2012

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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Inventaire des maladies des plantes au Canada

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Contents: **DISEASE HIGHLIGHTS** - 2011 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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VEGETABLES/LÉGUMES

Diagnostic Laboratories/Laboratoires Diagnostiques

CROP: Commercial Crops – Plant Health Laboratory Report
LOCATION: British Columbia

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TITLE: DISEASES DIAGNOSED ON COMMERCIAL CROPS SUBMITTED TO THE BRITISH COLUMBIA MINISTRY OF AGRICULTURE PLANT HEALTH LABORATORY IN 2011

METHODS: The British Columbia Ministry of Agriculture (BCMA) Plant Health Laboratory provides diagnoses and disease management information for diseases caused by fungi, bacteria, viruses, plant parasitic nematodes, and insect pests of agricultural crops grown in British Columbia. The following data reflect samples submitted to the laboratory by ministry staff, growers, agri-businesses, municipalities and master gardeners. Diagnoses were accomplished by microscopic examination, culturing onto artificial media, biochemical identification of bacteria using BIOLOG®, serological testing of viruses, fungi and bacteria with micro-well and membrane based enzyme linked immunosorbent assay (ELISA). Molecular techniques (PCR – conventional and/or real time) were used for some species specific diagnoses. Some specimens were referred to other laboratories for identification or confirmation of the diagnosis.

RESULTS AND COMMENTS: The year 2011 was a wet year with heavy rains until mid June. The summer was short followed by a mild fall. Weather conditions were conducive to fungal and bacterial diseases. The lab received close to 800 samples between January and November. Summaries of diseases and their causal agents diagnosed on crop samples submitted to the laboratory are presented in the following tables (1-11) arranged under crop category. The total number of submissions for each crop category is listed at the bottom of each table. Problems not listed include: abiotic problems such as nutritional stress, pH imbalance, water stress, drought stress, physiological response to growing conditions, 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 **field crop** samples submitted to the BCMA Plant Health Laboratory in 2011.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Barley	Covered smut	*Ustilago hordei*	1
	Net blotch	*Pyrenophora teres*	1
Wheat winter	Dwarf bunt	*Tilletia controversa*	1

DISEASED SAMPLES 3
ABIOTIC AND OTHER DISORDERS 0
TOTAL SUBMISSIONS 3

Table 2.0 Summary of diseases diagnosed on **Christmas tree** samples submitted to the BCMA Plant Health Laboratory in 2011.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Abies	Needle blight	*Phyllosticta* sp.	1
		Rhizosphaera sp.	1
Abies grandis	Needle blight	*Phyllosticta* sp. and *Hormonema* sp.	1
		Sclerophoma sp.	1
Abies procera	Botrytis blight	*Botrytis cinerea*	1
	Needle blight	*Rhizosphaera kalkhoffii*	1
		Sclerophoma sp.	1
Picea pungens	Needle cast	*Rhizosphaera* sp.	1
Pseudotsuga menzesii	Root rot	*Phytophthora* sp.	1

DISEASED SAMPLES	9
ABIOTIC AND OTHER DISORDERS	0
TOTAL SUBMISSIONS	9

Table 3.0 Summary of diseases diagnosed on **greenhouse floriculture** samples submitted to the BCMA Plant Health Laboratory in 2011.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Antirrhinum	Downy mildew	*Peronospora antirrhini*	1
Aquilegia	Foliar blight	*Botrytis cinerea*	1
	Leaf spot	*Cladosporium* sp.	1
Basil	Bacterial leaf spot	*Pseudomonas syringae* pv. *syringae*	1
	Botrytis stem canker	*Botrytis cinerea*	2
Bergenia	Nematode damage	*Aphelenchoides* sp.	1
Cimicifuga	Root rot	Oomycete	1
Cymbidium	Leaf spotting and mosaic	*Odontoglossum ringspot virus*	1
Dracaena sanderiana	Anthracnose	*Colletotrichum* sp.	1
	Stem rot	*Fusarium* sp.	1
Festuca	Root rot	*Pythium* sp.	1
Gaillardia	White smut	*Entyloma polysporum*	1
Gerbera	Petal blight	*Penicillium* sp.	2
	Petal blight	*Botrytis cinerea*	1
Hemerocallis	Daylily leaf streak	*Aureobasidium microstictum*	1
Hosta	Hosta Virus X	*Hosta virus X*	1
	Tomato spotted wilt virus	*Tomato spotted wilt virus*	1
Impatiens	Web blight	*Rhizoctonia solani*	1
	Leaf Mosaic	*Tobacco mosaic virus*	1
	Root rot	*Pythium* sp.	1
Kalanchoe	Leaf spot	*Penicillium* sp.	1
Liriope	Anthracnose	*Colletotrichum* sp.	1
Lonicera	Leaf spot	*Phyllosticta* sp.	1

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Lupinus	Stem spot	*Colletotrichum* sp.	1
Pachira aquatica	Stem rot	*Pythium splendens**	1
Pelargonium	Foliar blight	*Botrytis cinerea*	1
Petunia	Stem rot and wilt	*Fusarium* sp.	1
Phlox	Downy mildew	*Peronospora phlogina*	1
	Powdery mildew	*Erysiphe cichoracearum*	1
Rhus	Root rot	*Rhizoctonia* sp. and *Pythium* sp.	1
Rosa	Black spot	*Diplocarpon rosae*	1
	Downy mildew	*Peronospora sparsa*	1
Rosmarinus	Black root rot	*Thielaviopsis basicola*	1
	Foliar blight	*Botrytis cinerea*	1
	Web blight	*Rhizoctonia solani*	1
Salvia	Downy mildew	*Peronospora lamii*	2
Zinnia	Botrytis blight	*Botrytis cinerea*	1

* First detection in B.C.

DISEASED SAMPLES	40
ABIOTIC AND OTHER DISORDERS	19
TOTAL SUBMISSIONS	59

Table 4.0 Summary of diseases diagnosed on **greenhouse vegetable** samples submitted to the BCMA Plant Health Laboratory in 2011.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Cucumber	Damping off	*Pythium* sp.	1
	Fruit rot	*Penicillium olsonii*	1
	Vascular wilt	*Fusarium oxysporum* f.sp. *cucumerinum*	1
Pepper	Impatiens necrotic spot virus	*Impatiens necrotic spot virus*	1
	Necrotic leaf spots	*Tomato spotted wilt virus*	1
	Surface growth	*Penicillium* sp., *Aspergillus* sp.	1
Tomato	Blotchy fruit	*Pepino mosaic virus*	1
	Fusarium wilt	*Fusarium oxysporum* f. sp. *lycopersici*	1
	Leaf mold	*Cladosporium fulvum*	1
	Leaf mosaic and puckering	*Pepino mosaic virus*	1
	Verticillium wilt	*Verticillium dahliae*	1

DISEASED SAMPLES	11
ABIOTIC AND OTHER DISORDERS	7
TOTAL SUBMISSIONS	18

Table 5.0 Summary of diseases diagnosed on **mushroom** samples submitted to the BCMA Plant Health Laboratory in 2011.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Mushroom	Cinnamon brown mould	*Chromelosporium* sp.	1

DISEASED SAMPLES	1
ABIOTIC AND OTHER DISORDERS	3
TOTAL SUBMISSIONS	4

Table 6.0 Summary of diseases diagnosed on **small fruit (berry crop)** samples submitted to the BCMA Plant Health Laboratory in 2011.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Blackberry	Botrytis fruit rot	*Botrytis cinerea*	1
Blueberry	Anthracnose	*Colletotrichum acutatum*	1
	Armillaria root rot	*Armillaria* sp.	3
	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	8
	Blueberry Scorch Virus	*Blueberry scorch virus*	4
	Blueberry Shock Virus	*Blueberry shock virus*	7
	Coniothyrium canker	*Coniothyrium* sp.	5
	Crown /lower stem canker	*Phomopsis* sp.	4
	Crown gall	*Agrobacterium tumefaciens*	1
	Foliar blight	*Botrytis cinerea*	2
	Fruit rot	*Botrytis cinerea*	2
	Godronia canker	*Godronia cassandrae*	8
	Leaf spot	*Botrytis cinerea*	1
		Phomopsis sp.	1
	Phomopsis canker	*Phomopsis* sp.	10
	Root rot	*Phytophthora* sp.	4
Cranberry	Coniothyrium canker	*Coniothyrium* sp.	1
	Godronia canker	*Godronia* sp.	1
	Leaf spot	*Allantophomopsis* sp.	2
		Botryosphaeria sp. and *Colletotrichum* sp.	2
		Colletotrichum gloeosporioides	2
		Cryptosporiopsis sp.	1
		Phyllosticta sp.	2
		Protoventuria sp.	1
		Coleophoma sp. and *Botryosphaeria* sp.	1
		Discosia sp. and *Allantophomopsis* sp.	1
	Leaf spot and stem canker	*Godronia* sp.	2
	Red leaf spot	*Exobasidium* sp.	1
	Twig blight	*Botryosphaeria* sp.	1
		Diplodia sp.	1
	Upright dieback	*Phomopsis* sp.	2
Raspberry	Botrytis blight	*Botrytis cinerea*	2

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Raspberry	Cane blight	*Leptosphaeria coniothyrium*	1
	Crown gall	*Agrobacterium tumefaciens*	7
	Crumbly fruit	*Raspberry bushy dwarf virus*	3
	Nematode contribution	*Pratylenchus* sp.	18
		Pratylenchus sp. and *Xiphinema* sp.	3
	Root rot	*Phytophthora* sp.	13
	Spur blight	*Ascochyta* sp.	1
	Yellow rust	*Phragmidium rubi-idaei*	1
Strawberry	Black root rot	*Rhizoctonia fragariae*	3
	Verticillium wilt	*Verticillium dahliae*	1

DISEASED SAMPLES 135
ABIOTIC AND OTHER DISORDERS 146
TOTAL SUBMISSIONS 281

Table 7.0 Summary of diseases diagnosed on **tree fruit and grape** samples submitted to the BCMA Plant Health Laboratory in 2011.

CROP	DISEASE/DISORDER	CAUSAL/ ASSOCIATED ORGANISM	No.
Apple	Stem canker	*Cytospora* sp.	1
	Malformed fruit	*Green crinkle agent*	2
Cherry	Bacterial canker	*Pseudomonas syringae*	1
	Bacterial fruit blotch	*Pseudomonas syringae*	1
	Cherry mottle leaf virus	*Cherry mottle leaf virus*	1
	Leucostoma canker	*Cytospora* sp.	1
	Twisted leaf	*Cherry twisted leaf virus*	1
Grape	Black rot	*Phyllosticta* sp.	1
	Stem canker	*Phomopsis* sp.	1
	Leaf roll symptoms	*Grapevine leafroll associated virus 3*	1
	Nematode contribution	*Helicotylenchus* sp.	1
		Xiphinema sp.	1
	Nematode damage	*Pratylenchus* sp. and *Xiphinema* sp.	2
		Pratylenchus sp., *Xiphinema* sp. and *Paratylenchus* sp.	1
	Root rot	*Rhizoctonia* sp.	1
Peach	Mucor rot	*Mucor* sp.	1
Pear	Branch canker	*Phacidiopycnis piri*	1
	Pear trellis rust	*Gymnosporangium fuscum*	1

DISEASED SAMPLES 20
ABIOTIC AND OTHER DISORDERS 18
TOTAL SUBMISSIONS 38

Table 8.0 Summary of diseases diagnosed on **herbaceous perennial** samples submitted to the BCMA Plant Health Laboratory in 2011.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Aquilegia	Powdery mildew	*Erysiphe* sp.	1
Bambusa	Root rot	*Pythium* sp.	1
Buxus	Foliar blight	*Volutella* sp.	1
Buxus sempervirens	Boxwood blight	*Cylindrocladium buxicola**	1
Calluna	Root rot	*Pythium* sp.	1
	Twig blight	*Pestalotiopsis* sp.	1
Festuca idahoensis	Powdery mildew	*Erysiphe graminis*	1
Geranium	Root rot	*Thielaviopsis basicola*	1
Helleborus	Foliar blight	*Botrytis cinerea*	1
Hemerocallis	Anthracnose	*Gloeosporium* sp.	1
Humulus	Root rot	Oomycete	1
Hydrangea	Root rot	*Rhizoctonia solani*	1
Lilium	Leaf spot	*Alternaria* sp.	1
Lonicera	Crown rot	*Rhizoctonia* sp. and Oomycete	1
Paeonia	Foliar blight	*Botrytis cinerea*	1
Rudbeckia	Leaf spot	*Alternaria* sp.	1
		Botrytis cinerea	1

***** New record for B.C**.**

DISEASED SAMPLES	17
ABIOTIC AND OTHER DISORDERS	2
TOTAL SUBMISSIONS	19

Table 9.0 Summary of diseases diagnosed on g**olf course, sod, sports field and lawn** samples submitted to the BCMA Plant Health Laboratory in 2011.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Green	Yellow patch	*Rhizoctonia cerealis*	2
	Anthracnose	*Colletotrichum graminicola*	2
	Downy mildew	*Sclerophthora* sp.	1
	Foliar blight	*Leptosphaerulina* sp.	1
	Nematode contribution	*Meloidogyne* sp.	2
	Nematode damage	*Helicotylenchus* sp. and *Meloidogyne* sp.	2
		Helicotylenchus sp., *Mesocriconema* sp., and *Meloidogyne* sp.	1
		Helicotylenchus sp., *Hemicycliophora* sp., *Meloidogyne* sp., *Paratylenchus* sp. and *Pratylenchus* sp.	1
		Helicotylenchus sp., *Hemicycliophora* sp., *Meloidogyne* sp., *Paratylenchus* sp. and *Subanguina* sp.	1

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
	Nematode damage	*Meloidogyne* sp.	2
Sod	Algae	Algae	1
	Anthracnose	*Colletotrichum graminicola*	1
	Nematode damage	*Helicotylenchus* sp. and *Paratylenchus* sp.	1
	Root rot	*Pythium* sp.	1
	Yellow patch	*Rhizoctonia cerealis*	1

DISEASES/DISORDERS IDENTIFIED 20
TOTAL SUBMISSIONS 15

Table 10.0 Summary of diseases diagnosed on **field vegetable** samples submitted to the BCMA Plant Health Laboratory in 2011.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Beet	Bacterial leaf spot	*Pseudomonas syringae*	1
	Damping off	*Aphanomyces* sp. and *Fusarium* sp.	1
	Root rot	*Fusarium* sp.	1
		Sclerotinia sp.	1
Eggplant	Verticillium wilt	*Verticillium dahliae*	1
Garlic	Blue mold	*Penicillium* sp.	4
	Botrytis rot	*Botrytis* sp.	3
	Embellisia skin blotch	*Embellisia allii*	2
	Nematode damage	*Ditylenchus* sp.	1
	Purple blotch	*Alternaria* sp.	1
	White rot	*Sclerotium cepivorum*	1
Leek	Nematode contribution	*Pratylenchus* sp.	1
Lettuce	Grey mold	*Botrytis cinerea*	1
	Root rot	*Pythium* sp.	1
Onion	Bulb rot	*Penicillium* sp., *Alternaria* sp., *Botrytis allii*	1
Pea	Fusarium root rot	*Fusarium solani*	3
	Root rot	*Fusarium sp.* and *Rhizoctonia solani*	1
		Rhizoctonia solani	2
		Thielaviopsis basicola and *Rhizoctonia* sp.	1
Potato	Black scurf	*Rhizoctonia solani*	2
	Late blight	*Phytophthora infestans*	1
	Pythium leak	*Pythium ultimum*	1
	Scab	*Streptomyces scabies*	1
	Silver scurf	*Helminthosporium solani*	2
	Soft rot (tuber)	*Pectobacterium carotovorum* subsp. *carotovorum*	3
	Stem canker	*Rhizoctonia solani*	1
	Stem rot	*Pectobacterium carotovorum* subsp. *carotovorum*	2
	Tuber rot	*Fusarium* sp.	1

