River region of Alberta that exhibited unusual patches of stunting and chlorosis. Nematodes from the sample were identified as *Ditylenchus dipsaci*, the stem and bulb nematode. This is an unusual observation, because this pest has not been reported from alfalfa in western Canada for many years, and never before from rain-fed crops.

ACKNOWLEDGEMENT: We thank Dr. Q. Yu, AAFC, ECORC, Ottawa, Ont., for identification of the nematode specimen.

REFERENCE:

Wang, H., Hwang, S.F., Chang, K.F., Gossen, B.D., Turnbull, G.D. and Howard, R.J. 2004. Assessing resistance to spring black stem of alfalfa caused by *Phoma* spp. Can. J. Plant Sci. 84: 311−317.

Oilseeds & Special Crops / Oléagineux et Cultures Spéciales

CROP: Field bean
LOCATION: Manitoba

NAMES AND AGENCY:
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TITLE: DISEASES OF FIELD BEAN IN MANITOBA IN 2008

METHODS: Crops of field bean were surveyed for root diseases at 37 different locations and for foliar diseases at 47 locations in Manitoba. During the root disease survey, the severity of halo blight (*Pseudomonas syringae* pv. *phaseolicola*) also was assessed as a percentage of leaf tissue with symptoms. The survey for root diseases and halo blight was conducted in the third week of July when plants were at the early bloom stage. For foliar diseases the survey was carried out during the last week of August to the second week in September when the plants were starting to mature. The crops surveyed were selected at random from regions in southern Manitoba, where most field bean crops are grown. For the root diseases, 10 plants were sampled at each of three random sites in each crop surveyed. Root diseases were rated on a scale of 0 (no disease) to 9 (death of plant, seedling did not emerge or died back soon after emergence). Five to ten roots with disease symptoms per crop were collected for isolation of the causal organism in the laboratory in order to confirm the visual assessment. Foliar diseases were identified by symptoms. Levels of common bacterial blight (CBB) (*Xanthomonas axonopodis* pv. *phaseoli*) were estimated based on the percent incidence of leaf infection and a severity scale of 0 (no disease) to 5 (50-100% of the leaf area covered by lesions). Anthracnose (*Colletotrichum lindemuthianum*), rust (*Uromyces appendiculatus*) and white mould (*Sclerotinia sclerotiorum*) severity were assessed as a percentage of infected plant tissue. In each crop with anthracnose symptoms, pod samples were collected for isolation of the causal organism to confirm that the symptoms were caused by *C. lindemuthianum*.

RESULTS AND COMMENTS: Frequent showers occurred throughout the summer and daily temperatures were generally lower than normal. Two root diseases were observed (Table 1). Fusarium root rot (*Fusarium solani*) was observed in 34 of the 37 crops surveyed for root disease, making it the most prevalent root disease of dry bean. Fields in which *F. solani* was isolated had root rot severity ratings that ranged from 1.4 to 6.1 with an average of 4.0. Rhizoctonia root rot (*Rhizoctonia solani*) was detected in 13 of the 37 crops surveyed with severity ratings of 1.8 to 6.1 and an average severity of 4.2. Seventeen crops had average root rot ratings above a severity value of 4 (i.e., symptoms were present on 50% of the root system).

Halo blight was observed in 12 of the 37 crops with severity values ranging from 1.0 to 20.0%. Within a week of the survey, cool weather promoted the development of severe halo blight symptoms throughout the northern portion of the bean-growing area.

Four diseases were observed during the foliar disease survey (Table 2). Common bacterial blight was the most prevalent foliar disease and symptoms were observed in all 47 crops surveyed. The incidence of CBB leaf infection ranged from 7 to 60% with an average of 30.0%, while severity ranged from 1.7 to 5.0. Incidences above 20% with severity values of 4.0 were seen in 32 crops. Anthracnose was detected in two field bean crops with severity values of 0.1%. White mould symptoms were detected in 38 crops with an incidence of plant infection that ranged from 0.1 to 20.0%. The incidence of white mould exceeded 10% in five dry bean crops and this would have affected crop yield. These were the only bean crops in the survey in which the canopy had closed in the rows to provide favorable conditions for white

mould development. Bean rust was observed in seven of the 47 dry bean crops and severity ranged between 2 and 20%.

Table 1. Prevalence and severity of root diseases and halo blight in 37 crops of bean in Manitoba in 2008.

Disease	No. crops affected	Disease Severity	
		Mean[1]	Range
Fusarium root rot[2]	34	4.0	1.4-6.1
Rhizoctonia root rot[2]	13	4.2	1.8-6.1
Pythium root rot	0	0	0
Halo blight[3]	12	5.3	1.0-20.0

[1]Means are based on an average of the crops in which the diseases were observed.
[2]Root diseases were rated on a scale of 0 (no disease) to 9 (death of plant, seedlings did not emerge or died back soon after emergence).
[3]Halo blight severity was assessed as a percentage of leaf tissue displaying symptoms.

Table 2. Prevalence and severity of foliar diseases in 47 crops of field bean in Manitoba in 2008.

Disease	No. crops affected	Disease Severity[1]		Incidence of Leaf Infection	
		Mean[2]	Range	Mean[2]	Range
Common bacterial blight	47	3.9	1.7-5.0	30.0	7.0-60.0
Anthracnose	2	0.1%	0.1%		
Rust	7	5.7%	2.0-20%		
White mould	38	3.4%	0.1-20.0%		

[1]Anthracnose, rust and white mould severity were rated as the percentage of infected plant tissue; common bacterial blight severity was rated on a scale of 0 (no disease) to 5 (whole plant severely diseased).
[2]Means are based on an average of the crops in which the diseases were observed.

CROP: Canola
LOCATION: Alberta

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TITLE: INCIDENCE OF CLUBROOT ON CANOLA IN CENTRAL ALBERTA IN 2008

METHODS: A total of 374 commercial canola (*Brassica napus* L.) crops in 15 counties in central Alberta were surveyed (Table 1) for the incidence of clubroot, caused by the obligate parasite *Plasmodiophora brassicae* Woronin. The survey was conducted from August to October 2008, with most crops visited after swathing. The roots of all plants within a 1 m^2 area at each of 10 locations along the arms of a 'W' sampling pattern were dug from the soil and examined for the presence of galls, which were taken as an indication of *P. brassicae* infection. If the gall morphology was not typical of clubroot, infection by *P. brassicae* was confirmed by PCR-testing (1) in the Plant Pathology Laboratory, University of Alberta. The focus of the 2008 survey was on previously non-surveyed regions, where the presence of clubroot was not clear. Visits to fields were coordinated with the Agricultural Fieldman in each municipality. Furthermore, agricultural fieldmen throughout the province visited more than 1500 additional fields in their own surveys.

RESULTS AND COMMENTS:
In central Alberta, 18 of the 374 canola crops surveyed were found to be clubroot-infested, including in fields in the counties of Lacombe, Ponoka and Yellowhead, which were previously thought to be free of the disease (Table 1). Within these crops, two had a very high incidence of clubroot, nine were moderately infested, and seven had a low incidence of disease. Another 137 clubroot-infested canola crops were identified in surveys by the Agricultural Fieldmen, mainly in Leduc, Sturgeon and Parkland counties, where the disease outbreak has been most severe (2, 3, 4).

Amalgamation of these data with the results from surveys in 2005, 2006 and 2007 (2, 3, 4) reveals a total of 405 fields with confirmed clubroot in Alberta; these are distributed over 14 counties and a rural area of northeast Edmonton. The occurrence of clubroot on canola in the province as of fall 2008 is illustrated in Fig. 1. Additional possible cases of clubroot have been reported from at least four other counties, but these await confirmation. Generally, weather conditions seemed to have been less favorable for clubroot development in 2008 than in 2006 and 2007, and it is likely that the disease was not detectable in some lightly infested crops. Representative soil and root samples were collected from each infested field for further analysis.

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Table 1. Distribution of clubroot-infested canola fields in 15 counties surveyed in Alberta in 2008.

County	Total fields surveyed (2008)	Number of clubroot-infested fields (2008)	Total number of infested fields (2005-2008)
Barrhead	25	3*	7
Camrose	28	1	4
Flagstaff	24	1	4
Kneehill	21	0**	0
Lacombe	26	1	1
Lac Ste. Anne	25	0	1
Ponoka	21	3	3
Red Deer	21	0	0
Starland	23	0	0
Stettler	22	0	0
Thorhild	30	0	0
Westlock	27	7	10
Wetaskiwin	29	1	9
Wheatland	23	0	0
Yellowhead	29	1	1

*Three of the infested fields in Barrhead were identified in the University of Alberta survey; an additional two infested fields were found in the 2008 survey conducted by the municipality

**Two of seven soil samples received from one field in Kneehill County were positive for clubroot (as determined in a bioassay), although very low levels of disease were produced on susceptible bait plants. However, surveys in Kneehill County revealed no clubroot-infected canola plants.