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Potato	Verticillium wilt	*Verticillium* sp.	1
Rhubarb	Leaf and stalk spot	*Ramularia* sp.	1
	Poor growth	*Pratylenchus* sp.	2
Shallot	Blue mold	*Penicillium* sp.	1
	White rot	*Sclerotium cepivorum*	1
Cole crop soil	Club root	*Plasmodiophora brassicae*	8
Squash	Black rot	*Didymella bryoniae*	1
	Leaf blight	*Alternaria* sp.	1
	Leaf spot	*Cladosporium* sp.	1
	Powdery mildew	*Podosphaera* sp.	1
	Pythium fruit rot	*Pythium ultimum* var. *ultimum*	1
Tomato	Bacterial canker	*Clavibacter michiganensis* subsp. *michiganensis*	3
	Late blight	*Phytophthora infestans*	1
	Sclerotinia rot	*Sclerotinia sclerotiorum*	1
Zucchini	Stem canker and wilt	*Pectobacterium carotovorum* subsp. *carotovorum*	1

DISEASED SAMPLES	66
ABIOTIC AND OTHER DISORDERS	27
TOTAL SUBMISSIONS	93

Table 11.0 Summary of diseases diagnosed on **woody ornamental** samples submitted to the BCMA Plant Health Laboratory in 2011.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Acer	Anthracnose	*Discula* sp.	2
		Kabatiella apocrypta	2
	Botrytis blight	*Botrytis cinerea*	1
	Leaf spot	*Didymosporina* sp.	1
	Root rot	*Pythium* sp.	1
	Stem canker	*Botryosphaeria* sp.	1
	Twig canker	*Nectria cinnabarina*	1
Acer freemanii	Anthracnose	*Discula* sp.	1
	Bacterial blight	*Pseudomonas syringae*	1
Acer palmatum	Leaf spot	*Alternaria* sp.	1
		Didymosporina sp.	1
		Phyllosticta sp.	1
Acer saccharinum	Twig canker	*Cytospora* sp.	1
Acer tataricum	Anthracnose	*Kabatiella apocrypta*	2
Aesculus	Leaf blight	*Botrytis cinerea*	1
	Root rot	*Rhizoctonia* sp.	1
Amelanchier	Root rot	Oomycete	1
Betula	Root rot	*Phytophthora* sp.	1
		Thielaviopsis basicola	1

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Buxus	Foliar blight	*Volutella* sp.	2
Buxus sempervirens	Leaf spot	*Phyllosticta* sp.	2
Camellia williamsii	Anthracnose	*Colletotrichum* sp.	1
Cedrus atlantica	Needle blight	*Phyllosticta* sp.	1
	Tip blight	*Sclerophoma* sp.	1
Cornus	Anthracnose	*Discula destructiva*	4
	Bacterial blight	*Pseudomonas syringae*	1
	Leaf spot	*Phyllosticta* sp.	1
Corylus contorta	Eastern filbert blight	*Anisogramma anomala**	1
Crataegus	Fire blight	*Erwinia amylovora*	1
	Root rot	*Pythium* sp.	1
Euonymus	Stem canker	*Botrytis cinerea*	1
		Phoma sp.	1
Fraxinus	Phomopsis canker	*Phomopsis* sp.	1
	Stem canker	*Fusicoccum* sp.	1
Gleditsia	Anthracnose	*Colletotrichum* sp.	1
Hydrangea	Leaf blight	*Pseudomonas syringae*	1
	Leaf spot	*Ascochyta* sp.	1
		Phyllosticta sp.	2
		Pseudomonas syringae	2
Ilex	Stem canker	*Phomopsis* sp.	1
Juniperus	Root rot	*Phytophthora* sp.	1
	Twig blight	*Kabatina juniperi*	1
Juniperus scopulorum	Juniper rust	*Gymnosporangium tubulatum*	1
Lonicera	Basal rot	*Phoma* sp.	1
	Leaf spot	*Cladosporium* sp.	1
	Root rot	*Cylindrocarpon* sp. and *Fusarium* sp.	1
Magnolia grandiflora	Root rot	*Pythium* sp.	1
Malus	Branch canker	*Cytospora* sp.	1
	Fire blight	*Erwinia amylovora*	1
	Leucostoma canker	*Leucocytospora* sp.	1
	Nectria Canker	*Nectria galligena*	1
	Stem canker	*Botryosphaeria* sp.	1
Pachysandra terminalis	Volutella blight	*Volutella pachysandricola*	1
Picea	Cytospora canker	*Cytospora* sp.	1
	Nematode contribution	*Xiphinema* sp. and possibly *Rotylenchus* sp.	1
Picea abies	Twig blight	*Botrytis cinerea*	1
Picea omorika	Needle blight	*Sclerophoma* sp.	1
Picea pungens	Sudden needle drop	*Setomelanomma holmii*	1
Pieris japonica	Stem canker	*Phomopsis* sp. and *Coniothyrium* sp.	1
Pinus	Needle cast	*Lophodermella concolor*	1

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Pinus flexilis	Needle cast	*Lophodermium* sp. and *Coniothyrium* sp.	1
Platanus	Anthracnose	*Apiognomonia veneta*	1
	Stem canker	*Nectria cinnabarina*	1
Prunus	Bacterial canker	*Pseudomonas syringae* pv *syringae*	2
	Brown rot	*Monilinia* sp.	3
	Root rot	Oomycete	1
	Shot hole	*Wilsonomyces carpophilus*	3
Prunus cerasifera	Shot hole	*Wilsonomyces carpophilus*	1
Prunus lusitanica	Phomopsis canker	*Phomopsis* sp.	1
Prunus serrulata	Phomopsis canker	*Phomopsis* sp.	1
	Shot-hole	*Wilsonomyces carpophilus*	1
Prunus yedoensis	Shot hole	*Wilsonomyces carpophilus*	1
	Twig die-back	*Botryosphaeria dothidea*	1
Pseudotsuga menziesii	Botrytis blight	*Botrytis cinerea*	1
	Needle blight	*Sclerophoma* sp.	1
Pterocarya stenoptera	Root rot	*Cylindrocarpon* sp.	1
	Leaf spot	*Phyllosticta* sp.	1
Quercus	Botryosphaeria dieback	*Botryosphaeria dothidea*	1
Quercus palustris	Botryosphaeria dieback	*Botryosphaeria* sp.	1
	Leaf spot	*Sphaeropsis* sp.	1
Rhododendron	Anthracnose	*Glomerella cingulata*	1
	Leaf spot	*Pestalotia* sp.	1
Ribes nigrum	Root rot	*Thielaviopsis basicola*	1
	Stem canker	*Botrytis cinerea*	1
Rosa	Black spot	*Diplocarpon rosae*	5
	Botrytis blight	*Botrytis cinerea*	1
	Downy mildew	*Peronospora sparsa*	6
	Leaf spot	*Gloeosporium* sp. and *Monochaetia* sp.	1
Salix	Stem canker	*Cytospora* sp.	1
	Stem canker	*Dothiorella* sp.	1
Sambucus	Root rot	*Thielaviopsis basicola*	1
Sorbus aucuparia	Stem canker	*Phomopsis* sp.	1
Syringa	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	1
	Powdery mildew	*Erysiphe* sp.	1
	Root rot	*Pythium* sp.	1
Taxus	Root rot	Oomycete	2
Thuja	Coryneum blight	*Seiridium cardinale*	1
	Foliar blight	*Phyllosticta* sp.	1
	Keithia blight	*Didymascella thujina*	2
	Root rot	Oomycete	1
		Phytophthora sp.	1

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Thuja	Twig blight	*Leptosphaeria* sp.	1
Thuja occidentalis	Root rot	*Phytophthora* sp.	2
Thuja plicata	Coryneum blight	*Seiridium cardinale*	3
Viburnum	Root rot	*Phytophthora* sp.	1
Viburnum odoratissimum	Leaf spot	*Phyllosticta* sp.	1
		Sphaceloma sp.	1

* First record of the pathogen on an ornamental host in B.C.

DISEASED SAMPLES 136
ABIOTIC AND OTHER DISORDERS 87

TOTAL SUBMISSIONS **223**

CROPS: Commercial Ornamental Nursery Crops - Diagnostic Laboratory Report
LOCATION: British Columbia
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TITLE: DISEASES DIAGNOSED ON COMMERCIAL ORNAMENTAL NURSERY CROPS IN 2011.

METHODS: Elmhirst Diagnostics & Research (EDR) provides diagnosis of diseases of commercial horticultural crops in British Columbia caused by fungi, bacteria, viruses, plant parasitic nematodes, insect pests and abiotic factors. Diagnosis is performed primarily by association of symptoms with the presence and microscopic identification of a pathogen known to cause these symptoms. In uncertain cases, or if confirmation is needed, fungal and bacterial pathogens are isolated in pure culture and identified by sporulation, or plant tissue or cultured specimens are sent to other certified laboratories for identification by polymerase chain reaction (PCR), or for DNA extraction and sequencing.

RESULTS AND COMMENTS: The majority (90%) of EDR's diagnostic work is for wholesale ornamental nurseries, although the company also does berry, potato, vegetable and turf grass diagnosis. A summary of diseases and causal agents diagnosed on ornamental crops is presented in Table 1. Problems caused by abiotic factors, *i.e.,* nutrient or pH imbalance, water stress, physiological response to growing conditions, genetic abnormalities and environmental and chemical stresses including herbicide damage, are not included.

Boxwood blight of *Buxus* sp. caused by *Cylindrocladium buxicola** was detected at a Fraser Valley nursery in November 2011 and in a landscape planting on Vancouver Island. This disease has been known in Europe since 2004, but this is the first identification in Canada. The presence of the pathogen was communicated immediately by the nursery to the Canadian Food Inspection Agency and a sample was sent to the BCMA Plant Health Laboratory, which confirmed the diagnosis. The pathogen was detected in October 2011 in the U.S., and the USDA is currently conducting a survey to determine the extent of spread in the U.S. In the table below *Phytophthora* sp.** is not *P. ramorum*** according to PCR . Similarly isolates identified as *Colletotrichum* sp.*** were *C. acutatum* according to PCR but are awaiting sequence analysis to confirm the species.

Table 1: Diseases diagnosed on commercial ornamental nursery crops by Elmhirst Diagnostics & Research in 2011

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Acer circinatum	Bacterial leaf spot/ canker	*Pseudomonas syringae*	2
Acer circinatum	Powdery mildew	Erysiphales	1
Acer ginnea	Bacterial leaf spot/ blight	*Pseudomonas syringae*	1
Alnus rubra	Rust	*Melampsoridium* sp.	1
Alnus tenuifolia	Bacterial leaf spot	*Pseudomonas syringae*	1
Andromeda polifolia	Anthracnose	*Colletotrichum* sp.	1
Arbutus menziesii	Wilt/ stem canker/ leaf spot/ root rot	*Phytophthora cinnamomi*	1
Arctostaphylos uva-ursi 'Vancouver Jade'	Anthracnose	*Colletotrichum* sp.	2

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Arctostaphylos uva-ursi 'Vancouver Jade'	Bacterial leaf spot	*Pseudomonas* sp.	2
Arctostaphylos uva-ursi 'Vancouver Jade'	Root rot	*Pythium* sp. / *Phytophthora* sp.	2
Aronia melanocarpa 'Autumn Magic'	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Arrhenatherum elatius bulbosum 'Variegatum'	Rust	not identified	1
Athyrium metallicum	Web blight	*Rhizoctonia* solani	1
Athyrium niponicum 'Red Beauty'	Web blight	*Rhizoctonia* solani	1
Betula glandulosa	Rust	*Melampsoridium* sp.	1
Betula occidentalis	Rust	*Melampsoridium* sp.	1
Betula platyphylla 'Dakota Pinnacle'	Rust	*Melampsoridium* sp.	1
Betula 'Royal Frost'	Rust	*Melampsoridium* sp.	1
Betula sp.	Rust	*Melampsoridium* sp.	1
Blechnum spicant	Root rot	*Pythium* sp.	1
Blechnum spicant	Web blight	*Rhizoctonia solani*	1
Buxus 'Green Velvet'	Volutella stem blight	*Volutella buxi*	1
Buxus sempervirens	Boxwood blight	*Cylindrocladium buxicola**	2
Buxus sempervirens 'Suffructicosa'	Boxwood blight	*Cylindrocladium buxicola**	2
Buxus sempervirens 'Suffructicosa'	Volutella stem blight	*Volutella buxi*	1
Buxus sempervirens 'Variegata'	Volutella stem blight	*Volutella buxi*	1
Buxus sempervirens x 'Green Mountain'; 'Green Balloon'; 'Green Gem'; 'Green Velvet'	Boxwood blight	*Cylindrocladium buxicola**	5
Buxus sp.	Volutella stem blight	*Volutella buxi*	1
Calamagrostis acutiflora 'Karl Foerster'	Root rot	*Pythium* sp.	1
Calluna vulgaris 'Battle of Arnhem'; 'Dark Star' ; 'Jeanette'; 'Purple'; 'Red'; 'Svenja'	Root rot	*Pythium* sp. / *Phytophthora* sp.	10
Carex mertensiana	Rust	not identified	1
Ceanothus sanguineus	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Ceanothus velutinus	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Ceanothus victoria	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Chamaecyparis nootkatensis	Dieback/ root rot	Phytophthora sp.	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Chamaecyparis nootkatensis 'Pendula'	Dieback/ root rot	*Phytophthora* sp.	1
Chamaecyparis pisifera 'Golden Mop'; 'Sungold'	Dieback/ root rot	*Phytophthora* sp.	2
Chamaecyparis sp.	Dieback/ root rot	*Pythium* sp./ *Phytophthora* sp.	1
Clematis sp.	Botrytis leaf blight	*Botrytis cinerea*	2
Cordyline indivisia	Root rot	*Pythium* sp.	1
Cornus alba 'Ivory Halo'; 'Prairie Fire'	Septoria leaf spot	*Septoria cornicola*	2
Cornus canadensis	Black root rot	*Thielaviopsis basicola*	1
Cornus stolonifera	Septoria leaf spot	*Septoria cornicola*	1
Cornus stolonifera 'White Gold'	Septoria leaf spot	*Septoria cornicola*	1
Cotoneaster acutifolia	Fire blight	Erwinia amylovora	1
Cotoneaster dammeri	Fire blight	Erwinia amylovora	1
Cupressus macrocarpa	Canker/ root rot	*Pythium* sp. / *Phytophthora* sp.	1
Dryopteris filix-mas 'Linearis Polydactyla'	Dieback	*Phoma* sp.	1
Dryopteris goldiana	Dieback	*Phoma* sp.	1
Erica carnea	Dieback/ root rot	*Pythium* sp. / *Phytophthora* sp.	1
Erica carnea alba	Dieback/ root rot	*Pythium* sp./ *Phytophthora* sp.	1
Erica carnea alba 'Springwood White'	Root rot	*Phytophthora* sp.	1
Erica sp.	Dieback/ root rot	*Phytophthora* sp.	1
Erica x darleyensis	Root rot	*Phytophthora* sp.	1
Erica x darleyensis 'Kramers Red'; 'Silberschmelze'	Root rot/ shoot tip dieback	*Phytophthora* sp.	2
Euonymus fortunei 'Emerald Gaiety'; 'Emerald 'N Gold'	Bacterial leaf spot	*Pseudomonas syringae*	2
Euonymus sp.	Bacterial leaf spot/ blight	*Pseudomonas syringae*	2
Forsythia x *intermedia* 'Fiesta'	Bacterial leaf spot	*Pseudomonas syringae*	1
Forsythia x 'Kumson'	Bacterial leaf spot	*Pseudomonas syringae*	1
Gaultheria procumbens	Anthracnose	*Colletotrichum gloeosporioides*	3
Gaultheria procumbens	Botrytis berry rot/leaf spot	*Botrytis cinerea*	1
Gentiana acaulis	Stem rot	*Phoma* sp. + *Fusarium* sp.	1
Gerbera Garvinea® 'Cindy', 'Santana', 'Sylvana White'	Leaf spot	*Ascochyta gerberae*	3
Heuchera micrantha	Rust	*Puccinia heucherae*	1
Heuchera x 'Silver Scrolls'	Rust	*Puccinia heucherae*	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Heuchera x *villosa* 'Caramel'	Rust	*Puccinia heucherae*	1
Holodiscus discolor	Bacterial canker/ leaf spot	*Pseudomonas syringae*	2
Holodiscus discolor	Leaf spot	*Cylindrosporium* sp.	1
Hydrangea paniculata 'Limelight'	Bacterial Leaf spot	*Pseudomonas syringae*	1
Ilex mespili 'Blue Prince'; 'Blue Princess'	Root rot	*Phytophthora* sp.	2
Ilex sp.	Leaf blight	*Phytophthora ilicis*	1
Itea virginica 'Little Henry'	Bacterial leaf spot	not identified	1
Juniperus chinensis 'Old Gold'	Root rot	*Phytophthora* sp.	1
Juniperus communis	Root rot	*Phytophthora* sp.	1
Juniperus horizontalis	Root rot	*Phytophthora* sp.	1
Juniperus horizontalis 'Bar Harbour'; 'Blue Chip'; 'Icee Blue'; 'Prince of Wales'; 'Wiltoni'; 'Youngstown'	Root rot	*Phytophthora* sp.	5
Juniperus procumbens 'Nana'	Root rot	*Phytophthora* sp.	1
Juniperus sabina 'Broadmoor'; 'Blue Danube'; 'Blue Forest'; 'Calgary Carpet'; 'Moor-Dense'; 'Scandia'; 'Tamariscifolia'	Root rot	*Phytophthora* sp.	7
Juniperus scopulorum	Root rot	*Phytophthora* sp.	1
Juniperus scopulorum 'Green Ice'; 'Medora'	Root rot/ foliar blight	*Phytophthora* sp.**	3
Juniperus sp.	Root rot	*Phytophthora* sp.	2
Juniperus squamata 'Blue Star'	Root rot	*Phytophthora cinnamomi*	2
Juniperus squamata 'Blue Star'	Kabatina blight	*Kabatina* sp.	1
Juniperus squamata 'Holger'	Dieback/ root rot	*Phytophthora* sp.	1
Lavandula angustifolia 'Munsted'	Bacterial blight	*Pseudomonas syringae*	1
Lavandula angustifolia 'Hidcote Blue'	Root Rot	*Pythium* sp. / *Phytophthora* sp.	1
Lavandula 'Green Summer'	Botrytis	*Botrytis cinerea*	1
Lavandula 'Lodden Blue'	Bacterial blight	*Pseudomonas syringae*	3
Lavandula sp.	Bacterial leaf spot	*Pseudomonas syringae*	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Lavandula sp.	Black root rot	*Thielaviopsis basicola*	1
Lavandula sp.	Botrytis grey mould	*Botrytis cinerea*	1
Lavandula sp.	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Lavandula stoechas	Bacterial blight	*Pseudomonas syringae*	1
Lavandula stoechas	Yellowing/ black root rot	*Thielaviopsis basicola*	1
Lavandula stoechas "Silver Summer"	Bacterial blight	*Pseudomonas syringae*	1
Lavandula stoechas "Silver Summer"	Dieback	*Botrytis cinerea*	1
Lavendula stoechas 'Anouk'	Black root rot	*Thielaviopsis basicola*	1
Linnaea borealis	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Linnaea borealis	Yellowing/ black root rot	*Thielaviopsis basicola*	1
Lithodora diffusa 'Star'	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Lithodora diffusa 'Star'	Yellowing/ black root rot	*Thielaviopsis basicola*	1
Lonicera ciliosa	Powdery mildew	Erysiphales	1
Lonicera involucrata	Powdery mildew	Erysiphales	1
Lupinus polyphyllus	Downy mildew	*Peronospora trifoliorum*	1
Lupinus polyphyllus	Powdery mildew	Erysiphales	1
Magnolia loebneri 'Leonard Messel'	Bacterial leaf spot/ blight	*Pseudomonas syringae*	1
Magnolia soulangeana 'Susan'	Bacterial leaf spot/ blight	*Pseudomonas syringae*	1
Magnolia x 'Yellow Bird'	Bacterial stem canker	*Pseudomonas syringae*	1
Mahonia aquifolium	Bacterial leaf spot	*Pseudomonas syringae*	1
Mahonia aquifolium	Powdery mildew	Erysiphales .	1
Mahonia aquifolium	Rust	not identified	1
Mahonia aquifolium 'compacta'	Rust	not identified	1
Malus fusca	Powdery mildew	Erysiphales	1
Matteucia struthiopteris	Dieback	*Phoma* sp.	1
Myrica californica	Bacterial blight/ dieback	*Pseudomonas syringae*	1
Myrica californica	Root Rot	*Phytophthora* sp.	1
Oemlaria cerasiformis	Root Rot	*Pythium* sp. / *Phytophthora* sp.	1
Onoclea sensibilis	Stem dieback	*Phoma* sp.	1
Osmanthus heterophylla 'Goshiki'	Anthracnose	*Colletotrichum* sp.	1
Pachystima myrsinites	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Parthenocissus quinquefolia	Bacterial leaf spot/shot-hole	*Pseudomonas syringae*	1
Parthenocissus quinquefolia 'Engelmannii'	Downy mildew	*Plasmopara* sp.	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Phormium cookianum 'Flamingo'; 'Pink Panther'; 'Tricolor'	Root rot	*Pythium* sp.	3
Photinia cassini 'Pink Marble'	Leaf spot	*Diplocarpon mespili*	1
Photinia x fraseri	Leaf spot	*Diplocarpon mespili*	1
Picea abies 'Ohlendorfii'	Root rot	*Phytophthora* sp.	1
Picea glauca 'Little Gem'; 'Little Globe'	Root rot	*Phytophthora* sp.	1
Picea omorika	Root Rot	*Phytophthora* sp.	1
Picea pungens 'Procumbens'	Root rot/ dieback	*Phytophthora* sp.	1
Picea sp.	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Pieris japonica 'Forest Flame'; 'Mountain Fire'; 'Passion'	Leaf spot	*Phytophthora* sp.**	3
Pinus canariensis	Yellowing/ Root Rot	*Pythium* sp./ *Phytophthora* sp.	1
Pinus contorta latifolia	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Pinus mugo pumilio	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Pinus nigra	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Pinus ponderosa	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Polystichum acrostichoides	Web blight	*Rhizoctonia solani*	1
Polystichum munitum	Root rot	*Pythium* sp.	1
Polystichum munitum	Web blight	*Rhizoctonia* solani	1
Polystichum polyblepharum	Root rot/ dieback	*Pythium* sp.	1
Polystichum setiferum 'Herrenhausen'	Root rot/ dieback	*Pythium* sp.	1
Polystichum sp.	Dieback	*Phoma* sp.	1
Populus tremula 'Erecta'	Root rot	*Pythium* sp./ *Phytophthora* sp.	1
Populus tremula 'Erecta'	Root rot	*Thielaviopsis basicola*	1
Populus tremula 'Erecta'	Root rot	*Cylindrocarpon* sp.	1
Potentilla fruticosa 'Abbotswood'	Powdery mildew	Erysiphales	1
Potentilla sp.	Powdery mildew	Erysiphales	1
Prunus cerasus x 'Evans'	Bacterial leaf spot/ shot-hole	*Pseudomonas syringae*	1
Prunus cerasus x 'Evans'	Cherry leaf spot	*Blumeriella jaapii*	1
Prunus cerasus x 'SK Carmine Jewel'	Bacterial leaf spot/ shot-hole	*Pseudomonas* syringae	1
Prunus cerasus x 'SK Carmine Jewel'	Cherry leaf spot	*Blumeriella jaapii*	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Prunus cerasus x'SK Cupid'	Bacterial leaf spot/ shot-hole	*Pseudomonas* syringae	1
Prunus triloba 'Multiplex'	Bacterial leaf spot/ shot-hole	*Pseudomonas syringae*	1
Prunus triloba 'Multiplex'	Cherry leaf spot	*Blumeriella jaapii*	1
Prunus virginiana	Bacterial leaf spot/ shot-hole	*Pseudomonas syringae*	1
Prunus virginiana	Cherry leaf spot	*Blumeriella jaapii*	1
Pseudotsuga menziesii	Root rot/ dieback	*Phytophthora* sp.	1
Quercus garryana	Powdery mildew	Erysiphales	1
Quercus macrocarpa	Rust	not identified	1
Rhododendron impeditum	Root rot	*Phytophthora* sp.	1
Rhododendron 'Lem's Cameo'; 'Polynesian Sunset'; 'Rose Walloper'	Anthracnose	*Colletotrichum* sp.***	3
Rhododendron macrophyllum	Root rot	*Phytophthora cinnamomi*	1
Rhododendron 'Nova Zembla'	Root rot	*Phytophthora cinnamomi*	1
Rhododendron x 'Hellikki'	Root rot	*Phytophthora* sp.	1
Ribes sanguineum	Powdery mildew	*Sphaerotheca mors-uvae*	1
Ribes sanguineum	Root rot	*Phytophthora* sp.	1
Ribes sanguineum 'King Edward VII'	Leaf spot	*Ramularia* sp.	1
Ribes sanguineum 'King Edward VII'	Powdery mildew	*Sphaerotheca mors-uvae*	1
Rosa acicularis	Black spot	*Diplocarpon rosae*	1
Rosa acicularis	Powdery mildew	*Sphaerotheca pannosa*	1
Rosa 'Adelaide Hoodless'	Black spot	*Diplocarpon rosae*	1
Rosa nutkana	Downy mildew	*Peronospora sparsa*	1
Rosa woodsii	Black spot	*Diplocarpon rosae*	1
Rosmarinus officinalis	Bacterial blight / leaf spot	*Pseudomonas syringae*	1
Rosmarinus officinalis	Powdery mildew	Erysiphales	1
Rosmarinus officinalis	Root rot	*Pythium* sp. */ Phytophthora* sp.	1
Rosmarinus officinalis 'Upright Blue'	Leaf spot/ blight	*Pseudomonas syringae*	1
Rosmarinus 'Spedy'	Powdery mildew	Erysiphales sp.	1
Salix lasiocarpa	Rust	*Melampsora* sp.	1
Salix sitchensis	Rust	*Melampsora* sp.	1
Sedum sp.	Root rot	*Pythium* sp.	1
Sequoiadendron giganteum	Dieback/ root rot	*Phytopththora* sp.	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Sequoiadendron sp.	Stem canker	*Botrytis* sp.	1
Sorbus sitchensis	Powdery mildew	Erysiphales sp.	1
Spiraea douglasii	Powdery mildew	Erysiphales sp.	1
Spiraea japonica 'Darts Red'; 'Neon Flash'; 'Shirbana'	Leaf spot	*Pseudomonas syringae*	3
Spiraea sp.	Leaf spot	*Septoria* sp.	1
Symphoricarpos albus	Powdery mildew	Erysiphales	1
Symphoricarpos sp. 'Green'; 'Pink'; 'Red'; 'White'	Powdery mildew	Erysiphales	1
Syringa meyeri 'Palibin'	Stem canker	*Phytophthora* sp.**	2
Syringa patula 'Miss Kim'	Root rot	*Phytophthora* sp.	1
Syringa vulgaris 'Dappled Dawn'; 'Prairie Petite'; 'Sensation'	Bacterial leaf spot/ blight	*Pseudomonas syringae*	4
Syringa x 'Tinkerbelle'	Stem canker/root rot	*Phytophthora* sp.	1
Thuja occidentalis	Dieback/ root rot	*Phytophthora* sp.	1
Thuja occidentalis 'Brandon'; 'Golden Tuffet'; 'Rheingold'; Smaragd'; 'Teddy'	Dieback/ root rot	*Phytophthora* sp.	5
Thuja occidentalis 'Brandon'; 'Nigra'; 'Smaragd'; 'Wareana'; 'Woodwardii'	Kabatina blight	*Kabatina thujae*	5
Vaccinium alaskaense	Dieback/ root rot	*Phytophthora* sp.	1
Vaccinium membranaceum	Stem canker/ root rot	*Phytophthora cinnamomi*	1
Vaccinium parviflorum	Stem canker/ root rot	*Phytophthora cinnamomi*	1
Vaccinium sp.	Dieback/ root rot	*Phytophthora* sp.	1
Vaccinium x 'Top Hat'	Bacterial leaf spot	*Pseudomonas syringae*	1
Viburnum caricephalum	Bacterial leaf Spot	*Pseudomonas syringae*	1
Viburnum opulus 'Sterile'	Bacterial leaf spot	*Pseudomonas syringae*	1
Weigela florida "Variegata"	Leaf spot	*Phoma/Ascochyta* sp.	1
Weigela florida 'Red Prince'; 'Variegata'	Foliar nematodes	*Aphelenchoides* sp.	2
Yucca filamentosa 'Color Guard'	Bacterial soft rot	*Erwinia carotovora*	1
No. of samples with diseases or nematodes 2011			**274**

CROPS: Commercial crops – Diagnostic Laboratory Report
LOCATION: Saskatchewan

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TITLE: DISEASES DIAGNOSED ON CROP SAMPLES SUBMITTED IN 2011 TO THE SASKATCHEWAN MINISTRY OF AGRICULTURE CROP PROTECTION LABORATORY

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 (*Ulmus americana*) and Siberian elm (*U. pumila*) samples are tested for DED. Samples are submitted to the Crop Protection Laboratory by personnel from the Saskatchewan Ministry of Agriculture, the Saskatchewan Ministry of Environment, individual growers, crop insurance adjustors, agribusiness representatives and market/home gardeners. Samples have also been accepted from clients located in Alberta. Disease diagnoses are accomplished by naked eye and microscopic visual examination and isolation on artificial media. Virus and bacterial diagnoses are based on visible symptoms. ELISA testing was used to identify *wheat streak mosaic virus* (WSMV) in 2011.

RESULTS: From April 1 to November 30, 2011, the Crop Protection Laboratory received a total of 514 disease/disorder samples, 61% (315 samples) of which were elm samples submitted for DED testing. Categories and percentages of samples received (excluding DED samples) were: special crops (18%), cereals (31%), oilseeds (22%), shade trees (other than elm) (20%), vegetables (6%) fruit (1%), forages (1%) and ornamentals (1%). Samples which were submitted for disease identification, but were attributed to insect damage are not included in this report. Summaries of diseases and causal agents diagnosed on crop samples submitted to the Crop Protection Laboratory in 2011 are presented in Tables 1-8 by crop category.