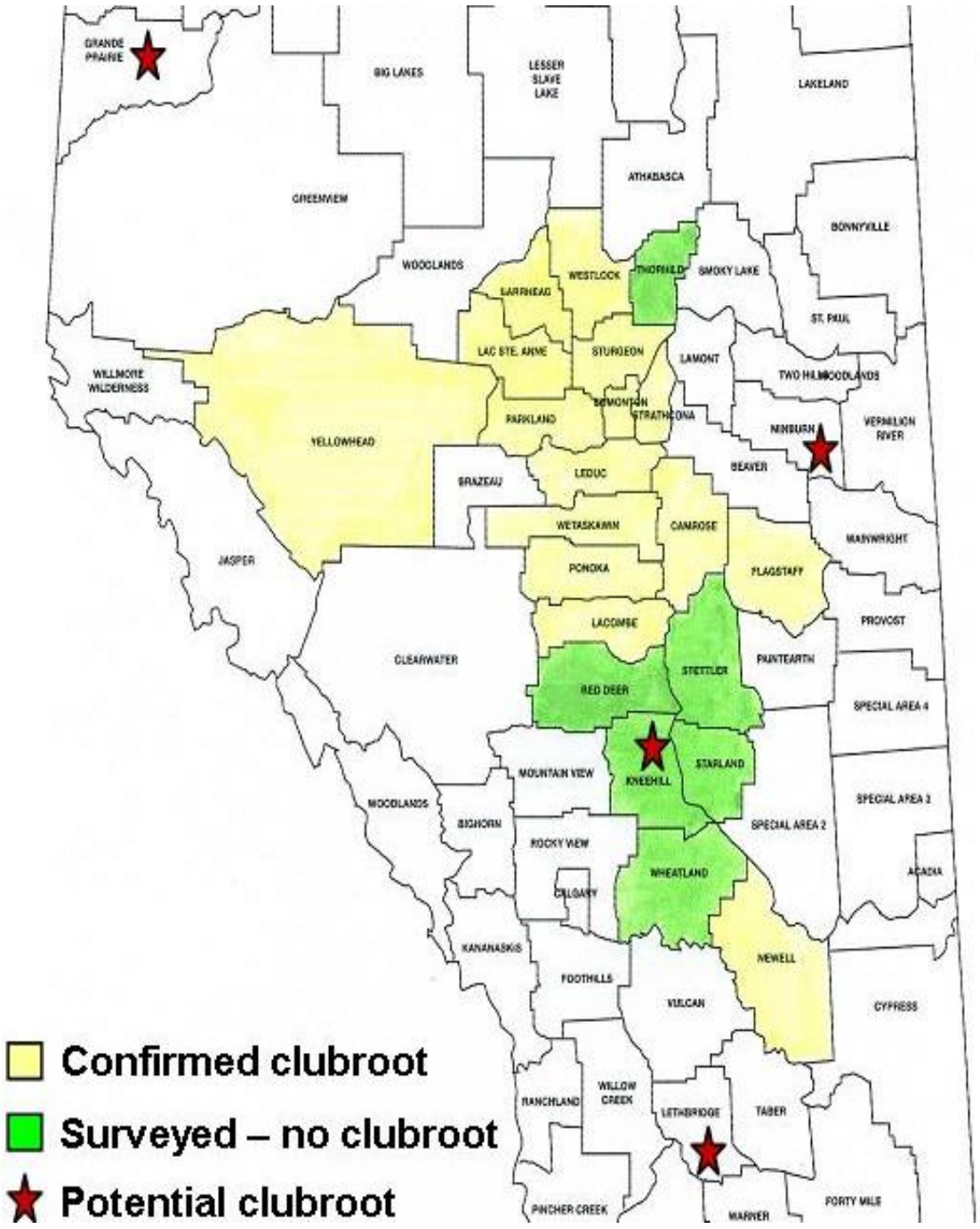

Figure 1. Occurrence of clubroot on canola in Alberta as of fall 2008. The disease has been confirmed in a total of 405 fields representing 14 counties and a rural area of northeast Edmonton. In addition, cases of potential clubroot and/or unclear symptoms have been reported from at least four other municipalities.

CROP: Canola
LOCATION: Saskatchewan

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TITLE: SURVEY OF CANOLA DISEASES IN SASKATCHEWAN, 2008

METHODS: A total of 130 fields were surveyed between August 8 and September 3 in the major canola production regions of Saskatchewan, including 128 crops of *Brassica napus* and two of canola-quality *B. juncea.* Regions included north-west (14 fields), north-east (34), west-central (34), east-central (35), south-west (1), and south-east (12) Saskatchewan. Seven crops in the west-central region were under irrigation. Crops were surveyed before swathing while plants were between growth stages 5.1 and 5.5 (Harper and Berkenkamp 1975). Disease assessments were made in each field by collecting 20 plants from each of five sites at least 20 m from the edge of the field and separated from each other by at least 20 m. Presence or absence of symptoms on each plant was determined to give percent disease incidence for sclerotinia stem rot (*Sclerotinia sclerotiorum*), blackleg (*Leptosphaeria maculans*), aster yellows (AY phytoplasma), foot rot (*Rhizoctonia* spp., *Fusarium* spp.), and fusarium wilt (*F. oxysporum* f.sp. *conglutinans*). For sclerotinia stem rot, each plant was scored for both main stem and upper branch/pod lesions. For blackleg, plants were scored for either severe basal stem cankers or any other type of blackleg stem lesion. For alternaria black spot (*Alternaria brassicae, A. raphani*), percent severity of lesions on the pods of each plant was assessed (Conn et al. 1990). When diseases were observed in the crop, but not in the sample of 100 plants, they were recorded as “trace” and counted as 0.1%. Mean disease incidence or severity values were calculated for each region. Mean incidence or severity values less than 0.1% were reported as “trace”. See Table 1.

RESULTS AND COMMENTS: Approximately 7.4 million acres (3 million ha) of canola were seeded in Saskatchewan in 2008. Seeding, emergence and early crop development were later than normal across the province due to cold weather. In the south dry soils, and in other areas wet soils and slow snow melt caused seeding delays. Early frost damage and poor germination resulted in uneven crops; re-seeding occurred in some areas. Precipitation was below normal in most areas in May, but by mid-June rain was received in southern Saskatchewan. Below-normal temperatures for much of the growing season delayed crop development. July and August brought hail, strong winds, and rainfall in many areas, followed by record-breaking heat in mid-August. Second growth of uneven crops and recovery from hail damage subsequently delayed harvest in some regions. (Saskatchewan Ministry of Agriculture, 2008)

Sclerotinia stem rot was observed in 81% of the crops surveyed. Incidence ranged from 0 to 40% for main stem lesions and from 0 to 54% for upper branch/pod lesions. Mean incidence was highest in the east-central and lowest in the south-west region, similar to 2007. Mean incidence for the seven irrigated crops (36%) was higher than the mean incidence without irrigation in seasons with greater precipitation (1999, 2000, 2004). Mean incidence for the province in 2008 (7%) was lower than in seasons with greater precipitation, higher than in drier seasons (2001, 2002, 2003, 2005, 2006), and similar to 2007 (5% incidence) when conditions were variable (Pearse et al. 2008).

Blackleg was observed in 35% of the crops surveyed, with incidence ranging from 0 to 11% for basal stem cankers and from 0 to 53% for lesions elsewhere on the stem. Mean incidence for the province (2.4%) was similar to the previous 10 seasons with the exception of 1999 (11%) and 2002 (trace). In 2008, 70% of the crops surveyed had hail damage, and in many cases blackleg was associated with the injured plant tissue. Hail damage has been associated with blackleg previously (Pearse et al. 2008).

Aster yellows was observed in almost half of the crops surveyed, with incidence ranging from 0 to 5%. Mean incidence for the province (0.2%) was similar to previous dry seasons. The highest incidence of aster yellows (2%) occurred in 2007 (Pearse et al. 2008). Foot rot was observed in 10% of the crops surveyed, with mean incidence (0.1%) similar to previous years. Alternaria black spot was reported in 64% of the crops surveyed. Of the crops affected, 46% had at least trace levels of alternaria black spot on all of the plants surveyed. Fusarium wilt was observed at trace levels in 2008. Clubroot was not observed in any of the surveyed fields and there have been no reports of clubroot in Saskatchewan.

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Table 1. Canola diseases in Saskatchewan in 2008.

REGION[1] (NO. OF FIELDS)	MEAN % DISEASE INCIDENCE						MEAN % SEVERITY
	Sclerotinia[2]		Blackleg[3]		Aster yellows	Foot rot	Alternaria black spot
	Main	Upper	Basal	Other			
North-west (14)	1	2	0.1	0.2	0.3	0.6	Trace
North-east (34)	6	2	0.9	5	Trace	Trace	Trace
West-central (34)	3	5	Trace	2	0.2	0.2	Trace
East-central (35)	6	3	0.5	2	0.2	0	Trace
South-west (1)	0	1	0	0	1	0	Trace
South-east (12)	0.5	2	0	0.3	Trace	0	Trace
Overall mean (130)	4	3	0.4	2	0.2	0.1	Trace

[1] Fields were surveyed in major canola production regions in the following rural municipalities: North-west = 406, 437, 438, 468, 471, 472, 493, 498, 499, 501, 502; North-east = 258, 369, 370, 395, 397-399, 401, 426–431, 457, 458, 460, 487, 490; West-central = 247, 252, 253, 283–285, 287, 290, 315, 317, 344–347, 349, 350, 376, 379, 409, 410; East-central = 159, 189, 215, 243, 244, 271, 273–275, 278–280, 282, 303–305, 307–309, 333, 334, 336–338, 367; South-west = 255; South-east = 67, 96, 98, 126, 151, 156–160

[2] Sclerotinia stem rot lesions were scored as either main stem lesion or as upper branch/pod lesions.

[3] Blackleg lesions were scored as either severe basal stem cankers or as any other type of stem lesion.

CROP: Canola
LOCATION: Manitoba

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TITLE: DISTRIBUTION, PREVALENCE AND INCIDENCE OF CANOLA DISEASES IN MANITOBA (2008)

METHODS: In August 2008, 54 canola crops were surveyed in the southwest (24), northwest (15) and central (15) regions. No crops were surveyed in the eastern/interlake region. All crops were *Brassica napus*. They were assessed for the prevalence (percent crops infested) and incidence (percent plants infected per crop) of sclerotinia stem rot (*Sclerotinia sclerotiorum*), aster yellows (phytoplasma), foot rot (*Fusarium* spp. and *Rhizoctonia* sp.), blackleg (*Leptosphaeria maculans*) and fusarium wilt (*Fusarium* spp.). Blackleg lesions that occurred on the upper portions of the stem were assessed separately from basal stem cankers. The prevalence and percent severity of alternaria pod spot (*Alternaria* spp.) were also determined.

In each canola crop, fifty 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. Ten 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 three regions of Manitoba. Sclerotinia stem rot and blackleg were the most prevalent diseases throughout these regions (Table 1). The prevalence of sclerotinia-infested crops ranged from a high of 100% in the central region to 92% in the southwest region, with a provincial mean of 94%. This was higher than the prevalence of 80% in 2007 (4). Mean disease incidence ranged from 31% in the central to 15% in the southwest region with a provincial mean of 23%.

The prevalence of aster yellows in the crops surveyed in 2008 had an overall mean value of 4%, This represents a significant decrease from 2007 when the prevalence of aster yellows was 80% (4). In 2008, aster yellows was observed in the central and southwest regions in two fields only with a mean disease incidence of 2%.

Blackleg basal cankers occurred in 17% of the crops surveyed in 2008 with disease incidence ranging from 8% in the central region to 1% in both the northwest and southwest regions, with a provincial mean of 3%. In 2007, blackleg basal cankers were found in 52% of surveyed crops with a mean disease incidence of 2% (4) for the province. Thus, the prevalence of fields with blackleg basal cankers was less in 2008 than in 2007, but there were more crops in the central region with a higher incidence of basal cankers than in 2007.

The mean prevalence of blackleg stem lesions was 54%. In contrast, 35%, 65%, 61% and 65% of crops were infested with stem lesions in 2004 (1), 2005 (2), 2006 (3) and 2007 (4), respectively. The mean incidence in 2008 was 7%, which was similar to that observed in 2007.

The mean prevalence of alternaria pod spot in 2008 was 20%, 8% and 7% for crops surveyed in the central, southwest and northwest regions, respectively (Table 1). In the survey, we observed that trace levels (<1%) of alternaria pod spot were found on most plants, therefore, only levels ≥ 1% were noted. The severity of alternaria pod spot was low (Table 2) with means $\leq$3%.

Of the 54 canola crops examined in Manitoba, fusarium wilt was observed in 9%, with a mean incidence of 1%. No fusarium wilt was observed in the southwest region (Table 1). This disease was found in 0%,

21%, 18% and 15% of fields in 2004, 2005, 2006 and 2007, respectively. Foot rot and clubroot were not observed in any of the surveyed crops.

Table 1. Number of canola crops surveyed and disease prevalence in Manitoba in 2008.