Table 1: Diseases of **fruit crops** submitted to the Crop Protection Laboratory in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Cherry	Brown rot	*Monilinia fructicola*	1
	Shot-hole	*Wilsonomyces carpophilus*	1
	Bacterial canker	*Pseudomonus syringae pv morsprunorum*	1
Saskatoon berry (*Amelanchier alnifolia*)	Entomosporium leaf spot	*Entomosporium mespili*	1

Table 2: Diseases of **cereal crops** submitted to the Crop Protection Laboratory in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Barley	Head blight	*Fusarium* spp	2
	Barley yellow dwarf	*Barley Yellow Dwarf Virus*	1
	Root rot	*Bipolaris sorokiniana*	3
	Spot blotch	*Bipolaris sorokiniana*	1
	Chemical injury		2
	Nutrient deficiency		1
	Environmental injury	Excess moisture	2
Durum wheat	Head blight	*Fusarium* spp.	2
	Common root rot	*Bipolaris sorokiniana*	1
	Physiological leaf spot	*Chlorine deficiency*	1
	Herbicide injury		3
Fall Rye	Cottony snow mold	*Coprinus psychromorbidus*	1
	Environmental injury	Freezing damage	1
Oat	Cladosporium rot	*Cladosporium herbarum*	1
	Red leaf	*Barley Yellow Dwarf Virus*	2
Wheat	Barley yellow dwarf	*Barley Yellow Dwarf Virus*	2
	Fusarium head blight	*Fusarium* spp.	2
	Leaf and glume blotch	*Stagonospora nodorum*	10
	Leaf rust	*Puccinia triticina*	3
	Wheat streak mosaic	*Wheat Streak Mosaic Virus*	1
	Speckled snow mold	*Typhula ishikariensis*	1
	Common root rot	*Bipolaris sorokiniana*	4
	Environmental injury	Excess moisture	2
	Chemical injury	Glyphosate injury	1
	Cladosporium rot	*Cladosporium herbarum*	1

Table 3: Diseases of **forage legume and grass crops** submitted to the Crop Protection Laboratory in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Alfalfa	Lepto leaf spot	*Leptotrochila medicaginis*	1
	Spring leaf spot	*Phoma medicaginis*	1

Table 4: Diseases of **oilseed crops** submitted to the Crop Protection Laboratory in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Canola	Black spot	*Alternaria brassicae*	2
	Grey stem	*Pseudocercosporella capsellae*	1
	Phoma leaf spot	*Phoma lingam*	1
	Root rot	*Rhizoctonia* spp.	1
	Chemical injury	Herbicide damage	22
	Nutrient deficiency	Sulfur	1
Flax	Chemical injury	Herbicide damage	6
	Pasmo	*Septoria linicola*	1
Sunflower	Basal rot	*Fusarium* spp.	1

Table 5: Diseases of **ornamental plants** submitted to the Crop Protection Laboratory in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Cedar (*Thuja* sp.)	Canker	*Botryosphaeria* sp.	1
	Canker	*Cytospora* sp.	1
	Canker	Unidentified	1
	Environmental injury		1
Cotoneaster	Fireblight	*Erwinia amylovora*	1
Crabapple	Scab	*Venturia inaequalis*	1
	Canker	*Cytospora* sp	1
	Environmental injury		1
Geranium	Nutrient deficiency		1
Juniper	Twig blight	*Phomopsis juniperovora*	2
Larch	Environmental injury		1
Lilac	Root rot	*Fusarium* sp, *Cylindrocarpon* sp	1
Mountain ash (*Sorbus* sp.)	Canker	*Botryosphaeria* sp.	1
	Leaf spot	*Phyllosticta* sp.	1
	Iron deficiency	Nutrient	2
Rose	Herbicide injury		1
	Nutrient deficiency		1

Table 6: Diseases of **shade trees** submitted to the Crop Protection Laboratory in 2011

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Ash (Fraxinus sp.)	Anthracnose	*Gloesporium aridum*	1
Aspen (*Populus* spp.)	Marssonina leaf spot	*Marssonina populi*	2
	Venturia leaf and shoot blight		
	Venturia leaf and shoot blight	*Venturia* sp.	1
Elm (*Ulmus* spp.)	Dutch elm disease	*Ophiostoma novae-ulmi*	128*
	Dothiorella wilt	*Dothiorella ulmi*	2
	Bacterial scorch	*Xylella fastidiosa*	7
Flowering crabapple (*Malus* sp.)	Scab	*Spilocea pomi* (*Venturia inaequalis*)	1
Hawthorn (*Crateagus* sp.)	Hawthorn rust	*Gymnosporangium* spp.	1
Maple (*Acer* spp.)	Iron chlorosis		1
	Chemical injury	Phenoxy herbicide Injury	2
	Environmental injury		1
Mountain ash (*Sorbus* sp.)	Black Rot	*Botryosphearia obtusa*	1
Spruce (*Picea* spp.)	Rhizosphaera needlecast	*Rhizosphaera kalkoffii*	2
	Stigmina needlecast	*Stigmina lautii*	1
	Chemical injury	Glyphosate injury	1

*the remaining 178 American elm submissions were negative for known pathogens of elm

Table 7: Diseases of **vegetable crops** submitted to the Crop Protection Laboratory in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Eggplant	White mold	*Sclerotinia sclerotiorum*	1
Tomato	Late blight	*Phytophthora infestans*	1
	Bacterial spot	*Xanthomonas campestris* pv. *vesicatoria*	1

Table 8: Diseases of **special crops** submitted to the Crop Protection Laboratory in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Canary Seed	Fusarium head blight	*Fusarium* spp.	1
	Fusarium root rot	*Fusarium* spp.	1
	Chemical injury	*Glyphosate Injury*	1
Cumin	Alternaria leaf blight	Alternaria spp.	1
	Ascochyta leaf blight	*Ascochyta* spp.	1
	Fusarium root rot	*Fusarium* spp.	1
	Root decay	*Zygomycete*	1
Lentil	Anthracnose	*Colletotrichum truncatum*	1
	Stemphylium leaf blight	*Stemphylium* spp.	1
	Root rot	*Fusarium* spp.	7
	Root rot	*Rhizoctonia solani*	1
	Chemical injury	Group 2 herbicide Injury	7
	Environmental injury	Excess moisture/ poor root development	4
Field pea	Chemical injury	Herbicide Injury	3
	Leaf and pod spot	*Ascochyta pisi*	2
	Root rot	*Fusarium solani*	4
	Septoria leaf blotch	*Septoria pisi*	1
	Wilt	*Fusarium oxysporum*	1
Soybean	Bacterial blight	*Pseudomonas savastonoi* pv. *glycinea*	1

CROP: Diagnostic Laboratory Report
LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: 2011 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 30, 2011.

Table 1. Summary of diseases diagnosed on **forage legume crops** submitted to the MAFRI Crop Diagnostic Centre in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Alfalfa	Common leaf spot	*Pseudopeziza medicaginis*	2
	Root rot	*Fusarium* sp.	1
	Spring black stem and leaf spot	*Phoma medicaginis*	1
	Stemphylium leaf spot	*Stemphylium* sp.	1
	Environmental injury		1
	Herbicide injury		1
Birdsfoot trefoil	Flower blight	*Botrytis cinerea*	1
Clover	Root rot	*Fusarium* sp.	1

Table 2. Summary of diseases diagnosed on **grasses** submitted to the MAFRI Crop Diagnostic Centre in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Perennial rye grass	Anthracnose	*Colletotrichum graminicola*	1
	Leaf spot	*Drechslera* sp.	1
Timothy	Anthracnose	*Colletotrichum graminicola*	1
	Leaf spot	*Drechslera phlei*	1
	Purple spot	*Cladosporium phlei*	1
Turf grasses	Fusarium blight	*Fusarium* spp.	2

Table 3. Summary of diseases diagnosed on **greenhouse crops** submitted to the MAFRI Crop Diagnostic Centre in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Artichoke	Environmental injury		1
Bedding plants	Grey mould	*Botrytis cinerea*	1
Eggplant	Leaf spot	*Phoma* sp.	1
Hydrangea	Leaf spot	*Phyllosticta* sp.	1
	Leaf spot	*Xanthomonas* sp.	1
Lily, Prairie	Grey mould	*Botrytis cinerea*	1
Peony	Flower blast	*Botrytis cinerea*	1
Radish	Root rot	*Rhizoctonia solani*	1
Star-flowered Solomon's Seal	Leaf spot	*Alternaria* sp.	1
Tomato	Grey mould	*Botrytis cinerea*	2
	Herbicide injury		1
	Nutrient deficiency		1

Table 4. Summary of diseases diagnosed on **herbaceous ornamentals** submitted to the MAFRI Crop Diagnostic Centre in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Blanket flower	Root rot	*Pythium* sp.	1
Echinacea	Crown rot	*Sclerotinia sclerotiorum, Pythium* sp.	1
	Grey mould	*Botrytis cinerea*	1
Fig, Weeping (*Ficus benjamina*)	Dieback	*Phomopsis* sp.	1
Gentian	Grey mould	*Botrytis cinerea*	1
Geranium	Nutrient deficiency		1
Hemerocallis	Stem rot	*Botrytis cinerea*	1
Hollyhock	Rust	*Puccinia malvacearum*	1
Hosta	Root rot	*Fusarium avenaceum*, *Cylindrocarpon* sp.	1
Iris (*Iris* × *germanica*)	Rhizome rot	*Botrytis convoluta*	2
	Rhizome rot	*Penicillium* spp.	1

Table 5. Summary of diseases diagnosed on **cereal crops** submitted to the MAFRI Crop Diagnostic Centre in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Wheat	Bacterial blight	*Pseudomonas syringae*	4
	Black head moulds	*Epicoccum* sp., *Alternaria* sp.	11
	Black point	*Fusarium* spp., *Alternaria* sp.	1
	Common root rot	*Cochliobolus sativus*	11
	Fusarium head blight	*Fusarium* spp.	4
	Leaf rust	*Puccinia triticina*	7
	Powdery mildew	*Blumeria graminis*	5
	Root rot	*Fusarium* spp., *Pythium* sp., *Rhizoctonia solani*	15
	Septoria leaf spot	*Septoria* spp.	2
	Spot blotch	*Bipolaris sorokiniana*	1
	Tan spot	*Pyrenophora tritici-repentis*	6
	Wheat streak mosaic	*Wheat Streak Mosaic Virus*	4
	Physiological disorders	undetermined	4
	Physiological leaf spot	chloride deficiency	5
	Environmental injury		28
	Herbicide injury		23
	Nutrient deficiency		2
Barley	Barley yellow dwarf	*Barley Yellow Dwarf Virus*	3
	Common root rot	*Cochliobolus sativus*	3
	Net blotch, spot form	*Drechslera teres* f. sp. *maculata*	1
	Root rot	*Fusarium* spp., *Rhizoctonia solani*	5
	Root rot	*Pythium* spp.	2
	Scald	*Rhynchosporium secalis*	1
	Spot blotch	*Bipolaris sorokiniana*	1
	Herbicide injury		3
	Environmental injury		5
	Nutrient deficiency		3
Oat	Barley yellow dwarf	*Barley Yellow Dwarf Virus*	1
	Bacterial blight	*Pseudomonas syringae*	4
	Crown rust	*Puccinia coronata* f. sp. *avenae*	2
	Leaf spot	*Stagonospora avenae*	3
	Root rot	*Fusarium* spp., *Rhizoctonia solani*	2
	Stem rust	*Puccinia graminis* f. sp. *avenae*	1
	Environmental injury		3
	Herbicide injury		3

Table 6. Summary of diseases diagnosed on **vegetable crops** submitted to the MAFRI Crop Diagnostic Centre in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Asparagus	Stem blight	*Botrytis cinerea, Ascochyta* sp.	1
	Rust	*Puccinia asparagi*	1
	Herbicide injury		1
Beet, red	Leaf spot	*Alternaria* sp.	1
	Leaf spot	*Phoma betae*	1
Cabbage	Fusarium yellows	*Fusarium oxysporum*	1
Cantaloupe	Leaf spot	*Alternaria* sp., *Phoma* sp.	1
	Environmental injury		1
Carrot	Alternaria leaf blight	*Alternaria dauci*	1
Cauliflower	Fusarium yellows	*Fusarium oxysporum*	1
Cucumber	Leaf spot	*Alternaria* sp.	1
Onion	Blue mould	*Penicillium* sp.	1
	Bulb rot	*Botrytis cinerea*	1
	Downy mildew	*Peronospora destructor*	1
	Fusarium basal plate rot	*Fusarium oxysporum*	6
	Neck rot	*Botrytis allii*	5
	Herbicide injury		1
Pumpkin	Fruit rot	*Sclerotinia sclerotiorum*	1
	Leaf spot	*Alternaria* sp.	1
Swiss chard	Leaf spot	*Phoma* sp., *Alternaria* sp.	1
Tomato	Early blight	*Alternaria solani*	1
	Late blight	*Phytophthora infestans*	1
	Septoria leaf spot	*Septoria lycopersici*	2
	Physiological disorder		1
Watermelon	Fruit rot	*Pythium* sp.	1
	Environmental injury		1
Zucchini	Fruit rot	*Fusarium oxysporum, F. graminearum*	1

Table 7. Summary of diseases diagnosed on **oilseed crops** submitted to the MAFRI Crop Diagnostic Centre in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Canola	Aster yellows	Aster yellows phytoplasma	2
	Blackleg	*Leptosphaeria maculans*	14
	Black spot	*Alternaria brassicae*	4
	Downy mildew	*Peronospora parasitica*	3
	Root rot	*Fusarium* spp.	10
	Root rot	*Rhizoctonia solani*	2
	Seedling blight	*Rhizoctonia solani*	2
	Wilt	*Verticillium dahliae*	1
	White rust	*Albugo candida*	1
	Environmental injury		15
	Herbicide injury		49
Camelina	Black spot	*Alternaria brassicae*	1
	Root rot	*Rhizoctonia solani*	1
Flax	Pasmo	*Septoria linicola*	1
	Physiological disorder		1
	Root rot	*Fusarium oxysporum*	1
	Environmental injury		2
	Herbicide injury		7
Sunflower	Downy mildew	*Plasmopara halstedii*	2
	Head rot	*Sclerotinia sclerotiorum*	1
	Stem rot	*Sclerotinia sclerotiorum*	1
	Wilt	Verticillium sp.	1
	Herbicide injury		2

Table 8. Summary of diseases diagnosed on **shelterbelt trees** and **woody ornamentals** submitted to the MAFRI Crop Diagnostic Centre in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Ash (*Fraxinus* sp.)	Anthracnose	*Gloeosporium aridum*	3
	Canker	*Cytospora* sp.	1
	Environmental injury		2
	Herbicide injury		3
Basswood	Canker	unidentified	1
	Herbicide injury		1
Cedar (*Thuja* sp.)	Canker	*Botryosphaeria* sp.	1
	Environmental injury		2
Cotoneaster	Fireblight	*Erwinia amylovora*	1
Crabapple	Canker	*Cytospora* sp.	1
	Scab	*Venturia inaequalis*	1
	Herbicide injury		1
Ulmus americana (American elm)	Canker	*Botryodiplodia* sp.	9
	Canker	*Botryosphaeria* sp.	2
	Canker	*Cytospora* sp.	1
	Dothiorella wilt	*Dothiorella* sp.	1
	Dutch elm disease	*Ophiostoma ulmi*	86
	Verticillium wilt	*Verticillium* spp.	3
Juniper	Twig blight	*Phomopsis* sp.	1
Lilac	Root rot	*Fusarium* spp., *Cylindrocarpon* sp.	1
Maple (*Acer* sp.)	Environmental injury		1
Mountain ash (*Sorbus* sp.)	Canker	*Botryosphaeria* sp.	1
	Leaf spot	*Phyllosticta* sp.	1
	Iron chlorosis	nutrient deficiency	2
Oak (*Quercus macrocarpa)*	Anthracnose	*Discula* sp.	1
	Canker	unidentified	1
Poplar (*Populus* spp.)	Canker	*Cytospora* sp.	2
	Canker	unidentified	2
	Leaf spot	*Marssonina* sp.	2
	Linospora leaf blight	*Linospora tetraspora*	1
	Iron chlorosis	nutrient deficiency	1
	Herbicide injury		2
Spruce (*Picea* spp.)	Canker	unidentified	2
	Cytospora canker	*Leucostoma kunzei*	2
	Needle blight	*Lirula* sp.	4

Table 8 (contd.)

Spruce (*Picea* spp.)	Rhizosphaera needlecast	*Rhizosphaera kalkhoffii*	1
	Rust, needle	*Chrysomyxa* sp.	1
	Stigmina needle blight	*Stigmina lautii*	9
	Twig blight	*Phomopsis* sp.	1
	Seedling blight	*Fusarium* sp., *Cylindrocarpon* sp.	1
	Environmental injury		16
	Herbicide injury		3
	Nutrient deficiency		1
Willow	Canker	*Cytospora* sp.	1
	Willow scab and Black canker	*Venturia saliciperda*, *Glomerella miyabeana*	3
	Iron chlorosis	nutrient deficiency	1

Table 9. Summary of diseases diagnosed on **potato crops** submitted to the MAFRI Crop Diagnostic Centre in 2011.

SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Bacterial soft rot	*Pectobacterium carotovorum* subsp. *carotovorum*	4
Blackleg	*Pectobacterium carotovorum* subsp. *atrosepticum*	4
Black dot, on stems	*Colletotrichum coccodes*	3
Black dot, on tubers	*Colletotrichum coccodes*	1
Brown spot	*Alternaria alternata*	1
Early blight, foliar	*Alternaria solani*	4
Late blight, foliar	*Phytophthora infestans*	16
Late blight, tuber	*Phytophthora infestans*	2
Leak	*Pythium* sp.	1
Leaf spot	*Colletotrichum coccodes*	1
Rhizoctonia stem and stolon canker	*Rhizoctonia solani*	2
Pink eye	Unknown	1
Pink rot	*Phytophthora erythroseptica*	2
Root rot	*Fusarium solani, Fusarium* spp.	2
Rubbery rot	*Geotrichum candidum*	1
Scab, common	*Streptomyces* spp.	3
Scab, powdery	*Spongospora subterranea*	4
Verticillium wilt	*Verticillium dahliae*	3
Physiological disorders		6
Herbicide injury		3
Environmental injury		1

Table 10. Summary of diseases diagnosed on **fruit crops** submitted to the MAFRI Crop Diagnostic Centre in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Apple	Canker	*Botryosphaeria* sp.	1
	Canker	*Cytospora* sp.	1
	Canker	*Diplodia* sp.	1
	Canker	*Phomopsis* sp.	1
	Canker	undetermined	3
	Fireblight	*Erwinia amylovora*	1
	Scab	*Venturia inaequalis*	1
	Twig canker	*Nectria cinnabarina*	1
	Herbicide injury		1
Cherry, dwarf sour (*Prunus cerasus*)	Environmental injury		1
Chokecherry (*Prunus virginiana*)	Shot hole	*Blumeriella jaapii*	1
Pear	Environmental injury		1
Raspberry	Cane blight	*Coniothyrium fuckelii*	1
	Fireblight	*Erwinia amylovora*	1
	Flower blight	*Botrytis cinerea*	1
	Fruit rot	*Botrytis cinerea*	2
	Powdery mildew	*Sphaerotheca macularis*	2
	Spur blight	*Phoma* sp.	2
	Iron chlorosis	nutrient deficiency	1
Saskatoon berry	Dieback	*Cytospora* sp.	4
	Fruit rot	*Botrytis cinerea*	1
	Nectria twig canker	*Nectria cinnabarina*	1
	Rust	*Gymnosporangium* sp.	1
	Twig canker	*Tubercularia* sp.	1
	Nutrient deficiency		1
Strawberry	Black root rot	*Fusarium* spp., *Cylindrocarpon* sp.	1
	Crown rot	*Phytophthora* sp.	1
	Leaf scorch	*Diplocarpon earlianum*	2
	Leaf spot	*Mycosphaerella fragariae*	2
	Root rot	*Rhizoctonia solani*	1
	Nutrient deficiency		1

Table 11. Summary of diseases diagnosed on **special field crops** submitted to the MAFRI Crop Diagnostic Centre in 2011.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Buckwheat	Herbicide injury		1
Canaryseed	Root rot	*Rhizoctonia solani*, *Fusarium* spp.	1
Corn	Goss's wilt	*Corynebacterium michiganensis* subsp. *nebraskensis*	2
	Environmental injury		3
	Herbicide injury		1
Fababean	Root rot	*Fusarium solani*	1
Field bean	Anthracnose	*Colletotrichum lindemuthianum*	1
	Root rot	*Rhizoctonia solani*	1
Field pea	Anthracnose	*Colletotrichum pisi*	2
	Ascochyta leaf spot	*Ascochyta* sp.	2
	Root rot	*Fusarium* spp., *Pythium* sp., *Rhizoctonia solani*	5
Hemp	Root rot	*Fusarium* spp.	2
	Herbicide injury		1
Soybean	Anthracnose	*Colletotrichum* sp.	2
	Bacterial blight	undetermined	2
	Brown spot	*Septoria glycines*	6
	Downy mildew	*Peronospora manshurica*	1
	Leaf spot	*Phyllosticta* sp.	1
	Root rot	*Fusarium* spp., *Pythium* spp., *Rhizoctonia solani*	8
	Root rot	*Phytophthora sojae*	19
	Stem rot	*Phomopsis* sp.	2
	Environmental injury		9
	Herbicide injury		11
	Nutrient deficiency		5

CROP: Vegetable Crops – Diagnostic Laboratory Report
LOCATION: Bradford/Holland Marsh, Ontario

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www.uoguelph.ca/muckcrop/

TITLE: DISEASES DIAGNOSED ON VEGETABLE CROPS SUBMITTED TO THE MUCK CROPS RESEARCH STATION DIAGNOSTIC LABORATORY IN 2011

METHODS: As part of the integrated pest management (IPM) program, the plant disease diagnostic laboratory of the Muck Crops Research Station (MCRS), University of Guelph, provides diagnosis and control recommendations for diseases of vegetable crops to growers in the Bradford/Holland Marsh, and surrounding area of Ontario. The program objectives are to scout growers' fields, provide growers with disease and insect forecasting information and to identify and diagnose diseases, insect pests and weeds. Samples are submitted to the MCRS diagnostic laboratory by IPM scouts, growers, agribusiness representatives and crop insurance agents. Disease diagnoses are based on a combination of visible symptoms, microscopic observations and culturing onto growth media.

RESULTS AND COMMENTS: Weather conditions in the 2011 growing season were conducive for the development of most pathogens including bacteria, *Pythium* spp., *Sclerotinia* spp. *and Rhizoctonia* spp. Excessive soil moisture, associated with the above average rainfall recorded in August, created ideal conditions for soil borne pathogens, particularly *Pythium* spp. on carrot. A high incidence of heat canker was observed on carrot due to a heat wave and shortage of rain in July. From January 8 to November 30, 2011, the MCRS diagnostic laboratory received 273 samples. Of these, 88% were for disease diagnosis (239 in total). These samples were associated with the following crops: onion (38.5%), carrot (27.6%), celery (4.6%), lettuce (2.5%), and other crops (26.8%). A total of 26 samples of insects or insect damage were assessed and there were also 8 weed identifications. A summary of diseases diagnosed and causal agents on crop samples submitted to the MCRS diagnostic laboratory in 2011 is presented in Table 1.

Table 1: Summary of plant diseases diagnosed on crops submitted to the MCRS Diagnostic Laboratory in 2011.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Arugula	Damping off	*Pythium* spp.	1
Baby guy choy	Black leaf spot	*Alternaria brassicae*	1
Beet	Damping off	*Rhizoctonia solani*	1
	Rhizoctonia root rot	*Rhizoctonia* spp.	2
	Fusarium damping off	*Fusarium* spp.	1
	Environmental injury	Wind damage	1
Cabbage	Tip burn	Calcium deficiency	1
Carrot	Pythium root dieback	*Pythium* spp.	8
	Cavity spot	*Pythium* spp.	6
	Leaf blight	*Alternaria dauci* and *Cercospora carotae*	15
	Crown gall	*Agrobacterium tumefaciens*	4
	Sclerotinia rot	*Sclerotinia sclerotiorum*	1
	Crown rot	*Rhizoctonia solani*	5
	Crater rot	*Rhizoctonia carotae*	2
	Fusarium dry rot	*Fusarium* spp.	3
	Black rot	*Chalara elegans*	1
	Soft rot	*Erwinia* spp.	1
	Root knot nematode	*Meloidogyne hapla*	2
	Bruising	Damage at harvest	2
	Growth crack (split)	Fluctuating soil moisture level	4
	Chemical injury	Herbicide damage	4
	Heat canker	High temperature	8
Celery	Bacterial leaf spot	*Pseudomonas syringae* pv*. apii*	4
	Soft rot	*Erwinia carotovora*	2
	Fusarium yellows	*Fusarium oxysporum* f.sp.*apii*	2
	Damping off	*Fusarium* sp.	1
	Chemical injury		1
	Nutrient deficiency	Magnesium deficiency	1
Chinese radish	Splitting	Fluctuating soil moisture level	2
Chrysanthemum	Bacterial leaf spot	*Pseudomonas* spp.	1
Garlic	Basal rot	*Fusarium oxysporum* f. sp*. cepae*	2
	Stem and bulb nematode	*Ditylenchus dipsaci*	2
Green onion	Stemphylium leaf blight	*Stemphylium vesicarium*	2
	Botrytis leaf blight	*Botrytis squamosa*	1
	Purple blotch	*Alternaria porri*	1
	Tip burn	Environmental injury	1
	Environmental injury	Pelting rain injury	1
Hop	Downy mildew	*Pseudoperonospora humuli*	6
	Leaf spot	*Alternaria* spp.	1
Impatiens	Pseudomonas leaf spot	*Pseudomonas* spp.	1
Leek	Purple blotch	*Alternaria porri*	1
	Botrytis leaf blight	*Botrytis squamosa*	1
	Stemphylium leaf blight	*Stemphylium vesicarium*	1
Lettuce	Lettuce drop	*Sclerotinia sclerotiorum* and *S. minor*	2
	Grey mould	*Botrytis cinerea*	2
	Downy mildew	*Bremia lactucae*	1
	Chemical injury	Spray drift injury	1
Mint	Mint rust	*Puccinia menthae*	1
Napa	Pythium basal rot	*Pythium* spp.	2
	Alternaria black spot	*Alternaria brassicae*	3

Table 1. (contd.)

Napa	Nutrient deficiency		1
	Hollow stem	Boron deficiency	1
	Petiole freckles	Heavy nitrogen side dressing	1
Onion	Stemphylium leaf blight	*Stemphylium vesicarium*	23
	Purple blotch	*Alternaria porri*	18
	Botrytis leaf blight	*Botrytis squamosa*	12
	White rot	*Sclerotium cepivorum*	11
	Downy mildew	*Peronospora destructor*	1
	Smut	*Urocystis cepulae*	3
	Soft rot	*Erwinia carotovora*	2
	Sour skin	*Pseudomonas cepacia*	2
	Neck rot	*Botrytis allii*	3
	Pink root	*Phoma terrestris*	6
	Blue mould	*Penicillium* sp.	1
	Environmental injury	Pelting rain injury	2
	Environmental injury	Heat canker	1
	Tip burn	Environmental injury	3
	Chemical injury	Herbicide damage	4
Oregano	Alternaria leaf spot	*Alternaria* spp.	1
Pak choy	Black root rot	*Thielaviopsis basicola*	1
	Bacterial soft rot	*Erwinia* spp.	1
	Alternaria black spot	*Alternaria brassicae*	1
Parsley	Alternaria leaf blight	*Alternaria petroselini*	2
Parsnip	Root knot nematode	*Meloidogyne hapla*	1
Pepper	Bacterial canker	*Clavibacter michiganensis*	1
Potato	Rhizoctonia canker	*Rhizoctonia solani*	1
Pumpkin	Fusarium rot	*Fusarium solani*	1
Radish	Splitting (cracking)	Fluctuating soil moisture level	1
	Alternaria black spot	*Alternaria brassicae*	1
Rhubarb	Downy mildew	*Peronospora rumicis*	1
Spinach	Damping off	*Pythium spp.*	2
	Fusarium wilt	*Fusarium oxysporum* f. sp. *spinaciae*	1
Shanghai bok choy	Alternaria black spot	*Alternaria brassicae*	2
Sweet basil	Damping off	*Pythium* spp.	1
Swiss chard	Nutrient deficiency		1
Tom choy (water spinach)	Black root rot	*Thielaviopsis basicola*	1
Yu choy	Alternaria black spot	*Alternaria brassicae*	2
DISEASE SAMPLES			**198**
ABIOTIC AND OTHER DISORDERS			**41**
TOTAL SUBMISSIONS			**239**

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

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TITRE : MALADIES DIAGNOSTIQUÉES SUR LES ÉCHANTILLONS DE CULTURES COMMERCIALES SOUMIS AU LABORATOIRE DE DIAGNOSTIC EN PHYTOPROTECTION DU MAPAQ EN 2011

MÉTHODES : Le Laboratoire de diagnostic en phytoprotection du Ministère de l'Agriculture et de l'Alimentation du Québec (MAPAQ) offre un service d'identification des maladies pour les cultures commerciales au Québec. Les données rapportées présentent les maladies identifiées sur les échantillons 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. 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 pour 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 sous microscope; 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. Le séquençage d'ADN est occasionnellement utilisé pour appuyer l'identification d'un champignon, d'une bactérie ou d'un phytoplasme. Deux références sont consultées pour les noms des maladies et des microorganismes : « *Noms des maladies des plantes au Canada* », 4e édition (2003) et « *Maladies des grandes cultures au Canada* », 1re édition (2004).

RÉSULTATS ET DISCUSSIONS : Les tableaux 1 à 13 présentent le sommaire des maladies identifiées. Au tableau 1, les maladies des plantes maraîchères de plein champ regroupent aussi les transplants provenant des serres et des pépinières. En plus de l'agaric cultivé, les maladies des légumes entreposées listées au tableau 2 incluent celles des légumes de courtes et de longues durées d'entreposage. Les plantes ornementales, qu'elles soient cultivées à l'extérieur (jardin, champ ou pépinière, tableau 11) ou en serre (tableau 12), sont essentiellement des espèces herbacées annuelles et vivaces.

Les totaux de maladies ne correspondent pas au nombre d'échantillons réçu parce que plusieurs maladies peuvent être identifiées sur un même échantillon. De plus, ces totaux ne tiennent pas compte des causes indéterminées, des diagnostics incertains et des échantillons soumis pour une détection spécifique de certains microorganismes ou autres problèmes. Lorsque non précisés, les stress culturaux regroupent les déséquilibres minéraux, les pH inadéquats, les sols compactés ou salins, les phytotoxicités causées par le mauvais usage des pesticides, excès ou le manque d'irrigation. Quant aux stress climatiques, ils concernent les insolations, le gel hivernal, le froid et l'excès de chaleur, les polluants atmosphériques, l'intumescence (œdème), l'asphyxie racinaire par l'excès d'eau, la pluie forte et la grêle.

Du 1er janvier au 15 décembre 2011, 1284 maladies ont été diagnostiquées. Parmi ces maladies, 945 (73 %) sont d'origine parasitaire (79% en 2010) ce qui demeure encore cette année supérieure à la moyenne de 67%. De ce nombre, 664 sont attribuables aux champignons, 158 aux bactéries, 69 aux virus, 32 aux phytoplasmes et 22 aux nématodes. Les plantes maraîchères provenant des champs, des serres et des entrepôts constituaient ensemble 43 % des échantillons. Une diminution du nombre de problèmes a été notée chez tous les grands groupes de cultures sauf parmi les plantes industrielles et les petits fruits où une légère augmentation est constatée. Les virus du groupe des potyvirus sont détectés le plus souvent parmi les 16 types de virus rencontrés et ce sont les plantes ornementales d'extérieur qui en étaient les plus affectées, surtout l'échinacée. Une progression du nombre de diagnostic de phytoplasmes est notée encore cette année, surtout chez les bleuetiers en corymbe, avec 21 des 32 cas confirmés.

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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 2011.