Crop Region	No. of Crops	Sclerotinia stem rot		Blackleg basal cankers		Blackleg stem lesions		Alternaria pod spot		Aster yellows		Fusarium wilt	
		P[1]	DI[2]	P	DI	P	DI	P	Sev.[2]	P	DI	P	DI
Central	15	100	31	33	8	73	8	20	3	7	2	20	3
Northwest	15	93	27	13	1	73	16	7	2	0	0	13	1
Southwest	24	92	15	8	1	29	2	8	1	4	2	0	0

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

Table 2. Distribution of incidence (sclerotinia, blackleg, aster yellows, and fusarium wilt) classes in 54 crops of *Brassica napus* in Manitoba in 2008.

	Percentage of crops with				
	Sclerotinia stem rot	Blackleg basal cankers	Blackleg stem lesions	Aster Yellows	Fusarium wilt
0%	6	83	46	96	91
1-5%	11	11	28	4	6
6-10%	15	0	9	0	4
11-20%	24	2	9	0	0
21-50%	31	2	4	0	0
>50%	13	2	4	0	0

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CROP: Flax
LOCATION: Manitoba

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TITLE: DISEASES OF FLAX IN MANITOBA AND SASKATCHEWAN IN 2008

METHODS: A total of 67 flax crops were surveyed in 2008, 37 in southern Manitoba, and 30 in southern and eastern Saskatchewan. Seven crops were surveyed during the third week of July, 13 in the third week of August, 43 in the last week of August, and four in the first week of September. Ninety-five percent of the crops were the brown seed-colour linseed flax, and only 5 % were yellow seed-colour flax. Crops surveyed were selected at random along pre-planned 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 fusarium wilt (*Fusarium oxysporum lini*), pasmo (*Septoria linicola*), powdery mildew (*Oidium lini*), rust (*Melampsora lini*), alternaria blight (*Alternaria* spp.), and aster yellows were recorded. Stand establishment, vigour, and maturity were rated on a scale of 1 to 5 (I = very good/early, and 5 = very poor/very late).

In addition, 10 samples of flax plants were submitted for analysis to the Crop Diagnostic Centre of Manitoba Agriculture, Food and Rural Initiatives by agricultural representatives and growers.

RESULTS AND COMMENTS: Eighty percent of the flax crops surveyed in 2008 were rated excellent for stand and the remainder were good to fair. Fifty-six percent of the crops surveyed were maturing early, and 70% had excellent to good vigour. Only 10% of the crops were late-seeded and were expected to mature and be harvested late, thereby reducing yield and seed quality. The 2008 growing season started early with abundant moisture and good growing conditions during the first part of the season. Frequent rains and normal temperatures during the growing season helped maintaining good crop conditions and resulted in good yields in most flax crops in Manitoba and Saskatchewan. The 2008 disease survey showed only minor differences in the incidence and severity of the major flax diseases between the crops surveyed in Manitoba and Saskatchewan.

Pasmo, the most prevalent disease in 2008, was observed in 90% of crops surveyed (Table 1). The prevalence and severity on stems were higher than in previous years (1, 2, 3, 4), due perhaps to the frequent rains and good moisture conditions favouring disease development in July and August. In most infested crops, pasmo severity ranged from trace to 20% of the stem area affected, and pasmo severity was >30% only in 24% of the crops (Table 1).

Some root infections and fusarium wilt were observed in 27% of flax crops in 2008. Incidence was very low (trace to 5%) in most crops, and only 5% of them had over 5% infected plants (Table 1). The prevalence of root infections and fusarium wilt in 2008 were lower than in previous years due perhaps to below normal temperatures in the early part of the growing season which do not favour infection of the roots (1, 2, 3).

Powdery mildew was observed in 45% of flax crops surveyed in 2008 with severity ranging from trace to 10% leaf area affected (Table 1). Incidence and severity in 2008 were lower than in 2007 but similar to 2006 (1,2,3), This was probably due to the late initiation of infection and a lack of warm weather that normally favours powdery mildew development during the second half of the growing season.

Rust was not observed in any of the crops surveyed in 2008, nor in the flax rust trap nurseries planted at Morden and Portage la Prairie in Manitoba, and at Saskatoon and Indian Head in Saskatchewan.

Aster yellows (phytoplasma) was observed in 25% of flax crops with incidence ranging from trace to 1% affected plants. Alternaria blight was observed in 60% of the crops with a severity range from trace to 10% leaf area affected. Traces of stem infection by *Sclerotinia sclerotiorum* were observed in one field in Manitoba. Lodging was found in only a few crops, and this is the lowest observed in the last 10 years (1, 2, 3, 4). Aphid and grasshopper infestations were also low and were observed in a few flax crops in both provinces.

Of the10 flax samples submitted to the Crop Diagnostic Centre, two were identified with blighting of flowers and bolls caused by *Alternaria linicola*, two with fusarium wilt, one with root rot caused by *Pythium spp*., one with environmental injury and four with chemical injury.

ACKNOWLEDGEMENTS: The assistance of T. Cabernel and M. Penner, is gratefully acknowledged.

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Table 1. Incidence and severity of fusarium wilt, pasmo, and powdery mildew in 67 crops of flax in Manitoba and Saskatchewan in 2008.

Fusarium Wilt				Pasmo				Powdery Mildew			
Disease Class		Crops		Disease Class		Crops		Disease Class		Crops	
Incid.[1]	Sever.[2]	No	%	Incid.[1]	Sever.[2]	No	%	Incid.[1]	Sever.[2]	No	%
0%	0%	49	73	0%	0%	7	10	0%	0%	36	54
1-5%	1-5%	15	22	1-10%	1-5%	30	45	1-10%	1-5%	30	45
5-20%	5-10%	2	3	10-30%	5-10%	14	21	10-30%	5-10%	1	1
2-40%	10-20%	1	2	30-60%	10-20%	12	18	30-60%	10-20%	0	0
>40%	10-40%	0	0	>60%	20-50%	4	6	>60%	20-50%	0	0

[1]Disease incidence = Percentage of infected plants in each crop.
[2]Disease severity = Percentage of roots affected by fusarium wilt, of stems affected by pasmo, and of leaves affected by powdery mildew.

CROP: Lentil
LOCATION: Saskatchewan

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TITLE: DISEASE SURVEY ON LENTIL IN SASKATCHEWAN, 2008

INTRODUCTION AND METHODS:
A survey of lentil crops was conducted in the major lentil growing areas of Saskatchewan between July 28 and August 7, 2008. The primary focus was to assess the incidence of anthracnose caused by *Colletotrichum truncatum*, and of stemphylium blight caused by *Stemphylium botryosum*. Anthracnose has been a major lentil disease since the early 1990s in Saskatchewan, but the overall incidence has decreased in recent years. This is due partly to the introduction of cultivars with resistance to one of the two races described in the pathogen population (1) and partly to widespread preventive fungicide applications by growers**.** Stemphylium blight has been consistently found in lentil crops and seed samples since 2002 (2, 3, 4, 5). The occurrence of other lentil diseases was also recorded. Qualitative assessments were made at 6 to 10 locations in each crop at least 100 m from the field margin. The data were summarized according to Saskatchewan crop districts (CD) (Fig. 1).

RESULTS AND COMMENTS:
A total of 54 crops were surveyed; 20 showed no symptoms of anthracnose, and 42 had no stemphylium blight (Table 1). A dry and cool spring prevented early disease onset and slowed plant development. The first major rain in many regions occurred in mid-June followed by widespread precipitation in mid-July. The incidence of anthracnose ranged from trace to slight infections whereas, with one exception, only traces of stemphylium blight were observed in crops.

The lowest anthracnose levels and the highest number of disease-free crops were observed in the west (CD 7A and B) while the highest levels and most widespread occurrences were in central and eastern regions (CD 5B, 6A, 6B). However, anthracnose incidence was usually slight. Clear gradients from the field margins into the field were observed in the majority of crops. Moderate to high levels of anthracnose were detected only in crops near Cupar and Dysart in CD 5A.

Traces of stemphylium blight were observed in crops located south and southwest of Regina and near Moose Jaw (CD 2B), in crops between Harris and Zealandia (CD 6B) and near Liberty (CD 6A). Two crops with low levels of stemphylium blight were detected near Tuxford (CD 2B) and near Silton (CD 6A). One crop with a few large patches of stemphylium blight was observed near Forgan (CD 3BN).

Root rot (*Fusarium* spp. and *Rhizoctonia solani*) symptoms at low levels were detected in 3 crops. No ascochyta blight (*Ascochyta lentis*) symptoms were observed in any of the lentil crops surveyed. This is surprising considering that infection has been detected in at least some seed samples harvested in years when conditions were not conducive to ascochyta blight (3, 4, 5). However, in those years the percentage of seed samples free of ascochyta blight was about 90%. Seed testing results also reflect late season infection and saprophytic growth of *Ascochyta* on pods and seeds due to delays in harvest. These would not have been detected in the present survey of lentil crops.

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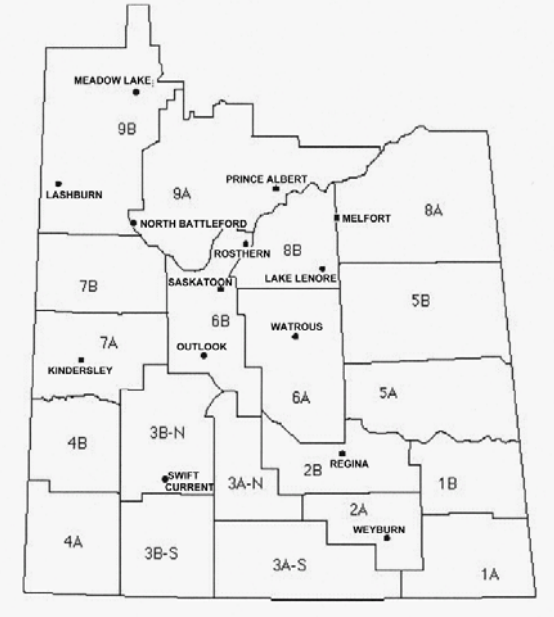
Table 1. Records of lentil diseases in producer fields in Saskatchewan in 2008

Crop District	# of Crops	Anthracnose		Stemphylium blight		Other Diseases (# of Crops)
		Mean Incidence	# of Crops with 0 %	Mean Incidence	# of Crops with 0 %	
2B	13	slight	4	trace	8	
3BN	6	slight	3	slight	5	
5A	3	moderate	0	trace	1	root rot (1)
6A	6	slight	0	trace	3	
6B	9	slight	0	trace	8	
7A	11	trace	9		11	
7B	6	slight	4		6	root rot (2)
Total	54	slight	20	trace	42	

Figure 1. Map of crop districts in Saskatchewan



CROP: Lentil
LOCATION: Saskatchewan

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TITLE: SEED-BORNE PATHOGENS OF LENTIL AND CHICKPEA IN SASKATCHEWAN IN 2008

METHODS: The results of agar plate tests conducted by four companies on seed samples from Saskatchewan were summarized. The tests on lentil were conducted to detect the pathogens causing ascochyta blight (*Didymella* [*Ascochyta*] *lentis*), anthracnose (*Colletotrichum truncatum*), botrytis stem and pod rot (grey mould) and seedling blight (*Botrytis* spp.), and sclerotinia stem and pod rot (*Sclerotinia sclerotiorum*). All samples were tested for *Ascochyta* and slightly fewer for *Colletotrichum*, *Botrytis* and *Sclerotinia*. For *Ascochyta* spp. mean % seed infection and % samples free of infection were calculated for each crop district [CD] in Saskatchewan (6). For the other pathogens means for CDs were not calculated because the levels were very low and comparisons would be valueless. With *Botrytis* the mean % seed infection and the % samples free of infection were calculated for the whole province; with *Colletotrichum* only the % samples infected for the whole province was calculated because anthracnose is not highly seed-borne on lentil and, thus, always at low infection levels (1, 3).

On chickpea the tests were conducted to detect *D. rabiei* (ascochyta blight), *B. cinerea (*botrytis blight) and *S. sclerotiorum (*sclerotinia stem and pod rot). Due to the small number of chickpea samples tested, kabuli and desi chickpea data were combined and only mean figures for the province were calculated.

The lentil seed samples could not be classified according to cultivar or whether the crops had been treated with seed treatments or foliar fungicides. However, using ascochyta-resistant cultivars and spraying with foliar fungicides to control ascochyta blight and anthracnose are widespread practices in lentil cultivation in Saskatchewan. Most or all chickpea samples came from crops sprayed once or more with chlorothalonil, pyraclostrobin, boscalid or azoxystrobin to control ascochyta blight. Fungicide application is usually essential for successful chickpea cultivation in Saskatchewan.

RESULTS AND COMMENTS: The 2008 growing season started with cool dry weather in all except the most northerly agricultural areas in Saskatchewan. Completion of seeding was timely in most regions, but crop growth was slow (5). Some of the driest areas in the south received plentiful rain in late May or mid-June. Other areas where lentil or chickpea are grown remained drier than normal until storms occurred in mid- or late July. In the period April 1-August 31 precipitation ranged from 60% to 150% of normal in different regions. Harvest of lentil crops started in late July in the extreme south, but in most regions progress was delayed by slow ripening. By mid-September lentil harvest was 85% complete, but chickpea harvest was only about 25% complete. However, the overall quality of both crops was high; 84% of the lentil crop was expected to fall in the top two grades, 10% more than the 10-year average (6). The overall mean yield per acre of lentil in Saskatchewan was 14% higher than in 2007 and 20% above the 10-year average (6). The overall yield per acre of chickpea was 23% higher than in 2007.

The data summarized were from samples tested between early September and mid- or late December 2008. These were assumed to be mainly from the 2008 crop. During this time 386 lentil samples were tested by the four companies, about the same as reported in 2007 (3) but only 30% of the numbers reported for wet years such as 2004 (4). Low numbers reflect obvious high quality of harvested seed as well as other factors. Only 21 chickpea samples were tested in the same period, compared with 165 in 2007 (2); this partly reflects a decline in 2008 chickpea acreage to only 29% of that in 2007, but also the fact that samples from CDs 3B and 4, the major chickpea-growing areas, were greatly underrepresented.

Levels of seed-borne *Ascochyta* in individual lentil samples ranged from 0% to 57.25% (in a sample from CD 3BN) with a provincial mean of 0.5%, more than double the value in 2007 (3). Means in crop districts varied from 0 to 1.6 (Table 1). However, these means give a poor picture of the overall health of the harvested seed because when most values are zero, or very low, a few samples with high values can have a major effect on the mean. A more useful picture of seed health is given by the percentage of ascochyta-free samples. This was high in all CDs from which there were more than a few samples (Table 1) and the provincial mean was 88%, almost identical to the figure of 89% in 2007 (3).

Colletotrichum was found in only 4% of lentil samples, similar to the 5% found in 2007 (1B) and less than in many previous years such as 2004 (4). *Botrytis* showed a mean percentage infection level for the province of 0.4% and 72% of samples were *Botrytis*-free. These figures are comparable with other years with favourable late summer weather and quite different from wet years such as 2004 when only 28% of samples were *Botrytis*-free (4). In addition to the seed-borne pathogens which laboratories normally test for in lentil, tests in 2008 commonly revealed low levels of *Stemphylium* sp., the cause of stemphylium blight and occasional infection by Fusarium avenaceum, a cause of seedling blight (1).

The mean and highest levels of infection with *A. rabiei* in the 21 chickpea samples tested were 1.6% and 6.6%, respectively; the percentage of *Ascochyta*-free samples was 43%. However, the sample size was too small to make valid comparisons with previous years' crops.

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Table 1. Number of lentil seed samples tested from September to December, 2008 by four commercial companies, and levels of infection with *Ascochyta* in relation to Saskatchewan Crop Districts.

Crop District	No. of samples tested	Mean % infection	% samples with 0% infection
1A	3	0	50
1B	0	-	-
2A	29	0.2	93
2B	78	0.1	95
3AN	7	0	100
3AS	16	0.1	94
3BN	84	1.6	71
3BS	5	0.7	80
4A	2	0.8	50
4B	2	0	100
5A	9	0	100
5B	0	-	-
6A	27	0	100
6B	80	0.1	91
7A	35	1.4	83
7B	6	0	100
8A	0	-	-
8B	1	0	100
9A	2	0	100
9B	0	-	-
TOTAL	386	0.5	88

CROPS / CULTURES: Yellow, Brown, Oriental Mustard
LOCATION / RÉGION: Western Canada

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TITLE / TITRE: FREQUENCY OF FUNGI ON WESTERN CANADIAN MUSTARD SEED, 2003 TO 2005

INTRODUCTION AND METHODS / INTRODUCTION ET MÉTHODES:
Canada is a major supplier of condiment mustard seed. Mustard seed can be infected by a number of fungi, some of which are considered pathogens. Four of the more important seedborne pathogens are *Alternaria brassicae* (Berk.) Sacc. and *A. raphani* Groves & Skolko, the causal agents of alternaria blackspot, and *Leptosphaeria maculans* (Desm.) Ces. & de Not., and *L. biglobosa* Shoemaker & Brun, causal agents of blackleg. During the 3 years of this survey there were no reports on mustard diseases in the Canadian Plant Disease Survey. In fact, there have been no reports on mustard since 1998 (Al-Mughrabi, 1998). The present survey demonstrates the frequency of seedborne fungi on harvested seed of yellow mustard (*Sinapis alba* L.) and brown and oriental mustard (*Brassica juncea* (L.) Czern. & Coss.).

From 2003 to 2005, 416 yellow mustard, 242 brown mustard, and 253 oriental mustard samples (Table 1), were received from producers and grain companies immediately after harvest. Samples were submitted to the Grain Research Laboratory (GRL) in envelopes capable of holding 500 g of seed. Composites of these samples were made at the GRL according to year, mustard type, and crop district (CD), then subsampled for mycological tests. Seeds were surface disinfected by soaking in a 0.3% solution of NaOCl for 1 min, then air dried under a laminar flow hood. Each year, 300 seeds per composite were placed onto 20% V-8 agar in 9 cm petri dishes, 15 seeds per plate, and incubated for 7 days at room temperature under a cycle of 12 hrs darkness and 12 hrs UV and fluorescent light. Because of the regionality of mustard growing, samples were not received from all western CDs.

RESULTS AND COMMENTS / RÉSULTATS ET COMMENTAIRES :
The number of samples within a composite ranged from 1 to 41. The majority of samples originated in Saskatchewan, which contributed 722 of the 911 samples received (Table 1). All Saskatchewan CDs were represented at least twice between 2003 and 2005. Only 10 samples were received from Manitoba, an area where little mustard is grown. Samples were received from only 3 of 12 Manitoba CDs and 4 of 7 Alberta CDs over the 3 years of the study.

Overall fungal levels were low, with saprophytic species of *Alternaria* Nees ex Fr. being the most commonly detected group (Table 2). These fungi were also the most frequently detected in canola seed (Clear and Patrick 1995). However, levels of all fungi were much lower in mustard. This is likely partly because mustard is generally grown in the drier areas of the Canadian prairies (Daun 1993).

Pathogens such as *A. brassicae* and *A. raphani*, the causal agents of alternaria blackspot, never infected more than an average of 1.58% of seeds in any year (Table 2). The highest level of infection over the 3 years of this survey for *A. brassicae* were11.0% in a composite of brown mustard from Saskatchewan CD 5A in 2005, and for *A. raphani* 2.67% in brown mustard from Saskatchewan CD 3BN in 2004. *Leptosphaeria maculans* and *L. biglobosa*, the causal agents of blackleg, were rarely isolated (Table 2), and were recovered from composite samples at a maximum of 0.67% and 2.33%, respectively. The highest number of infected seeds was in 2004, primarily by the saprophytic species of *Alternaria*. Growing and harvest conditions in 2004 were considerably cooler and wetter than in 2003, when dry warm conditions kept disease levels in the mustard crop at their lowest levels in a decade (DeClercq and Daun 2003; DeClercq 2004), or in 2005, when growing conditions were more typical (DeClercq 2005). Overall, yellow mustard seeds had lower average levels of seed infection than oriental or brown mustard (Table 2).

Only *Alternaria alternata* (Fr.) Keissler, *A. brassicae* (0.33%) and *Apiospora montagnei* Sacc. (0.21%) averaged more than 0.1% seed infection. Other species detected were *Alternaria infectoria* Simmons, *Arthrinium phaeospermum* Kunze ex Fr., *Aspergillus flavus* Link ex Gray*, A. glaucus* Link ex Gray group, *Bipolaris sorokiniana* (Sacc.) Shoem.*, Chaetomium dolichotrichum* Ames*, C. funicolum* Cooke*, C. perlucidum* Sergejeva*, C. succineum* Ames*, Cladosporium cladosporioides* (Fres.) de Vries, *C. herbarum* (Pers.) Link, *C. macrocarpum* Preuss, *C. sphaerospermum* Penzig, *Drechslera teres* (Sacc.) Shoem., *Epicoccum nigrum* Link, *Fusarium acuminatum* Ell.& Ev., *F. avenaceum* (Fries) Saccardo*, F. dimerum* Penzig, *F. equiseti* (Corda) Sacc., *F. poae* (Peck) Wollenw., *F. semitectum* Berkeley & Ravenel, *Microdochium bolleyi* (Sprague) de Hoog & Hermanides-Nijhof, *Nigrospora oryzae* (Berk. & Br.) Petch., *Rhizoctonia solani* Kühn, *Stagonospora nodorum* (Berk.) Castellini & E.G. Germano, *Stemphylium globuliferum* (Vestergren) Simmons, *S. herbarum* Simmons, *S. vesicarium* (Wallr.) Simmons, and *Ulocladium atrum* Preuss. Also isolated were species of *Cephalosporium, Gonatobotrys*, *Graphium, Papulospora, Phaeoramularia, Penicillium,* and *Verticillium.*

The low frequency of infection by fungi on mustard seed suggests that the direct impact of infected seed on mustard production is minimal. However, infected seed can be an important source of disease spread.

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Table 1. Number of mustard seed samples from each province, 2003 to 2005.