CULTURE	AGENT PATHOGÈNE /CAUSE	MALADIE / SYMPTÔME	NOMBRE
Agaric	*Mycogone perniciosa*	Môle humide	1
	Pseudomonas tolaasii	Taches bacteriennes (goutte)	2
Ail	*Botrytis* sp.	Pourriture du col	4
	Embellisia allii	Tache des bulbes	1
	Ditylenchus sp.	Enflure	5
	Fusarium sp.	Fusariose du plateau	1
	Pantoea agglomerans	Brûlure apicale des feuilles	1
	Penicillium sp.	Tache des bulbes	2
	Phoma sp.	Brûlure marginale des feuilles	1
	Potyvirus	Anomalie de coloration foliaire	2
	Stress climatiques et culturaux		6
Asperge	*Colletotrichum* sp.	Anthracnose	1
	Fusarium oxysporum	Pourriture fusarienne	1
	Stemphylium sp.	Tache stemphyllienne	1
	Phytotoxicité par des herbicides		1
Aubergine	*Verticillium dahliae*	Verticilliose	2
	pH élevé du sol		1
Betterave/poirée	*Pythium* sp.	Fonte de semis	1
	Insolation		1
Brocoli	*Peronospora* sp.	Mildiou	1
	Pectobacterium carotovorum	Pourriture molle bactérienne	1
	Pseudomonas syringae	Brûlure foliaire	1
	Xanthomonas campestris	Nervation noire	1
	Phytotoxicité métolachlore		1
	Autres stress culturaux		2
Carotte/panais	*Fusarium* spp.	Chancre et pourriture de racines	4
	Geotrichum candidum	Pourriture molle de la racine	1
	Meloidogyne sp.	Nodosité des racines	4
	Phoma sp.	Pourriture racinaire	1
	Phytophthora sp.	Pourriture racinaire	1
	PVY	Mosaïque	1
	Pythium spp.	Pourridié pythien	4
	Rhizoctonia solani	Rhizoctone	2
	Chancre de chaleur		1
	Excès d’eau		3
	Dérèglement physiologique		1
Céleri	*Cercospora* sp.	Cercosporiose	2
	Pectobacterium carotovorum	Pourriture molle bactérienne	2
	Phytoplasmes	Anomalie de coloration foliaire	1
	Pseudomonas cichorii	Pourriture molle bactérienne	1
	Pythium ultimum	Anomalie de coloration racinaire	1

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CULTURE	AGENT PATHOGÈNE /CAUSE	MALADIE / SYMPTÔME	NOMBRE
Céleri	Phytotoxicité herbicides		2
Chou/chou de Bruxelles/radis	*Alternaria brassicae*	Tache grise	2
	Alternaria brassicicola	Tache noire	1
	Botrytis cinerea	Moisissure grise	1
	Fusarium oxysporum	Fusariose	3
	Phoma sp.	Tache foliaire	1
	Pythium sp.	Pourriture pythienne	1
	Rhizoctonia solani	Rhizoctone	1
	Xanthomonas campestris pv. *campestris*	Nervation noire	3
	Oedème		2
	Nécrose autogène des feuilles		1
	Stress climatiques et culturaux		3
Chou chinois	*Pectobacterium carotovorum*	Pourriture molle bactérienne	1
	Pseudomonas syringae	Tache foliaire	1
	Xanthomonas campestris pv. *armoraciae*	Tache bactérienne	2
	Xanthomonas campestris pv. *campestris*	Nervation noire	2
Chou-fleur	*Alternaria brassicicola*	Tache noire	1
	Fusarium oxysporum	Fusariose vasculaire	1
	Xanthomonas campestris pv. *campestris*	Nervation noire	1
	Carence Mg		1
Citrouille	*Alternaria* sp.	Tache foliaire	1
	Alternaria sp./*Geotrichum candidum*	Pourriture des fruits	2
	CMV	Mosaïque	1
	Erwinia tracheiphila	Flétrissement bactérien	4
	Fusarium acuminatum / Fusarium spp.	Pourriture des fruits	5
	Pectobacterium carotovorum	Pourriture molle bactérienne	5
	Phoma sp.	Pourriture noire	1
	Phytophthora capsici	Pourridié phytophthoréen	10
	Pseudomonas syringae	Tache angulaire	2
	Pythium sp.	Pourriture des fruits	3
	Sclerotinia sclerotiorum	Sclérotiniose	1
	Septoria cucurbitacearum	Tache septorienne	2
	SqMV	Mosaïque, malformation	2
	Blessure par la grêle		1
Concombre	*Alternaria alternata*	Tache foliaire	1
	Fusarium solani / F. oxysporum	Pourriture des racines et du collet	2
	Phoma sp.		1
	Blessure mécanique	Tache foliaire	1
Courge/courgette	*Geotrichum candidum*	Pourriture des fruits	5
	CMV	Mosaïque	1
	Erwinia tracheiphila	Flétrissement bactérien	5
	Fusarium sp.	Pourriture des fruits	1
	Phoma cucurbitacearum	Pourriture noire	2

Tableau 1. Sommaire des maladies diagnostiquées parmi les **cultures maraîchères** de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE /CAUSE	MALADIE / SYMPTÔME	NOMBRE
Courge/courgette	*Phytophthora capsici*	Pourriture des fruits	6
	Pseudomonas syringae	Tache angulaire	1
	Pythium sp.	Dépérissement du plant	1
	Septoria sp.	Tache septorienne	3
	SqMV	Mosaïque	3
Épinard	*Rhizoctonia solani*	Rhizoctone	1
	Phytotoxicité par des herbicides		3
	Stress culturaux		2
Haricot/Pois	*Alternaria alternata*	Tache foliaire	2
	CMV	Mosaïque	2
	Fusarium oxysporum / F. solani	Pourriture fusarienne	7
	Pseudomonas syringae	Graisse bactérienne	4
	Phoma sp.	Tache ascochytique	2
	Pythium sp.	Pourriture pythienne des racines	3
	Phytotoxicité herbicides		3
Laitue (frisée, pommée, romaine)	*Bremiae lactucae*	Mildiou	1
	Fusarium sp.	Fusariose vasculaire	1
	Pectobacterium carotovorum	Pourriture molle bactérienne	1
	Pseudomonas cichorii	Tache luisante	1
	Pseudomonas fluorescens	Tache foliaire	2
	Pseudomonas syringae	Tache foliaire	2
	Rhizoctonia solani	Pourriture des feuilles	1
	Sclerotinia sclerotiorum	Sclérotiniose	3
	Septoria lactucae	Septoriose	1
	Xanthomonas campestris	Tache bactérienne	2
	Phytotoxicité par des pesticides		1
	Déséquilibres minéraux		3
	Autres stress culturaux		3
Maïs sucré	*Fusarium equiseti / F. oxysporum*	Pourriture fusarienne des racines	4
	Stress culturaux		4
Melon/pastèque	*Erwinia tracheiphila*	Flétrissement bactérien	1
	Fusarium oxysporum / F. solani	Fusariose vasculaire	3
	Phytophthora capsici	Pourriture du fruit	4
Oignon/Poireau/ Échalotte	*Alternaria porri*	Tache pourpre	1
	Colletotrichum circinans	Anthracnose	1
	Botrytis spp.	Dépérissement, tache foliaire	2
	Cladosporium allii	Brûlure hétérosporienne	1
	Burkholderia cepaciae	Pourriture bactérienne	1
	Fusarium solani/F. oxysporum/Fusarium spp.	Pourriture du bulbe et des racines	6
	Penicillium sp./*Geotrichum candidum*/levures		9
	Pantoea agglomerans	Pourriture des bulbes	6
	Phytoplasmes	Brûlure apicale des feuilles	1
	Xanthomonas campestris	Malformation du feuillage	1
	Blessure par fortes pluies, vent, grêle	Pourriture des feuilles	4

Tableau 1. Sommaire des maladies diagnostiquées parmi les **cultures maraîchères** de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE /CAUSE	MALADIE / SYMPTÔME	NOMBRE
Oignon/Poireau/ Échalotte	Insolation		2
	Phytotoxicité herbicides		3
	Stress culturaux		2
Panais	CMV	Anomalie de coloration foliaire	1
	Potyvirus	Anomalie de coloration foliaire	1
	TMV	Anomalie de coloration foliaire	1
Piment/poivron	*Alternaria spp.*	Pourriture de fruits, tache foliaire	2
	Botrytis cinerea	Moisissure grise	1
	Clavibacter michiganensis ssp. *michiganensis*	Flétrissement bactérien	2
	Pectobacterium carotovorum	Pourriture molle bactérienne	10
	Phytophthora capsici	Pourriture de fruits et de racines	8
	Pseudomonas syringae	Moucheture bactérienne	2
	Sclerotinia sclerotiorum	Sclérotiniose	1
	Stress climatiques		2
Pois	*Ascochyta* sp.	Ascochytose	1
	Fusarium oxysporum	Fusariose	1
Pomme de terre	*Alternaria alternata / A. solani*	Alternariose	4
	Colletotrichum coccodes	Dartrose	7
	Fusarium oxysporum / F. sambucinum	Pourriture fusarienne	8
	Helminthosporium solani	Tache argentée	1
	Pectobacterium carotovorum	Pourriture molle bactérienne	3
	Phytophthora erythroseptica	Pourriture rose	3
	Phytophthora infestans	Mildiou	3
	Pseudomonas fluorescens	Rosissement des yeux	1
	Pythium sp.	Pourriture aqueuse	1
	Potyvirus	Mosaïque foliaire	1
	PVS	Anomalie de coloration foliaire	2
	PVX	Anomalie de coloration foliaire	1
	Rhizoctonia solani	Rhizoctonie	1
	Streptomyces sp.	Gale commune	1
	Verticillium dahliae	Verticilliose	7
	Asphyxie racinaire		2
	Cœur brun		1
	Peau d'éléphant		1
	Sol inadéquat		3
	Autres stress climatiques et culturaux		3
Rutabaga	*Sclerotinia sclerotiorum*	Sclérotiniose	1
	Pectobacterium carotovorum	Pourriture molle bactérienne	1
	Xanthomonas campestris	Nervation noire	1
Tomate	*Clavibacter michiganensis* ssp. *michiganensis*	Chancre bactérien	8
	Fusarium sp.	Fusariose vasculaire	2
	Geotrichum candidum	Pourriture laiteuse	2
	Mycovellosiella fulva	Moisissure olive	1
	Phytophthora infestans	Mildiou	1

Tableau 1. Sommaire des maladies diagnostiquées parmi les **cultures maraîchères** de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE /CAUSE	MALADIE / SYMPTÔME	NOMBRE
Tomate	*Phytophthora capsici*	Pourriture des fruits	3
	Pseudomonas syringae	Moucheture bactérienne	3
	Septoria sp.	Tache septorienne	1
	Xanthomonas campestris	Tache bactérienne	1
	Phytotoxicité par des herbicides		5
	Stress climatiques		3
Zucchini	*Alternaria alternata*	Tache foliaire	1
	CMV	Mosaïque	1
	Fusarium solani	Fusariose vasculaire	1
	Pectobacterium carotovorum	Pourriture molle bactérienne	1
	Phoma sp.	Tache foliaire	1
	Potyvirus	Mosaïque	1
	Pseudomonas syringae	Tache angulaire	3
	Blessure par la grêle		1
Total			**414**

Tableau 2. Sommaire des maladies diagnostiquées parmi les **céréales** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Avoine	*Rhizoctonia* sp.	Rhizoctone	1
	pH élevé du sol		1
Orge	*Bipolaris sorokiniana*	Tache helminthosporienne	5
	Colletotrichum graminicola	Anthracnose	1
	Fusarium spp.	Piétin fusarien	2
	Pythium sp.	Piétin brun	1
	Ustilago hordei	Charbon vêtu	2
	Sol inadéquat		1
Blé	*Fusarium graminearum*	Fusariose de l’épi	1
Total			**15**

Tableau 3. Sommaire des maladies diagnostiquées parmi les **légumes d'entrepôt** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Ail	*Botrytis spp.*	Pourriture du bulbe	1
	Colletotrichum circinans	Anthracnose	1
	Embellisia allii	Tache et pourriture du bulbe	1
	Ditylenchus dipsaci	Tache et pourriture du bulbe	5
	Fusarium oxysporum	Pourriture du bulbe	2
Courge	*Phytophthora capsici*	Pourriture du fruit	1
Poivron	*Colletotrichum sp.*	Anthracnose sur fruit	1
	Geotrichum candidum	Pourriture du fruit	1
	Phytophthora capsici	Pourriture du fruit	1
Pomme de terre	*Alternaria solani*	Alternariose	3
	Colletotrichum coccodes	Dartrose	2
	Fusarium spp.	Pourriture fusarienne	3
	Pectobacterium carotovorum	Pourriture molle bactérienne	3
	Phytophthora erythoseptica	Pourriture rose	2
	PMTV	Anomalie de coloration dans le tubercule	2
	Pythium sp.	Pourriture aqueuse	1
	Rhizoctonia solani	Rhizoctonie	1
	Cœur brun		1
	Nécrose du talon par le défanage		1
	Autres stress climatiques et culturaux		3
Total			**39**

Tableau 4. Sommaire des maladies diagnostiquées parmi les **plantes maraîchères de serres** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Concombre	*Alternaria* sp.	Tache alternarienne	1
	Fusarium oxysporum	Pourriture des racines	1
	Phoma cucurbitacearum (Didymella)	Pourriture noire	1
	Pseudoperonospora cubensis	Mildiou	1
	Pythium spp.	Pourridié pythien	5
	Rhizoctonia solani	Rhizoctone	1
	Sphaerotheca sp.	Blanc	1
	Carence de Mg		1
	Salinité élevée du sol		1
Laitue	*Bremia lactucae*	Mildiou	1

Tableau 4. Sommaire des maladies diagnostiquées parmi les **plantes maraîchères de serres** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Laitue	Phytoplasmes	Malformation du plant	1
	Xanthomonas axonopodis	Tache bactérienne	1
	Carence de B		1
	Salinité élevée du sol		1
Poivron	*Fusarium oxysporum*	Pourridié fusarien	3
Tomate	*Botrytis cinerea*	Moisissure grise	3
	Clavibacter michiganensis ssp. *michiganensis*	Chancre bactérien	26
	Colletotrichum sp.	Anthracnose sur racines	2
	Fusarium oxysporum	Pourridié fusarien	6
	Fusarium solani	Chancre de collet et de tige	8
	Leveillula taurica	Blanc	1
	Mycovellosiella fulva	Moisissure olive	2
	Oidium neolycopersici	Blanc	4
	Penicillium sp.	Moisissure bleue sur fruits	2
	Potyvirus	Mosaïque	1
	PVY	Mosaïque	1
	Pyrenochaeta lycopersici	Racine liégeuse	1
	Pythium sp.	Pourriture pythienne racinaire	3
	Verticillium dahliae	Verticilliose	2
	Asphyxie racinaire		3
	Blessure par la chute de gouttes d'eau froide		1
	Déséquilibres minéraux		9
	Désordre physiologique, argenture		2
	Excès de chaleur		3
	Intumescence		2
	pH élevé du sol		1
	Phytotoxicités par des pesticides variés		2
	Salinité du sol élevée		2
Total			**108**

Tableau 5. Sommaire des maladies diagnostiquées parmi les **petits fruits** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Amélanchier	*Gymnosporangium clavipes*	Rouille du cognassier	4
	Oidium sp.	Blanc	1
Bleuetier en corymbe	*Botrytis cinerea*	Moisissure grise	2
	Cladosporium sp.	Anomalie de coloration des tiges	1
	Colletotrichum sp.	Anthracnose	7
	Fusicoccum sp.	Chancre	4
	Monilinia sp.	Pourriture sclérotique	4
	Oidium sp.	Blanc	2
	Phytophthora sp.		1

Tableau 5. Sommaire des maladies diagnostiquées parmi les **petits fruits** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Bleuetier en corymbe	*Pythium splendens*	Pourriture des racines	1
	Phytoplasmes	Brunissement des vaisseaux	21
	Rhizobium radiobacter	Malformation, nanisme	1
	Xiphinema sp.	Tumeur du collet	1
	Gel hivernal	Faible développement du plant	6
	Phytotoxicité herbicides		4
	pH inadéquat		6
	Autres stress culturaux		4
Bleuetier nain	*Aureobasidium* sp.	Brûlure des rameaux	3
	Cladosporium sp.	Chancre	1
	Oidium sp.	Blanc	2
	Monilia sp.	Pourriture sclérotique	1
	Septoria sp.	Tache septorienne	5
	Gel hivernal		2
Camerisier	Blessure par le vent		1
	Désordre génétique		1
	Gel hivernal		1
	Oedème		1
Canneberge	*Phyllosticta sp.*	Tache foliaire; pourriture du fruit	2
	Pseudomonas marginalis	Pourriture des tiges	1
Cassissier/ groseillier	*Candida* sp.	Pourriture des fruits	1
	Phytoplasmes	Malformation des feuilles	1
Fraisier	*Aphelenchoides* sp.	Dépérissement de feuilles	1
	Botrytis cinerea	Moisissure grise	3
	Phytophthora cactorum	Pourriture du fruit et du collet	1
	Phytophthora fragariae	Stèle rouge	4
	Phytophthora spp.	Pourriture des racines, dépérissement	12
	Phytoplasmes	Balai de sorcières	1
	Pratylenchus sp.	Lésions des racines	2
	Pythium/*Rhizoctonia*/*Cylindrocarpon*/*Fusarium*	Pourriture noire des racines	32
	Ramularia sp.	Tache commune	1
	Sphaerotheca macularis (Oïdium)	Blanc	1
	Verticillium dahliae	Verticilliose	5
	Xanthomonas fragariae	Tache angulaire	1
	Zythia fragariae	Brûlure foliaire	2
	Déséquilibre du pH		5
	Déséquilibre minéral		3
	Gel hivernal		4
	Phytotoxicité herbicide		4
	Sol inadéquat		4
	Autres stress culturaux		1
Framboisier rouge/noir	*Botrytis cinerea*	Moisissure grise	3
	Coniothyrium sp.	Brûlure des tiges	1