	Year	Yellow	Brown	Oriental
Manitoba	2003	2	3	0
	2004	2	0	0
	2005	3	0	0
Saskatchewan	2003	85	71	66
	2004	115	57	64
	2005	97	83	84
Alberta	2003	18	15	14
	2004	62	9	7
	2005	32	4	18

Table 2. Average % infection of saprophytic *Alternaria* spp. and four pathogens in 3 types of mustard seed grown between 2003 and 2005 in western Canada

	Year	Alt spp.	A. brass	A. raph	L. biglo	L. mac
Yellow	2003	4.7	≤0.1	≤0.1	≤0.1	0.0
	2004	20.4	≤0.1	≤0.1	0.0	0.0
	2005	6.3	≤0.1	≤0.1	≤0.1	0.0
Brown	2003	12.3	≤0.1	≤0.1	≤0.1	≤0.1
	2004	31.4	0.4	0.4	≤0.1	≤0.1
	2005	13.6	1.6	≥0.1	≤0.1	0.0
Oriental	2003	9.4	≤0.1	≤0.1	0.0	0.0
	2004	29.1	0.9	≤0.1	0.0	≤0.1
	2005	11.7	1.0	0.0	0.0	≤0.1

Alt spp.= saprophytic species of *Alternaria*; A. brass= *Alternaria brassicae*; A. raph= *Alternaria raphani*; L. biglo= *Leptosphaeria biglobosa*; L. mac= *Leptosphaeria maculans*

CROP: Field Pea (*Pisum sativum* L.)
LOCATION: Central Alberta

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TITLE: OCCURRENCE OF DOWNY MILDEW ON FIELD PEA IN CENTRAL ALBERTA IN 2008

METHODS: One research field and 22 commercial fields of pea were surveyed for downy mildew (*Peronospora viciae* L.) in late June, mid-July and early August of 2008. The survey was conducted in central Alberta at six locations, namely Gibbons, Lacombe, Mannville, Namao, Redwater and Vermilion. The shoots, leaves, tendrils and stems in the top, middle and lower portions of 10-20 plants were assessed at each of five equally spaced sites along the arms of a "W" sampling pattern in each field. Downy mildew severity was evaluated according to a 0-4 scale in which: 0 = 0% infection, 1 = any 1/3 portion of the plant showed infection on 1-25% of the surface area, 2 = any two or three portions of the plant showed 1-25% infection, 3 = any two portions of the plant showed 1-25% infection and the other portion had 26-50% infected area, 4 = the lower portion of the plants showed infection on more than 50 % of the surface area and the upper or middle portions had 26 – 50% infected area (Table 1).

RESULTS AND COMMENTS: Downy mildew of pea is becoming endemic and widespread in central Alberta. The disease was observed in all 23 crops surveyed. However, it was unevenly distributed in many of the crops (Table 2). The disease was first observed in a crop near Elk Point, Alberta in early June (Devin Pendree, personal communication). At Gibbons, a crop of the yellow pea cultivar Midas, which was at the 11-12-node stage, had 100% infection on the lower leaves. At this location, cool, wet conditions in the canopy prevailed in late June, which were ideal for pathogen propagation. When the field was surveyed again in July, many plants had systemic infection and were stunted and covered with fungal mycelia and spores. Disease severity and incidence were highest in this field. The disease also occurred on a pea crop five years ago in the same field and caused an estimated 25% yield loss (Mike Kalisvaart, personal communication), indicating that the pathogen survives for extended periods in the soil. In one field near Mannville, approximately 10-20% of plants or tillers that had shown systemic symptoms died 2-3 weeks later when conditions turned hot and dry. Dead plant material becomes enclosed in the plant canopy, and the pathogen survives in soil, thereby providing large quantities of inoculum for future outbreaks of the disease in pea crops.

Heavy infections also occurred near Redwater, Namao, Mannville and Vermilion. However, pea crops at the AAFC Lacombe Research Centre developed only mild downy mildew symptoms on shoots and tendrils at the flowering stage. Shoot internodes were shortened and sterile, leaves became pale green, and tendrils became swollen and then brown. These symptoms indicated that infection occurred later in the growing season from airborne spores.

Overall, the disease in central Alberta in 2008 was much more severe than in 2004 and 2006 (1, 2). This is not surprising, because frequent rain showers and low temperatures made conditions ideal for development and spread of the disease in May and June. Where mild infection occurred, the upper sides of the leaves showed no symptoms; fungal mycelia formed only on the lower sides of the leaves. As the disease progressed, light chlorotic spots and brown or necrotic lesions appeared on the upper surface of the leaves.

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Table 1. Disease severity scale for downy mildew of pea.

Score	Percent plant infection*		
	Upper 1/3 of plant	Middle 1/3 of plant	Lower 1/3 of plant
0	0	0	0
1	Any 1/3 portion showed infection on 1-25% of the surface area		
2	Any two or three portions showed 1-25% infection		
3	1-25%	1-25%	26-50%
4	One or two portions showed 26-50% infection		> 50%

*Including shoots, leaves, stems and tendrils

Table 2. Incidence and severity of downy mildew in 23 pea fields at six locations in Central Alberta in 2008.

Location	No. of fields surveyed	Incidence (%)		Severity (0-4)	
		Range	Mean	Range	Mean
Gibbons	1	100	100	1.4 – 2.1	1.6
Lacombe	1	0 – 16	4	0 – 0.2	0.1
Mannville	9	10 – 100	56	0.1 – 2.1	0.8
Namao	1	50 – 100	90	0.6 – 1.5	1.2
Redwater	3	0 – 100	58	0 – 1.8	0.7
Vermilion	8	0 – 100	50	0 – 2.9	0.9

CROP: Pea
LOCATION: Saskatchewan

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TITLE: SEED-BORNE PATHOGENS OF PEA IN SASKATCHEWAN IN 2008

METHODS: The results of agar plate tests on pea seed samples from Saskatchewan provided by four companies were summarized. The tests were conducted between early September and mid- or late December, 2008. It was assumed that the majority of samples were from the 2008 crop. The tests were conducted to detect the pathogens causing ascochyta blights (*Mycosphaerella* [*Ascochyta*] *pinodes*, *Didymella* [*Ascochyta*] *pisi* and *Phoma medicaginis* var. *pinodella* = *A. pinodella*), botrytis blight (*Botrytis cinerea*) and sclerotinia stem and pod rot (*Sclerotinia sclerotiorum*). Not all samples were tested for *Botrytis* and *Sclerotinia* but all were tested for the ascochyta blight pathogens. For *Ascochyta* spp. mean % seed infection and % samples free of infection were calculated for each crop district [CD] in Saskatchewan (5). However, this was not done for *Botrytis* and *Sclerotinia* because low mean infection levels in all CDs would make comparisons meaningless.

It is unknown which of the seed samples came from pea crops that had been treated with registered fungicides used as seed treatments or foliar protectants against one or more seed- or soil-borne diseases. Although the use of foliar fungicides on pea was once uncommon in Saskatchewan because of economic factors, recent improvements in commodity prices and new fungicide registrations have led to increased use.

RESULTS AND COMMENTS: In Saskatchewan the 2008 growing season started with cool dry weather in all except the most northerly agricultural areas, where some flooding occurred after rapid runoff. Completion of seeding was timely in most regions, but crop growth was slow (4). Some of the driest areas in the south received plentiful rain in late May or mid-June. Other areas remained drier than normal until storms occurred in mid- or late July. In the period April 1-August 31 precipitation ranged from 60% to 150% of normal in different regions. Harvest of pea crops started in late July in the extreme south, but in most regions progress was delayed by slow ripening. Excellent weather from mid-September on resulted in rapid completion. The overall mean yield per acre of pea crops in Saskatchewan was 10% higher than in 2007 and 10% above the 10-year average (5). Crop quality was high, with 92% of crops expected to fall in the top two grades (5).

The number of samples tested by the four companies was 386, about 80% of that reported for 2007 (1). The decrease occurred despite a small increase in provincial pea acreage in 2008, perhaps because of the relatively high crop quality. As in previous years (1, 3) samples were received from every CD in Saskatchewan, but the majority originated in the traditional pea growing regions of CDs 5-9.

Levels of seed-borne ascochyta in individual samples varied from 0% to 40.5% (in a sample from CD 5A) and mean levels for crop districts varied from 0 to 8.9% (Table 1). Some mean values for CDs were based on too few samples to be meaningful, but generally levels were lower in south and western areas (CDs 1-4, 7 and 9) than in central and eastern areas (CDs 5, 6 and 8). The overall provincial mean level of infection of 3.3% was higher than in 2007 and 2006 (1, 3) but lower than in 2005 (2). The percentage of samples in which no *Ascochyta* was detected was 24% in contrast to 39% in 2007 (1), but similar to figures for the previous three years (3). For the eighth consecutive year (1) *A. pinodes* was the dominant species in seed and *A. pisi* was more commonly isolated from samples from southern Saskatchewan than from central or northern areas. However, localized “foci” of samples with a high proportion of *A. pisi*

occurred in central and eastern areas; the sample from CD 5A with 40.5% infection was in one such focus and was mainly infected by *A. pisi*.

As in previous years, *Botrytis* and *Sclerotinia* were detected in only a small percentage of seed samples and usually at low levels. Mean *Botrytis* infection in all samples tested was 0.4% and 75% of the samples were free of *Botrytis*. Although *Botrytis* is usually not a problem on pea crops in Saskatchewan, its damaging potential was illustrated in 2008 by three samples with unusually high infection levels, 8% (CD 6B), 11% (CD 9B) and 16% (CD 8B).

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Table 1. Number of pea seed samples tested from September to December, 2008 by four commercial companies, and levels of infection with *Ascochyta* in relation to Saskatchewan Crop Districts.

Crop District	No. of samples tested	Mean % infection	% samples with 0% infection
1A	4	1.4	50
1B	4	1.3	50
2A	5	0.9	40
2B	19	1.2	47
3AN	1	0	100
3AS	20	2.0	35
3BN	31	3.8	16
3BS	4	1.9	25
4A	3	0	100
4B	3	0	100
5A	18	8.9	11
5B	29	6.9	3
6A	48	4.5	19
6B	63	4.0	21
7A	11	1.7	36
7B	20	1.4	20
8A	30	2.8	20
8B	23	3.3	9
9A	24	0.1	21
9B	26	0.9	42
TOTAL	386	3.3	24

CROP: Field pea
LOCATION: Manitoba

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TITLE: FIELD PEA DISEASES IN MANITOBA IN 2008

METHODS: Field pea crops in Manitoba were surveyed for root and foliar diseases at 32 and 37 different locations, respectively. The crops surveyed were randomly chosen from regions in south-central and southwest Manitoba, where field pea is commonly grown. The survey for root diseases was conducted during the last week of June and the first week of July when most plants were at the 10-15 node stage. Due to cool weather, growth of pea plants had not progressed as rapidly as in 2007, although the survey was conducted about the same time in each year. Many crops were at the preflowering stage when assessed for root diseases in 2008. Root diseases were rated on a scale of 0 (no disease) to 9 (death of plant, the seedling could not emerge or died back quickly after emergence). Five to ten symptomatic roots were collected per field for isolation of fungi in the laboratory in order to confirm the visual disease identification. *Fusarium* species were identified based on the methods of Nelson et al. (1983). Foliar diseases were assessed during the first two weeks of August when most plants were at the round pod stage. A minimum of 30 plants (10 plants at 3 sites/field) was assessed in each field. Foliar diseases were identified by symptoms. The severity of three foliar diseases observed was estimated using a scale of 0 (no disease) to 9 (whole roots/plants severely diseased). Powdery mildew was rated on the percentage of leaf area infected.

RESULTS AND COMMENTS: Three root diseases were observed (Table 1). Fusarium root rot *(Fusarium solani* f. sp. *pisi and F. avenaceum*) was the most prevalent and was observed in all fields surveyed. In 2006 and 2007, only 67% and 88% of crops, respectively had symptoms of fusarium root rot (McLaren et al. 2007; 2008). *Fusarium avenaceum* was more frequently isolated from symptomatic roots than *F. solani* f. sp. *pisi* in 2008. Fusarium wilt (*F. oxysporum*) and rhizoctonia root rot (*Rhizoctonia solani*) were detected in 14 and 3 fields, respectively. Severity means for all root diseases were lower in 2008 than 2007. One pea crop had a root rot severity rating of 8.7, which would have significantly affected yield. This crop was located in central Manitoba, which received more moisture than southwestern Manitoba, and during the survey was at a later growth stage than most pea crops.

Four foliar diseases were observed (Table 2). Mycosphaerella blight (*Mycosphaerella pinodes*) was the most prevalent, as in previous years (McLaren et al. 2007, 2008), and was present in 36 of 37 fields surveyed. Sclerotinia stem rot (*Sclerotinia sclerotiorum*) was detected in 6 fields. The prevalence of sclerotinia-infested crops was 16.2% in 2008 compared with 27.5% reported in 2007 (McLaren et al. 2008). Powdery mildew (*Erysiphe pisi*) was observed in only one field. Because all newly registered pea cultivars are required to have resistance to powdery mildew, the low prevalence of this disease can likely be attributed, in part, to the adoption of new cultivars by growers. This disease was observed very late in the growing season on a few susceptible lines at AAFC-Morden which suggests that there may have been a few more crops with powdery mildew than were detected at the time of the survey. Foliar diseases, such as septoria blotch (*Septoria pisi*), bacterial blight (*Pseudomonas syringae* pv. *pisi*) and downy mildew (*Peronospora viciae*) were not observed in the surveyed fields. Anthracnose (*Colletotrichum pisi*) was observed in five fields (Table 2).

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Table 1. Prevalence and severity of root diseases in 32 crops of field pea in Manitoba in 2008.

		Disease severity (0-9)[1]	
Disease	**No. crops affected**	**Mean**	**Range**
Fusarium root rot	32	1.6	0.1-8.7
Fusarium wilt	14	1.5	0.3-3.8
Rhizoctonia root rot	3	1.2	0.5-1.9

[1]All diseases were rated on a scale of 0 (no disease) to 9 (whole roots severely diseased).

Table 2. Prevalence and severity of foliar diseases in 37 crops of field pea in Manitoba in 2008.

		Disease severity (0-9)[1]	
Disease	**No. crops affected**	**Mean**	**Range**
Mycosphaerella blight	36	5.1	1.3-8.0
Sclerotinia stem rot	6	1.0	0.3-2.0
Powdery mildew	1	0.3	0.3
Anthracnose	5	0.5	0.3-0.7

[1]Powdery mildew was rated as the percentage of leaf area infected; other diseases were rated on a scale of 0 (no disease) to 9 (whole plant severely diseased).

CROP: Sunflower
LOCATION: Manitoba

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TITLE: DISEASES OF SUNFLOWER IN MANITOBA IN 2008

METHODS: A total of 68 sunflower crops were surveyed in 2008 in Manitoba. Seventy percent were confectionery hybrids and 30% were oilseed hybrids, showing a significant increase in the oilseed acreage over the past few years (1, 2, 3). Eight crops were surveyed in the third week of July primarily for downy mildew, 26 crops in the third week of August, 10 crops in the fourth week of August, 15 crops in the third week of September, and nine crops at the last week of September. Crops were surveyed along pre-planned 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 incidences 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.), powdery mildew (*Erysiphe cichoracearum*) and stem diseases (*Phoma* spp. *& Phomopsis* spp.) were estimated as percent leaf or stem area infected. A disease index was calculated for each disease in every crop based on disease incidence or disease severity (Table 1). Stand establishment, vigour, and maturity were rated on a scale of 1 to 5 (I = very good/early, and 5 = very poor/very late).

In addition,14 samples of sunflower plants were submitted for analysis to the Crop Diagnostic Centre of Manitoba Agriculture, Food and Rural Initiatives by agricultural representatives and growers.

RESULTS AND COMMENTS: Ninety percent of the sunflower crops surveyed in 2008 had excellent to good stands while the rest had fair to poor stands. Fifty-two percent of the crops were maturing early, and only 4% were maturing late. Sixty-five percent of the crops had good to excellent vigour, and only 10% had poor vigour (Table 1). The 2008 growing season started early with abundant moisture and good growing conditions but the soil moisture levels and temperatures were not favourable for high downy mildew infections. Normal temperatures and moisture conditions in July and August and relatively dry and frost-free conditions in September helped the crops to develop and mature normally in Manitoba. Such conditions were not favourable for high sclerotinia head rot severity in most sunflower crops. Traces of infestation with the sunflower beetle (*Zygogramma exclamationis*) were observed in a few crops. However, traces to 10% infestation by aphids and grasshoppers were observed in 20 and 40% of the crops, respectively. Infestations with stem and bud borers were present in 30% of crops and more prevalent than in previous years (1, 2, 3), causing some damage and reduction in yield, especially in a few fields around Rosenort.

Sclerotinia wilt was present in 68% of the crops surveyed in 2008, but with incidences only ranging from trace to 5% (Table 1). Sclerotinia head rot and mid-stem infection, both caused by ascospore infections, were present in only 41% of all crops surveyed and with incidence ranging from trace to 30%. The prevalence and incidence of head rot in 2008 were much higher than in 2007 but similar to previous years (1, 2, 3).

Rust was present in 74% of the crops surveyed, with severity ranging from trace to 40% leaf area affected (Table 1). Rust infections started early and developed rapidly in some fields especially in southeast Manitoba. The incidence and severity were higher than in 2007 (1), but similar to other years (2, 3), probably due to early infections in north-central North Dakota and early arrival of inoculum in Manitoba.

Verticillium wilt was present in 71% of the crops surveyed, with incidence ranging from trace to 20% (Table 1). Incidence was higher in 2008 than in 2007 but similar to previous years (1, 2, 3).

Downy mildew was observed in 41% of crops with incidence from trace to 10% infected plants (Table 1). The prevalence and incidence of downy mildew in 2008 were lower than in 2007 (1) due perhaps to normal soil moisture levels at the seedling stage of the crop.

Traces to 5% leaf area infected by *Septoria helianthi* and *Alternaria* spp. were observed in 7% of the crops surveyed (Table 1). These are lower severity and prevalence values than in previous years (1,2, 3). Stem lesions caused by *Phoma* and *Phomopsis* were present in a few crops with trace to 5% stem area affected. Traces to 5% leaf area affected by powdery mildew were observed in a few crops.

Of the 14 samples submitted to the Crop Diagnostic Centre, three were identified with downy mildew, three with rust, one with root rot caused by *Rhizoctonia solani / Pythium and Fusarium spp*., and seven with chemical injury.

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Table 1. Prevalence and index of diseases in 68 crops of sunflower in Manitoba in 2008.

Disease	Crops Affected		Disease Index[1]	
	No. of crops	% of crops	Mean	Range
Sclerotinia wilt	46	68%	1.0	T – 2
Sclerotinia head rot/stem rot	28	41%	1.0	T – 3
Verticillium wilt	48	71%	1.0	T – 2
Downy mildew	28	41%	0.8	T – 2
Rust	50	74%	1.4	T – 4
Leaf spots (Septoria & Alternaria)	5	7%	0.5	T – 1
Lateness[2]	3	4%	2.3	1 – 4
Poor stand	2	3%	1.5	1 – 2
Poor vigour	7	10%	2.1	1 – 4

[1] Disease index on a scale of T to 5: Trace (T) = < 1%, 1= 1-5%, 2= 5-20%, 3= 20-40%, 4= 40-60%, and 5= > 60% disease levels. Index is for disease incidence with downy mildew, verticillium wilt, sclerotinia; and for disease severity measured as percent leaf and stem area affected with rust and leaf spots.

[2] Indexes for lateness, stand, and vigour are based on a 1-5 scale (1= early/very good and 5= very late/very poor).

Vegetables / Légumes

CROP: Cruciferous vegetables
LOCATION: Alberta

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TITLE: INCIDENCE OF CLUBROOT ON CRUCIFEROUS VEGETABLES IN ALBERTA IN 2008

METHODS: Six commercial vegetable farms or market gardens in central and southern Alberta were surveyed for symptoms of clubroot caused by *Plasmodiophora brassicae* Woronin in 2008. Four of the six farms/gardens were located near Edmonton, with one farm near Lethbridge and one near Medicine Hat (Fig. 1). These locations were selected because they included many of the largest vegetable farms in Alberta and had been surveyed in previous years. The six farms/gardens contained a total of 68 different vegetable plots at 8 different field sites. Sampling dates were selected based on availability of sampling personnel and in cooperation with the landowners. In the Edmonton area, sampling was performed in August (sites 1, 2, 3, 4). Sampling in the Medicine Hat area was done in September (site 5), and the sample site near Lethbridge (site 6) was surveyed in October. A second sampling at site 5 near Medicine Hat was also performed in October. At each location and on each sampling date, five random sample sites were selected along either a diagonal transect or a 'W-shaped' transect across each plot. Five plants were dug up and examined at each sample site for a total of 25 roots sampled and examined in each of the 68 vegetable plots. Ten types of cruciferous vegetables were encountered: bok choy [*Brassica rapa* L. subsp. *chinensis* (Lour.) Hanelt]; broccoli [*Brassica oleracea* L. var. *italica* Plenck]; Brussels sprouts [*Brassica oleracea* L. var. *gemmifera* DC.]; cabbage, i.e. white, red and savoy [*Brassica oleracea* L. var. *capitata* L.]; cauliflower [*Brassica oleracea* L. var. *botrytis* L.]; kale [*Brassica oleracea* L. var. *acephala* DC.], kohlrabi [*Brassica oleracea* L. var. *gongylodes L.*], and rutabaga [*Brassica napobrassica* Mill]. Conspicuous galls or tumors visible on root tissues were considered a presumptive positive diagnosis for clubroot disease. Subsequently, galls were sectioned and stained to enable visual examination of pathogen structures via light microscopy. The presence of resting spores within root tissues was the first confirmatory test. A secondary confirmation via PCR testing was done at the University of Alberta.