Tableau 5. Sommaire des maladies diagnostiquées parmi les **petits fruits** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Framboisier rouge/noir	*Erwinia amylovora*	Brûlure bactérienne	2
	Phytophthora spp.	Pourridié phytophthoréen	17
	Pratylenchus sp.	Lésions des racines	1
	Pythium/*Rhizoctonia*/*Cylindrocarpon*/ *Fusarium*	Pourriture noire des racines	18
	Rhizobium radiobacter	Tumeur du collet	1
	Septoria rubi	Tache septorienne	1
	Déséquilibre du pH		2
	Gel hivernal		4
	Gel printanier		2
	Phytotoxicité glyphosate		1
	Salinité élevée du sol		1
	Autres stress climatiques		2
Vigne	*Alternaria* sp. / *Cladosporium* sp.	Pourriture des baies	4
	Botrytis cinerea	Tache foliaire, avortement	9
	Elsinoe (Sphaceloma) ampelina	Anthracnose	3
	Guignardia sp.	Pourriture noire	1
	Oïdium sp. (*Uncinula*)	Blanc	1
	Phoma sp.	Anomalie de coloration des baies	2
	Phomopsis sp.	Brûlure phomopsienne	1
	Phytoplasmes	Malformation, anomalie de coloration	3
	Plasmopara sp.	Mildiou	2
	Rhizobium radiobacter	Tumeur du collet	1
	Phytotoxicité herbicide		11
	Gel hivernal		5
	Carences minérales		3
	Insolation		3
	Autres stress climatiques		1
Total			**296**

Tableau 6. Sommaire des maladies diagnostiquées parmi les **plantes fourragères** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Luzerne	*Fusarium* spp.	Pourridié fusarien	3
	Leptosphaerulina sp.	Tache lepto	3
	Pythium sp.	Pourriture des racines	1
	Rhizoctonia solani	Rhizoctone	1
	Gel hivernal		2
	Stress culturaux		3
Total			**13**

Tableau 7. Sommaire des maladies diagnostiquées parmi les **cultures industrielles** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Canola	*Alternaria sp.*	Anomalie de coloration des graines	1
	Fusarium spp.	Pourriture fusarienne	3
	Plasmodiophora brassicae	Hernie	1
	Phytoplasmes	Malformation des gousses	1
	Déséquilibre minéral		2
	Phytotoxicité par des herbicides		2
Houblon	*Pseudoperonospora* sp.	Mildiou	1
Maïs	*Cladosporium* sp. / *Trichoderma* sp.	Moisissure noire	3
	Fusarium spp.	Fusariose	4
	Gaeumannomyces graminis	Piétin échaudage	1
	Pratylenchus sp.	Lésions des racines	1
	Phytotoxicité herbicides		7
Soya	*Colletotrichum* sp.	Anthracnose	1
	Fusarium graminearum	Pourriture de tiges et de graines	2
	Fusarium oxysporum	Pourriture du collet et des racines	3
	Fusarium spp.	Pourriture du collet et des racines	11
	Phomopsis sp. (*Diaporthe*)	Brûlure phomopsienne	2
	Pseudomonas syringae	Tache foliaire	1
	Phytophthora spp.	Pourridié phytophthoréen	6
	Pythium spp.	Pourriture pythienne	3
	Rhizoctonia solani	Rhizoctone commun	3
	Septoria glycines	Tache septorienne	3
	Carence de K		15
	Phytotoxicité herbicides		4
	pH élevé du sol		1
Total			**82**

Tableau 8. Sommaire des maladies diagnostiquées parmi les **arbres et arbustes fruitiers** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Cerisier	*Blumeriella* sp.	Tache foliaire	6
	Cercospora sp.	Tache cercosporéenne	1
	Septoria sp.	Tache septorienne	2
	Pseudomonas syringae	Tache septorienne	1
	Phytoplasmes	Brûlure foliaire, dépérissement	1
	Phytotoxicité glyphosate		1
	Autres stress culturaux		5
Poirier	*Erwinia amylovora*	Brûlure bactérienne	1
	Phomopsis sp.	Chancre phomopsien	1
	Phytotoxicité par les pesticides		1
Pommier	*Cryptosporiopsis* sp.	Chancre sur tige	1
	Gymnosporangium sp.	Rouille	1
	Phomopsis mali	Chancre phomopsien	2
	Pseudomonas syringae	Chancre bactérien	2
	Sphaeropsis malorum	Chancre sur rameau	1
	Spilocaea pomi	Tavelure	16
	Erwinia amylovora	Brûlure bactérienne	1
	Rhizobium radiobacter	Tumeur du collet	2
	Phytoplasmes	Jaunissement de la marge des feuilles	1
	Xiphinema sp.		1
	Gel hivernal		4
	Phytotoxicité par les pesticides		4
Prunier	*Apiosporina morbosa*	Nodule noire	1
	Blumeriella sp.	Criblure	1
	Cladosporium sp.	Tavelure noire	1
	Phytoplasmes	Anomalie de coloration foliaire	1
Total			**60**

Tableau 9. Sommaire des maladies diagnostiquées parmi les **graminées à gazon** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
(Agrostide/ pâturin annuel)	*Colletotrichum graminicola*	Anthracnose	3
	Curvularia sp.	Tache foliaire	1
	Fusarium sp.	Brûlure fusarienne des feuilles	2
	Gaeumannomyces graminis	Piétin échaudage	1
	Puccinia sp.	Rouille	2
	Pythium sylvaticum / Pythium torulosum	Piétin brun	5
	Rhizoctonia sp.	Rhizoctone brun	3
	Sol inadéquat		1
Total			**18**

Tableau 10. Sommaire des maladies diagnostiquées parmi les **arbres** et **arbustes ornementaux** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Acer spp.	*Aureobasidium* sp.	Brûlure des feuilles	1
	Discula sp.	Anthracnose	2
	Phomopsis sp.	Brûlure des feuilles	1
	Rhytisma acerina	Tache goudronneuse	1
	Agents climatiques défavorables		2
	Carence de bore		1
Aesculus hippocastaneum	*Colletotrichum* sp.	Anthracnose	1
	Guignardia aesculi	Brûlure des feuilles	2
Alnus sp.	pH élevé du sol		1
Buxus sempervirens	*Volutella* sp.	Tache, abscission foliaire	2
Crataegus sp.	*Sphaeropsis* sp.	Chancre	1
Cotoneaster acutifolia	*Phyllosticta* sp.	Tache foliaire	1
Euonymus alata	*Rhizobium radiobacter*	Tumeur du collet	1
Forsythia	*Alternaria* sp.	Tache alternarienne	1
Fraxinus sp.	*Discula* sp.	Anthracnose	1
Magnolia	*Fusarium* sp.	Pourriture des racines	1
	Pseudomonas syringae	Brûlure bactérienne	1
	Pythium sp.	Pourriture des racines	1

Tableau 10. Sommaire des maladies diagnostiquées parmi les **arbres** et **arbustes ornementaux** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
	Septoria sp.	Tache septorienne	1
Picea glauca	*Rhizosphaera* sp.	Rouge	1
	pH élevé du sol		1
Picea pungens	*Sirococcus*	Dépérissement	1
Quercus spp.	*Discula* sp.	Anthracnose	1
	Carence de fer		1
	Gel printanier		1
	Phytotoxicité glyphosate		1
Syringa	*Ascochyta* sp.	Tache ascochytique	1
	Fusarium sp.	Pourridié fusarien	2
	Phytophthora sp.	Brûlure des pousses	2
	Pseudomonas syringae	Brûlure bactérienne	1
Thuja occidentalis	Gel hivernal	Tache foliaire	1
Ulmus sp.	*Phoma* sp.	Tache foliaire	1
	Pseudomonas syringae	Tache foliaire	1
Viburnum	*Phoma* sp.	Tache foliaire	1
	Pseudomonas syringae	Tache foliaire	1
Total			**41**

Tableau 11. Sommaire des maladies diagnostiquées parmi les **plantes ornementales d’extérieur** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Aconitum	Blessure par le vent		1
Actaea	*Phoma* sp.	Brûlure foliaire	1
Alpiste	*Sclerotium rhizodes*	Pourriture des feuilles	1
Alternanthera	*Colletotrichum* sp.	Anthracnose	1
Astilbe	*Pythium* sp.	Pourriture pythienne	1
	Rhizoctonia solani	Rhizoctone	1
Althaea officinale	Carence de N		1

Tableau 11. Sommaire des maladies diagnostiquées parmi les **plantes ornementales d'extérieur** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Anemone robustissima	*Aphelenchoides* sp.	Tache foliaire	1
Bacopa	Phytotoxicité par le Dual		1
	Phytotoxicité par le glyphosate		1
Calibrachoa	Phytotoxicité par le Dual		1
	Phytotoxicité par le glyphosate		1
Cannabis	*Ascochyta* sp.	Tache ascochytique	1
Coreopsis	*Fusarium* sp.	Pourridié fusarien	1
Delphinium	Carence de B	Anomalie de coloration foliaire	1
Dicentra	*Phytophthora* sp.	Pourriture des racines	1
Echinacea	*Botrytis cinerea*	Moisissure grise	1
	AMV	Tache et brûlure foliaire	1
	ArMV	Anomalie de coloration foliaire	2
	INSV	Anomalie de coloration foliaire	3
	Potyvirus	Anomalie de coloration foliaire	2
	PVX	Tache et brûlure foliaire	4
	TMV	Anomalie de coloration foliaire	1
	ToMV	Anomalie de coloration foliaire	1
	TNV	Anomalie de coloration foliaire	1
	TRSV	Anomalie de coloration foliaire	1
	TRV	Tache et brûlure foliaire	4
	pH élevé du sol		1
Hedwidgia	*Fusarium acuminatum*	Brûlure des feuilles, dépérissement	2
Heliotropium	Phytotoxicité par le Dual		1
	Phytotoxicité par le glyphosate		1
Helianthus annuus	*Alternaria helianthi*	Tache alternarienne	3
	Septoria helianthi	Tache septorienne	1
Heliopsis	*Verticillium* sp.	Verticilliose	1
Hemerocallis	*Aureobasidium* sp.	Tache foliaire	1
	Oedème		1
Hosta	PVX	Anomalie de coloration foliaire	1
Lavendula	*Pseudomonas syringae*	Tache foliaire	1
	Rhizoctonia solani	Rhizoctone	1
	Pythium sp.	Pourriture pythienne des racines	1

Tableau 11. Sommaire des maladies diagnostiquées parmi les **plantes ornementales d'extérieur** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Lavendula	*Septoria* sp.	Tache septorienne	1
	Gel hivernal		1
Lilium	*Fusarium oxysporum*	Pourridié fusarien	1
Oxalis sp.	*Pythium* sp.	Pourriture pythienne	1
	Thielaviopsis basicola	Pourriture noire des racines	1
	Salinité élevée du sol		1
Parthenocissus sp.	Oedème		2
	Phytotoxicité par le Dual		1
	Phytotoxicité par le glyphosate		1
Pennisetum rubrum	Phytotoxicité par le Dual		2
	Phytotoxicité par le glyphosate		2
Phlox paniculata	*Septoria* phlogis	Tache septorienne	1
	Thielaviopsis basicola	Pourriture noire des racines	1
	Potyvirus	Tache et brûlure foliaire	2
Phlox carolina	ArMV	Tache et brûlure foliaire	2
	Potyvirus	Tache et brûlure foliaire	1
Phlox subulata	*Colletotrichum* sp.	Anthracnose	1
Rudbeckia	*Septoria* sp.	Tache septorienne	2
	Xanthomonas campestris	Tache bactérienne	1
Scaevola	Phytotoxicité par le Dual		1
	Phytotoxicité par le glyphosate		1
Tithonia rotundifolia	*Sclerotinia sclerotiorum*	Sclérotiniose	1
Tricyrtis	INSV	Tache et brûlure apicale foliaire	1
Trollius	*Ascochyta* sp.	Tache ascochytique	1
Verbena	Phytotoxicité par le Dual		1
	Phytotoxicité par le glyphosate		1
Veronica	*Puccinia* sp.	Rouille	1
Total			**86**

Tableau 12. Sommaire des maladies diagnostiquées parmi les **plantes ornementales de serres** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Achillea	*Rhizobium radiobacter*	Tumeur du collet	1
Adiantum	*Phoma* sp.	Brûlure foliaire	1
Argyranthemum	*Rhizobium radiobacter*	Tumeur du collet	2
	Cercospora sp.	Tache cercosporéenne	1
Amaranthe	*Pythium* sp.	Pourriture pythienne des racines	1
Aruncus	*Rhizoctonia solani*	Rhizoctone	2
Begonia	Potyvirus	Marbrure	1
	TSWV	Tache foliaire	1
	Xanthomonas hortorum pv. *begoniae*	Tache bactérienne	1
Calibrachoa	*Botrytis cinerea*	Moisissure grise	1
	Phytophthora spp.	Pourriture des racines	4
	Pythium spp.	Pourriture pythienne des racines	4
	Thielaviopsis basicola	Pourriture noire des racines	1
	Salinité élevée du sol		1
Coleus	INSV	Tache foliaire	1
Coreopsis	*Pseudomonas cichorii*	Tache foliaire	1
Dahlia	*Botrytis cinerea*	Moisissure grise	2
	Fusarium sp.	Pourridié fusarien	1
	Pythium sp.	Pourriture pythienne des racines	2
	Stress culturaux		4
Dianthus	*Fusarium oxysporum*	Fusariose	1
Dracaena/ cordyline	*Colletotrichum* sp.	Anthracnose	1
	Fusarium oxysporum	Pourridié fusarien	1
Echinacea purpurea	Phytotoxicité par le chlopyralide		1
Euphorbia pulcherrima (poinsettia)	*Phytophthora* sp.	Pourridié phytophthoréen	1
	Salinité élevée du sol		1
Fuchsia	*Pythium* sp.	Pourriture pythienne des racines	2
Gaillardia	*Rhizobium radiobacter*	Tumeur du collet	1
Heliotropium	*Botrytis cinerea*	Moisissure grise	1
Hibiscus	*Thielaviopsis basicola*	Pourriture noire des racines	1