RESULTS AND COMMENTS: The results for all six locations are shown in Table 1. The vegetable crops surveyed ranged in development from mature to nearing maturity, with some already harvested. All crops were sufficiently developed to display clubroot symptoms if disease pressure and suitable environmental conditions were present. The most commonly encountered vegetable was white cabbage, which was sampled at all six farms/gardens; however, no clubroot was observed in any cabbage plants sampled. Clubroot symptoms were observed in a single field of rutabaga at location five. Although the infestation was strictly localized to a single field of approximately 5-ha, the disease incidence within that field was 80% based on symptoms. The infected plants showed mostly low to moderate disease severity with few large root galls (Fig. 2). Occasional above-ground symptoms, such as stunting, were observed (Fig. 2). Almost no yield loss was predicted for the infested area; however, a few roots displaying conspicuous galls may not have been marketable. *Plasmodiophora brassicae* resting spores were observed in stained root sections of galls dissected from symptomatic roots using light microscopy. Additionally, the presence of *P. brassicae* was confirmed via molecular detection techniques (1). When the infested rutabaga field at

site 5 was sampled a second time 28-days later the symptoms were only slightly more advanced but a PCR test was again positive.

In Alberta, over the past five years, clubroot has been observed in canola and vegetables. In canola, clubroot was reported in 2003, 2005, 2006 and 2007 (6, 7, 8, 9, 11). The clubroot survey results for canola fields in central Alberta for 2008 are presented in a separate report (10). In mixed cruciferous vegetables, clubroot was reported in the Edmonton area in 2004, 2005, 2006, and 2007 (2, 3, 4, 5). During this period, surveillance has documented a spreading of clubroot into new canola fields each year, but only sporadic occurrence on vegetables and at only two locations, both near Edmonton. At one of the two infested locations, the disease was not found in 2008, indicating successful containment and management of the infestation by the grower through rotation, sanitation and cultural practices. The second infested site had been confirmed with clubroot each year since 2004. Unfortunately, this chronically infested location was not sampled in 2008 because the crops were plowed under before sampling due to extensive earlier hail damage. In this report, we document the presence of clubroot on rutabaga at a location near Medicine Hat. This is the first report of the disease in a commercial field of rutabaga in Alberta, and the first report of clubroot in a commercial vegetable field away from the Edmonton area. The source or cause of the outbreak is unknown. None of the neighboring cabbage fields on the same farm were infested, including a field of white cabbage less than 100 m away.

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Table 1. Vegetable plots sampled at each of six locations in Alberta. Sampling dates are shown in parentheses below the location number. The sample site positive for clubroot is shaded.

	Location 1 (26-08-08)	**Location 2 (26-08-08)**	**Location 3 (27-08-08)**	**Location 4 (27-08-08)**	**Location 5 (12-09-08) (15-10-08)**	**Location 6 (17-10-08)**	**Total**
Bok Choy	0	0	0	0	0	2	2
Broccoli	4	1	1	3	0	0	9
Brussels sprouts	1	1	0	1	0	0	3
Cabbage (White)	8	4	4	7	2	1	26
Cabbage (Red)	2	1	0	3	0	1	7
Cabbage (Savoy)	1	1	1	1	0	0	4
Cauliflower	2	1	1	3	0	0	7
Kale	0	0	0	1	0	0	1
Kohlrabi	2	0	0	4	0	0	6
Rutabaga	1	0	0	0	2	0	3
Total	**21**	**9**	**7**	**23**	**4**	**4**	**68**

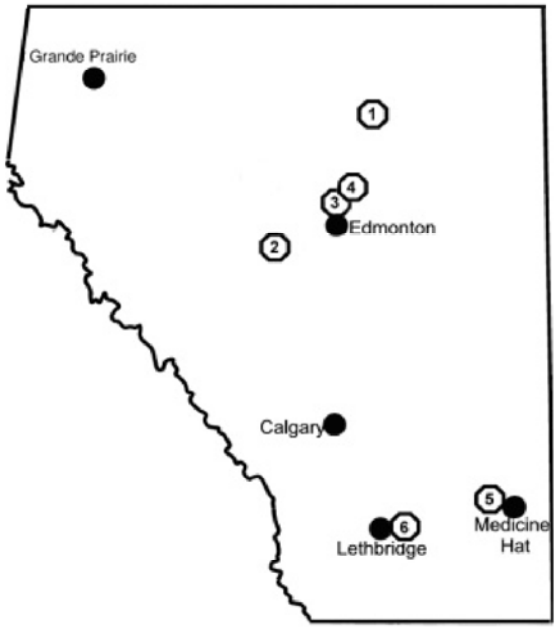

Figure 1. Map of central and southern Alberta showing vegetable farms surveyed for clubroot.

Figure 2. Putative above-ground symptoms of clubroot in rutabaga at location 5 (upper panel). Rutabaga root samples taken from sites two (lower left panel) and three (lower right panel) of the October sampling at location five. Severity in size of root galls was highly variable between and within sample sites ranging from small to moderate size galls (lower right) to large swellings (lower left).

Fruits, Nuts and Berries, Ornamentals and Turfgrass / Fruits, Fruits à Écale et Baies, Plantes Ornementales et Gazon

CROP/CULTURE: Grape (*Vitis vinifera*)
LOCATION/RÉGION: British Columbia

NAMES AND AGENCY/NOMS ET ORGANISME:
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TITLE/TITRE: NEW DISEASES CAUSING DECLINE OF WINE GRAPES IN THE OKANAGAN VALLEY.

INTRODUCTION: A limited vineyard survey was conducted to help identify the cause of new and unusual disease symptoms emerging on grapevines in the Okanagan Valley of British Columbia. The survey was initiated in August 2007 and continued through the growing season of 2008. A significant number of vines showing a variety of decline symptoms was observed (delayed and stunted growth, short internodes, yellowing and premature loss of leaves, shoot tip dieback, tendril dieback, trunk dieback, dead arm and cankers). The numerous symptoms point to several root and trunk diseases such as: esca, eutypa dieback, black foot, botryosphaeria canker and roesleria root rot (Pearson and Goheen 1988). These diseases can cause rapid decline and plant death over a two to three week span, or a slow decline and loss of vigour and yield over several years.

METHODS: Symptomatic vines complete with roots were collected and brought back to the laboratory for analysis. In order to expose necrotic tissue, cross sections of the vines were taken from root material and from the trunk, both above and below the graft union. Small pieces of plant tissue (5-10 mm) were shaved from the margins of necrotic areas and then surface sterilized in a 0.53% NaOCl solution, rinsed in sterile distilled water and plated on acidified potato dextrose agar. Emerging fungal isolates were transferred onto new plates for visual identification using colony morphology and microscopic characteristics.

To confirm the fungal identification, DNA was extracted from pure culture and the internal transcribed spacer (ITS) regions of the ribosomal RNA genes were amplified and sequenced. DNA sequence data were imported into SeqMan Pro analysis software (Lasergene 7.1: DNASTAR Inc., Madison, WI) for manual editing and BLAST searches of the GenBank database (National Center for Biotechnology Information: http://www.ncbi.nlm.nih.gov/).

RESULTS AND COMMENTS: The survey of symptomatic vines collected from 24 vineyards identified four diseases, three of which have not previously been reported on grape in the Okanagan Valley of British Columbia (Fig. 1). The identity of the pathogens was based on fungal morphology and BLAST search results of ITS sequence data.

Roesleria root rot: *Roesleria subterranea* was isolated from vines at three different vineyards ranging in age from three to 15 years and was always associated with vines that were co-infected with *Cylindrocarpon* species. At one site tiny mushrooms, a diagnostic feature of *Roesleria* root rot, were observed on the roots (Fig. 2). The soils at these vineyards were all composed of fine silt that has the capacity to retain a high water content. *Roesleria* root rot is not new to the Okanagan Valley and has been previously reported to affect grapevines in B.C. vineyards by Sholberg and Haag (2007).

Black foot disease: *Cylindrocarpon liriodendri* and several other unidentified *Cylindrocarpon* species were isolated from plants in four vineyards showing both rapid decline symptoms as well as a more gradual decline. The isolates were obtained from root tissue as well as from the trunk section below the graft union (Fig. 3). Again, the infected vines ranged in age from about three to 15 years of age.

C*ylindrocarpon liriodendri* has been shown previously to be the primary species responsible for this disease (Halleen 2006).

Esca: Esca was identified at three vineyards and two different species responsible for this disease have been isolated and identified based on their ITS sequence data: *Phaeomoniella chlamydospora* and *Phaeoacremonium aleophilum* (Groenewald et al. 2001). These pathogens were isolated from necrotic vascular tissue taken from above the graft union (Fig. 4) on vines planted after 2002. *Phaeoacremonium aleophilum* was also recovered from vines that were co-infected with *Cylindrocarpon* at a vineyard that had well over 50% of its vines showing obvious decline symptoms.

Botryosphaeria canker: Botryosphaeria canker was confirmed at five vineyards and two species, *Botryosphaeria parva* and *B. dothidea* were isolated from cankers and necrotic vascular tissue. The vineyards where *B. parva* was isolated showed severe decline with the number of symptomatic vines being in excess of 50%. *Botryosphaeria parva* is thought to be more virulent on grapevine than *B. dothidea* (D. Gubler personal communication). The infected vines ranged in age from three to 11 years.

To our knowledge these are the first reports of esca, black foot disease and botryosphaeria canker on grapevine in British Columbia. There are also no previous reports of the two esca pathogens on grapevine in Canada. Although not reported on grape, *P. aleophilum* (syn: *Tognina minima*) was isolated in Ontario from *Prunus pennsylvanica* in 1960 and reported in taxonomic studies by Hausner et al. (1992). Similarly, *Botryosphaeria obtusa* and *B. stevensii* have been reported causing dead arm of grape in eastern Canada (Chamberlain et al. 1964; Shoemaker 1964), but the species identified in this report, *B. parva* and *B. dothidea,* have not been associated with vine decline in Canada. Finally, black foot disease caused by *Cylindrocarpon* species, is known to be a problem in vineyards worldwide, including California, Oregon and Washington. However, it has not previously been identified as a problem in vineyards in BC or other regions of Canada.

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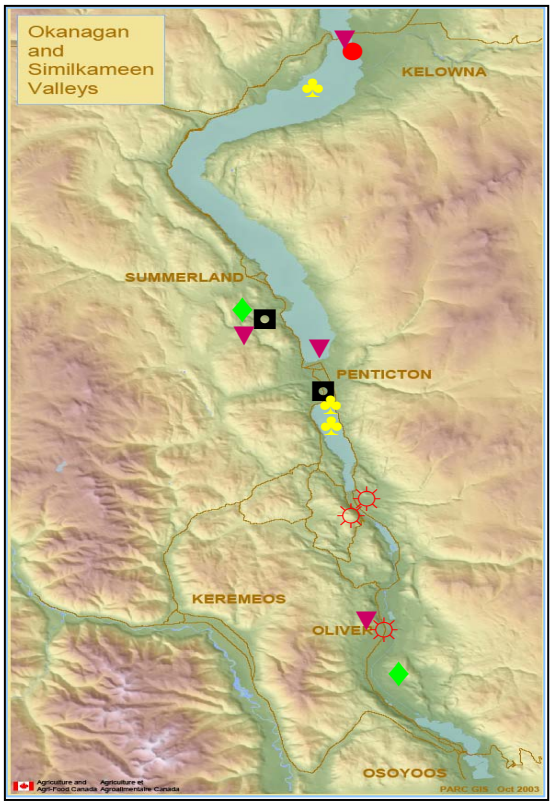


Figure 1. Map of the Okanagan Valley of British Columbia, showing the approximate location of vineyards with positive pathogen isolation and ID for the following diseases: **Botryosphaeria canker:** ☼ *Botryosphaeria dothidea and* ◘ *B. parva* **Esca:** ♦ *Phaeomoniella chlamydospora and* ● *Phaeoacremonium aleophilum* **Black foot disease:** ▼ *Cylindrocarpon liriodendri or Cylindrocarpon spp.* **Roesleria root rot:** ♣ *Roesleria subterranea*

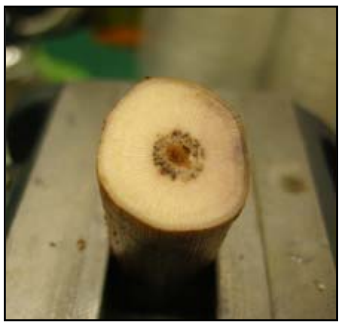
.

A. **B.**

Figure 2. Roesleria root rot: **(A)** Tiny mushrooms of *Roesleria subterranea* on exposed roots of declining grapevine *(photo by P. Haag)* and **(B)** close up of similar mushrooms *(photo by M. Weis).*

A. **B.**

Figure 3. Black foot disease: (A) Vines infected with *Cylindrocarpon liriodendri*, the cause of black foot disease, showing a rapid decline, with plant death occurring within two weeks and **(B)** darkened pith and dark speckling of vascular tissue shown in a cross-section taken below the graft union on the trunk.



A. **B.**

Figure 4. Esca: (A) Grapevine infected with *Phaeomoniella chlamydospora,* showing general decline symptoms, with stunted growth and shortened internodes. **(B)** Cross section of esca-infected vine showing dark speckling of the vascular tissue, a typical diagnostic feature of this disease *(photo by P. Haag).*

A. **B.**

Figure 5. Botryosphaeria canker: (A) Vines showing delayed growth due to infection by *Botryosphaeria parva*. **(B)** V-shaped cankers typically found near old pruning wounds on grapevines infected by *Botryosphaeria* species *(photos by P. Haag)*.

Forest Trees / Arbres Forestiers

CROP: Elm
LOCATION: Alberta

NAMES AND AGENCIES:
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TITLE: INCIDENCE OF ELM WILT PATHOGENS IN ALBERTA IN 2008

METHODS: Surveys to detect symptoms of Dutch elm disease (DED) (*Ophiostoma nova-ulmi*) were conducted by members of the City of Edmonton Pest Management Lab and other communities throughout Alberta. Samples of elm shoots with wilted or discolored leaves were sent to the Plant Pathology Laboratory, University of Alberta, for identification of fungi that could be associated with the symptomatic tissues. The three most diseased twigs (based on degree of vascular staining) received from an individual tree were selected for further processing. Three 1 cm^3 pieces were cut from each twig (generating 9 test pieces per tree), surface sterilized, and plated onto potato dextrose agar containing streptomycin sulfate (0.2 g/L), at a density of three pieces per Petri dish. The samples were incubated at room temperature in darkness for 3 weeks, and then examined microscopically to confirm identification.

RESULTS AND COMMENTS: A total of 61 samples (each representing one elm tree) were received by the Plant Pathology Laboratory, with 45 samples from Edmonton, 11 from Red Deer, three from Parkland County and one each from Lethbridge and Bonnyville. Fungi were isolated from all samples received, but no *Ophiostoma* was found. Some trees had multiple infections, and at least 12 different fungal genera were identified in the samples from Edmonton. As in previous years (1, 2), the majority of trees from Edmonton (84%) were infected with *Dothiorella ulmi*. Nine fungal genera were identified from the 11 samples from Red Deer, with *Alternaria alternata* as the most common species; four fungi were isolated from the three samples received from Parkland County, including *A. alternata* and *Cytospora* spp. A total of five genera were found on the two samples from Lethbridge and Bonnyville, along with several colonies that could not be identified. *Dothiorella ulmi* was not recovered outside of Edmonton. The fungi isolated from each sample are listed in Table 1.

The most common elm pathogen in Edmonton, *D. ulmi*, is associated with a die-back of shoots and branches and may eventually cause tree mortality. Its prevalence in Edmonton could be related to a predisposition to dothiorella wilt in stressed boulevard elms (1). Most of the other fungi recovered in this study were either incidentals or secondary invaders of dead or dying tissues. Based on the samples sent to the Plant Pathology Laboratory in 2008, the cities of Edmonton and Red Deer appear to be DED-free. However, as only five samples were received from other parts of Alberta, it is difficult to draw general conclusions regarding DED in the rest of the province.

ACKNOWLEDGEMENTS: We would like to thank Mario Castillo, Mark Wartenbe and Mike Jenkins (City of Edmonton Pest Management Lab) and other pest management staff in Edmonton and throughout the province for supplying elm samples.

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Table 1. Fungi isolated from elm samples showing wilt symptoms and collected from Edmonton, Red Deer, Parkland County, Lethbridge and Bonnyville, Alberta in 2008.

Fungus	Number of Trees Infected*				
	Edmonton	**Red Deer**	**Parkland County**	**Lethbridge**	**Bonnyville**
Dothiorella ulmi	38	0	0	0	0
Cytospora spp.	6	2	1	0	0
Phyllosticta-like	6	1	0	0	0
Alternaria alternata	2	5	2	1	0
Penicillium spp.	5	1	2	1	0
Chaetomium spp.	2	3	0	0	1
Coniothyrium spp.	1	2	1	0	0
Phoma spp.	2	1	0	0	0
Trichoderma spp.	2	0	0	0	0
Macrophoma spp.	0	2	0	0	0
Aspergillus niger	0	2	0	0	0
Aureobasidium spp.	1	0	0	1	0
Verticillium dahliae	1	0	0	0	0
Sordaria spp.	1	0	0	0	0
Mucor spp.	0	0	0	1	0
Unidentified	1	0	1	0	2

*A total of 45 samples (each representing one elm tree) were received from Edmonton, 11 were received from Red Deer, 3 were received from Parkland County, and one each from Lethbridge and Bonnyville. Some trees had multiple infections, and hence the total number of fungi isolated exceeds the total number of trees.

CROP: Butternut
LOCATION: New Brunswick

NAMES AND AGENCIES:
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TITLE: CURRENT STATUS OF BUTTERNUT CANKER (*SIROCOCCUS CLAVIGIGNENTI-JUGLANDACEARUM*) IN NEW BRUNSWICK - 2008

INTRODUCTION: As discussed previously (1, 2), butternut (*Juglans cinerea* L.) is an endangered tree in Canada that reaches the northeastern limit of its natural distribution in New Brunswick. Butternut canker (*Sirococcus clavigignenti-juglandacearum* Nair, Kostichka & Kuntz) is a fungal disease of butternut that is causing extensive mortality throughout the native range of the tree in eastern North America. This disease is responsible for the listing of butternut as “Endangered” (3).

In Canada, New Brunswick remains the only province where the disease has not yet expanded to infect butternut throughout the host’s entire natural range. The disease is now widespread and tree mortality is common throughout both Ontario and Quebec.

RESULTS AND COMMENTS: In 2008, two new butternut canker locations were found in New Brunswick. A small group of infected butternut trees was found on Gilbert Island, Sunbury County. The island is located in the Saint John River near McGowans Corner about 35 km southeast of Fredericton, York County.

A single, infected butternut tree was found in an upland butternut stand near Stanley, York County. This new location is about 35 km due north of Fredericton. All previous finds were made on the islands along the Saint John River watershed upstream of Fredericton.

Table 1 lists new positive locations in 2008 by geographical place name with their Universal Transverse Mercator (UTM) grid references. Map 1 shows the natural distribution of butternut, the previously known distribution of butternut canker in New Brunswick and the most recent finds of the disease.

A plot was established in an infected butternut stand at Aroostook, Victoria County in 2005. In Table 2, the amount of girdling observed on the main stem suggests that butternut canker has intensified on the plot trees between 2007 and 2008. We are uncertain if the increase in the percentage of dead trees within the plot is caused by butternut canker or is the result of natural factors, such as suppression

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Table 1: List of new positive locations for butternut canker in 2008 for New Brunswick.

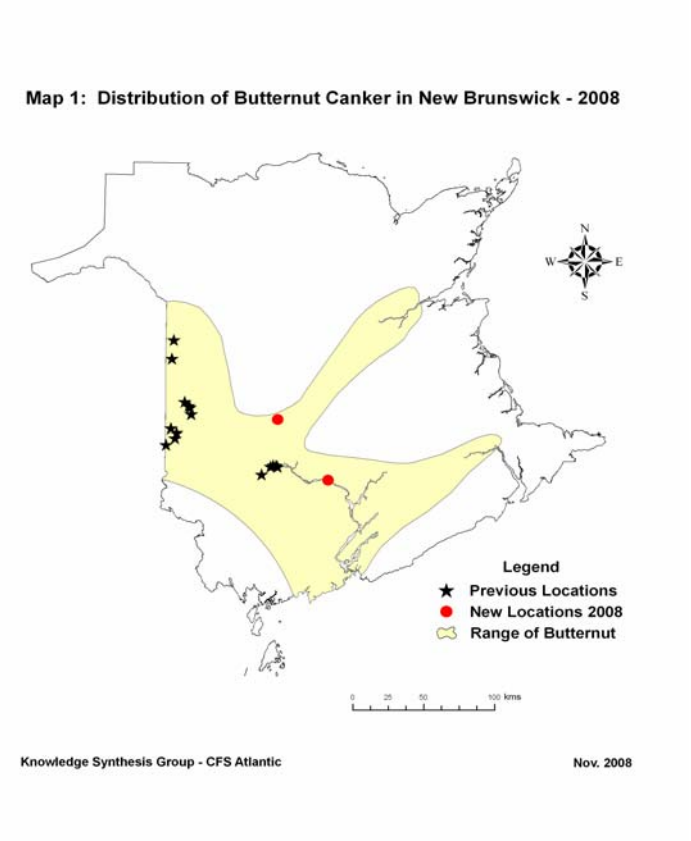
Location	UTM Grid *	Year Found
York County		
Stanley	19-673-5128	2008
Sunbury County		
Gilbert Island	19-710-5084	2008

* UTM - Universal Transverse Mercator grid, North American Datum

Table 2: Percentage of butternut trees in stem girdling classes at Aroostook, Victoria County, N.B.

	Percentage Dead Trees	Percentage of trees in stem girdling class *				
		0	1	2	3	4
2007	3.7	7.4	11.1	37.0	33.3	7.4
2008	11.1	3.7	3.7	3.7	22.2	55.6

* Stem girdling classes:
0. No damage on main stem.
1. Main stem girdled on <¼ of the circumference.
2. Main stem girdled on >¼ but <½ of the circumference.
3. Main stem girdled on >½ but <¾ of the circumference.
4. Main stem girdled on >¾ of the circumference.



LIST OF CPDS AUTHORS IN ALPHABETICAL ORDER

LIST OF FIGURES