Tableau 12. Sommaire des maladies diagnostiquées parmi les **plantes ornementales de serres** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Impatiens	*Cercospora* sp.	Tache cercosporéenne	1
	Fusarium oxysporum.	Pourridié fusarien	1
	Pythium sp.	Pourridié pythien	2
	Xanthomonas hortorum	Tache bactérienne	1
Ipomoea	INSV	Malformation des feuilles	1
	Insolation		1
Lilium	Phytoplasmes	Marbrure foliaire	1
Lobelia	TSWV	Anomalie de coloration des feuilles	1
Lysimachia	Froid	Anomalie de coloration des feuilles	1
Matteucia struthiopteris	Dérèglement physiologique	Anomalie de coloration de la tige	2
Miscanthus	Potyvirus	Mosaïque	3
Monarda	*Pythium* sp.	Pourriture pythienne des racines	2
Onoclea sensibilis	*Aphelenchoides* sp.	Tache foliaire	1
	Phoma sp.	Brûlure foliaire	1
Paeonia	pH élevé du sol		2
Pelargonium	*Fusarium* sp.	Pourridié fusarien	1
	Pythium sp.	Pourriture pythienne des racines	1
	TSWV	Anomalie de coloration foliaire	1
	Xanthomonas hortorum pv. *pelargonii*	Pourriture bactérienne	4
	Oedème		1
	pH acide du sol		1
	Toxicité de fer		2
Petunia	INSV	Malformation des feuilles	1
Phalaris	*Ustilago striiformis*	Charbon	1
Phlox carolina	Potyvirus	Tache et brûlure foliaire	1
Phlox maculata	AMV	Malformation et anomalie de coloration foliaire	1
	Potyvirus	Mosaïque	1
	TBRV	Anomalie de coloration foliaire	2
Phlox paniculata	INSV		1
	Stress culturaux		1

Tableau 12. Sommaire des maladies diagnostiquées parmi les **plantes ornementales de serres** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Rudbeckia	*Septoria* sp.	Tache septorienne	2
Saintpaulia	INSV	Anomalie de coloration foliaire	1
Sanvitalia tequila	*Pythium* sp.	Pourriture pythienne des racines	1
	Salinité du sol élevée		1
Scaevola	Phytotoxicité par un pesticide		1
Thunbergia	Gel des feuilles		1
Tricyrtis	Potyvirus	Tache foliaire, mosaïque	1
	TBRV	Tache foliaire, mosaïque	1
Verbena	TBRV	Mosaïque	2
	TSWV	Tache	1
Vinca	*Pectobacterium carotovorum*	Pourriture molle bacterienne	1
Viola	*Cercospora* sp.	Tache cercosporéenne	1
Total			**99**

Tableau 13. Sommaire des maladies diagnostiquées parmi les **plantes aromatiques et les fines herbes** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2011.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Basilic	*Acidovorax.* sp.	Tache foliaire	1
	Alternaria alternata	Tache foliaire	1
	Colletotrichum sp.	Anthracnose	1
	Fusarium oxysporum	Fusariose	1
	Peronospora sp.	Mildiou	2
	Pseudomonas cichorii	Tache foliaire	1
	Rhizoctonia sp.	Rhizoctone	1
Fenouil	Problème varietal		1
Persil	*Fusarium solani*	Fusariose	2
	Pseudomonas marginalis	Pourriture de la racine	1
	Septoria sp.	Tache septorienne	1
Total			**13**
GRAND TOTAL			**1284**

Cereals / Céréales

CROP / CULTURE : Barley
LOCATION / RÉGION: Central Alberta

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT :
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TITLE / TITRE: 2011 BARLEY DISEASE SURVEY IN CENTRAL ALBERTA

INTRODUCTION AND METHODS: A survey to document diseases of barley was conducted in 20 fields in Central Alberta from August 5 to 22, 2011. Growers were contacted for permission to access their land, with the evaluation being done at the late milk to soft dough stage. The fields were traversed in a diamond pattern starting some 25 m in from the field edge, with a visual assessment made of 10 penultimate leaves at each of 5 locations that were at least 25 m apart. Leaf disease severity was rated as the percent leaf area diseased (PLAD) by scald, netted net blotch and other leaf spots. Common root rot (CRR) was assessed on 5 sub-crown internodes at each of 5 sites using a 0-4 scale where 0= none, 1= trace and 4= a severe CRR lesion. Other diseases, if present, were rated as the percent plants affected. A representative tissue sub-sample of diseased plant parts collected at each location was subsequently 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 generally wet and cool throughout May, June, July, and August. This resulted in delayed crop maturity and considerable disease development throughout the region.

Scald (*Rhynchosporium secalis*) severity ranged from 0.1 to 10 % PLAD in 11 fields, 10 to 40% in five fields and 65% in one field; crops in the remaining three fields had no scald. Levels of netted net blotch (*Pyrenophora teres* f. *teres*) were similar, and observed throughout the survey region, with PLAD ranging from 0.1% to 10% in 11 fields, 10% to 21% in three fields, and 59% in one field; crops in the remaining five fields had no netted net blotch. Other barley leaf spots, primarily diagnosed as spotted net blotch (*P. teres* f. *maculata*), were found in all 20 fields surveyed. The severity of these leaf spots ranged from 1.3% to 25%. In addition to *P. teres* f. *maculata*, Al*ternaria spp*. also were isolated from sub-samples of tissues exhibiting ‘spotted net blotch’ symptoms.

Common root rot (*Cochliobolus sativus* and *Fusarium* spp.) occurred in all fields at levels similar to those reported for 2010 (Rauhala and Turkington 2011).

Stripe rust (*Puccinia striiformis)* was detected at a low level in a single field.

REFERENCE:
Rauhala, N.E. and Turkington, T.K. 2011. 2010 barley disease survey in central Alberta. Can. Plant Dis. Surv. 91: 58-59 (cps.-scp..ca/cpds.shtml).

Table 1. Disease incidence and severity in 20 commercial barley fields in Central Alberta, 2011.

Disease (severity rating scale)	**% crops affected**	**Overall average severity (%)**	**Average field severity range (%)**
Scald (PLAD*)	85	10	0 – 65
Netted net blotch (PLAD)	75	7	0 – 59
Other leaf spots (PLAD)	100	9	1 – 25
Total Leaf Area Diseased (PLAD)	100	25	1 – 78
Common root rot (0-4)	100	1.8	1 – 4

*Percent leaf area diseased

CROP / CULTURE : Barley
LOCATION / RÉGION: Saskatchewan

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
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TITLE / TITRE: FUSARIUM HEAD BLIGHT IN BARLEY IN SASKATCHEWAN IN 2011

INTRODUCTION AND METHODS: Fusarium head blight (FHB) incidence and severity in Saskatchewan in 2011 were assessed in 49 barley crops (42 two-row; 7 six-row). Fields and results were grouped according to soil zone (Zone 1 = Brown; Zone 2 = Dark Brown; Zone 3 = Black/Grey).

Crop adjustors with Saskatchewan Crop Insurance Corporation and irrigation agrologists with Saskatchewan Ministry of Agriculture randomly collected 50 spikes from barley crops at late milk to early dough 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 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 to confirm the presence of and identify *Fusarium* species on infected kernels.

RESULTS AND COMMENTS: Approximately 0.88 million ha (2.2 million acres) of barley were seeded in Saskatchewan in 2011 (Statistics Canada, 2011). Excess moisture created delays and challenges for farmers in the southeast and other parts of southern Saskatchewan in the spring of 2011. By late June, a reported 18 per cent of the possible 13.8 million seedable ha in the province remained unseeded. Of the areas that were seeded, eight per cent (0.89 million ha) were subsequently flooded and unlikely to produce a crop. In most other areas, seeding progressed ahead of, or on, schedule, and an extended period of warm sunny days through harvest allowed producers to harvest the crop in a timely fashion. Yields in most regions other than the southeast were reported to be average to above-average, and the crop quality good (Saskatchewan Ministry of Agriculture 2011).

In 2011, FHB occurred in 94% of the barley crops surveyed, 93% of two-row and 100% of six-row samples (Table 1). The provincial mean FHB severities of 2.8% for two-row and 2.2% for six-row barley were lower than in 2010 but higher than in 2009 (Miller et al. 2011).

Almost two-thirds of the barley samples were collected from soil zone 3. The samples with the highest severities were also from this soil zone, and the mean severities of FHB for two-row (3.4%) and six-row (2.7%) crops were also highest in this zone. Eight of the two-row barley and one of the six-row barley crops had FHB severities higher than 5%.

Of the 49 barley survey samples collected, 46 had visible FHB symptoms and 269 isolations were made from these for *Fusarium* identification. The most frequently isolated species was *F. poae*, found in 91% of barley samples and consisting of 66% of total *Fusarium* isolates. The dominance of this species in 2011 was even more pronounced than found in 2008-2010 (Miller et al. 2011).

Fusarium graminearum was found in 15% of the barley survey samples with visible symptoms, a similar level to that reported in 2010 (Miller et al. 2011). It accounted for 4% of isolates from two-row and 3% of isolates from six-row barley. As reported for 2010, *F. graminearum* was not detected in barley samples from soil zone 1 in 2011; additionally in 2011, it also was not detected from soil zone 3.

Other *Fusarium* species identified in samples having visible symptoms included *F. avenaceum* (16% of total isolations), *F. sporotrichioides* (7.5%), *F. equiseti* (1.9%), *F. culmorum* (0.7%), and *F. acuminatum* (0.4%). *Fusarium moniliforme* was not detected in 2011, while other unidentified *Fusarium* species accounted for 1.1% of the isolations. These results are similar to those obtained in 2008-10 (Miller et al. 2011).

Other barley pathogens found included *Cochliobolus* and *Septoria* spp. Secondary moulds were isolated from 96% of the barley 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.

REFERENCES:
Lancashire, P.D., Bleiholder, H., Van Den Boom, T., Langeluddeke, P., Stauss, R., Weber, E. and Witzenberger, A. 1991. A uniform decimal code for growth stages of crops and weeds. Ann. Appl. Biol. 119:561-601.

Miller, S.G., Dokken-Bouchard, F.L., Northover, P.R., Weitzel, C.N., Shiplack, J.J. and Fernandez, M.R. 2011. Fusarium head blight in barley in Saskatchewan in 2010. Can. Plant Dis. Surv. 91: 60-61. (cps-scp.ca/cpds.shtml)

Saskatchewan Ministry of Agriculture. 2011. Final crop report. (www.agriculture.gov.sk.ca)

Statistics Canada. 2011. Field Crop Reporting Series – September estimate of production of principal field crops. Catalogue no. 22-002-X (www.statcan.gc.ca/pub/22-002-x/22-002-x2011008-eng.pdf)

Table 1. Prevalence and severity of fusarium head blight (FHB) in barley crops grouped by soil zone in Saskatchewan, 2011.

	Two-Row Barley		**Six-Row Barley**	
Soil Zones	**Prevalence[1] (No. of Crops Surveyed)**	**Mean FHB Severity[1] (range)**	**Prevalence[1] (No. of Crops Surveyed)**	**Mean FHB Severity[1] (range)**
Zone 1 Brown	88% (8)	1.7% (0 – 3.3%)	100% (1)	0.1%
Zone 2 Dark Brown	89% (9)	2.1% (0 – 7.3%)	100% (1)	1.9%
Zone 3 Black/Grey	96% (25)	3.4% (0 – 13.3%)	100% (5)	2.7% (0.6 – 5.9%)
Overall Total/Mean	93% (42)	2.8%	100% (7)	2.2%

[1] Prevalence (%) = Number of crops affected / total crops surveyed
[2] Percent FHB severity = [% of spikes affected x mean proportion (%) of kernels infected] / 100.

CROP / CULTURE: Barley
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: FUSARIUM HEAD BLIGHT OF BARLEY - MANITOBA 2011

INTRODUCTION AND METHODS: In 2011, from August 1-8 when crops were at the early- to soft-dough (ZGS 79-86) stage of growth, a total of 26 barley fields (17 two-row, 9 six-row) in southern Manitoba were monitored for the presence of fusarium head blight (FHB). The fields were selected at random along the survey routes, depending on crop frequency. The area sampled was bounded by Highway #s 227, 16 and 45 to the north, the Manitoba/North Dakota border to the south, Hwy #12 to the east and Hwy #21 to the west. FHB incidence (the percentage of spikes with typical symptoms) was assessed in each crop by sampling 80-120 spikes at three locations and averaging the results. The mean spike proportion infected (SPI) was also estimated for each field. Several affected spikes 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 spikes per location. The kernels were surface sterilized in 0.3% NaOCl (Javex brand) for 3 min., air-dried, and plated on potato dextrose agar in Petri plates (10 kernels per plate) to quantify and identify *Fusarium* spp. on the kernels based on morphological traits described in standard taxonomic keys.

RESULTS AND COMMENTS: Spring conditions in 2011 throughout southern Manitoba were wetter than normal and particularly so in south-central and south-western regions. Flooding was widespread and resulted in considerable land not being seeded or, if seeded, subsequently abandoned due to poor emergence. Despite a difficult start, reasonable crops were harvested in many districts, due in large part to the particularly dry (except in the south-west) and warm period from mid-July to late September. Accumulation of growing degree days (May 15 to Sept 15) was near normal in most regions.

Barley was grown on some 96,000 ha (237,000 acres) in 2011, a reduction of 43% compared to 2010 (Tekauz et al. 2011). Two cultivars, both 2-row, made up about half of the area: ‘Conlon’ (33%), and ‘Newdale’ (15%) – (Yield Manitoba 2012’, Manitoba Crop Development Council, supplement to the Manitoba Co-operator, Feb. 23, 2012).

Putative symptoms of FHB were observed in 24 of the 26 fields surveyed. Mean incidence of FHB in two-row crops was 3.4% (range 0 - 15%), while the spike proportion infected (SPI) averaged 7.8% (range 0 - 20%); in six-row crops incidence was 5.3% (range 0 - 15%) and the SPI 11.1% (range 0 - 30%). The resulting mean Fusarium head blight index (FHB-I) [%incidence X %SPI / 100] for 2-row barley was 0.4% (range 0 – 3%), and that for 6-row barley 0.5% (range 0 – 2%). The mean FHB-I for all barley was 0.5%. This level would have resulted in minimal yield loss to FHB in 2011. The mean FHB-I in 2011 was lower than that reported for 2010 (Tekauz et al. 2011) and much lower than the 10-year average (2001-2010) of 1.9% (Tekauz and Gilbert 2011). The higher (slightly so in 2011) FHB severity in six-row vs. two-row barley is typically expected, but not always realized, as was the case in both 2010 and 2009 (Tekauz et al. 2011, 2010). While moisture was abundant early in the growing season, it was accompanied by cool weather, which likely curtailed inoculum development on overwintered straw in farm fields. Subsequent very dry and warm conditions in most regions would have further reduced the likelihood of *Fusarium* infection, and hence visual manifestation of FHB.

Fusarium colonies were isolated from selected kernels of all fields surveyed, at a mean level of 34.2%. The individual *Fusarium* species isolated from kernels are listed in Table 1. In 2011, *F. poae* predominated; it was detected in all fields and made up 75% of the total *Fusarium* flora. This was in contrast to 2010 or 2009, when *F. graminearum* either dominated or was found at similar levels to *F. poae* (Tekauz et al. 2011, 2010). *Fusarium avenaceum* and *F. sporotrichioides* were detected in 15% and 12% of fields, respectively, at low infestation levels. Two noteworthy results included a six-row crop 7 km east of Neepawa (on flax stubble) with only *F. poae* present on the 38% of kernels with *Fusarium*, and a two row crop 6 km south of Steinbach with 38% of kernels infested by the root, leaf and spike pathogen *Cochliobolus sativus* (mean level 2%), in addition to 18% *Fusarium*.

REFERENCES:

Tekauz, A. and Gilbert, J. 2011. Pathogen variability and FHB development in Manitoba cereal crops, 2001-2010. P. 101. *In* Proceedings '7th Canadian Workshop on Fusarium Head Blight', Winnipeg MB, November 27-30, 2011.

Tekauz, A., Stulzer, M., Beyene, M., Kleiber, F., Ghazvini, H. and Hajipour, Z. 2011. Monitoring fusarium head blight of barley in Manitoba in 2010. Can. Plant Dis. Surv. 91: 62-63. (cps-scp.ca/cpds.shtml)

Tekauz, A., Gilbert, J., Stulzer, M., Beyene, M. and Slusarenko, K. 2010. Monitoring fusarium head blight of barley in Manitoba in 2009. Can. Plant Dis. Surv. 90: 60-61. (cps-scp.ca/cpds.shtml)

Table 1. *Fusarium* spp. isolated from barley in Manitoba in 2011.

***Fusarium* spp.**	**Percent of fields**	**Percent of kernels**
F. avenaceum	15	2.3
F. equiseti	4	0.6
F. graminearum	65	22.2
F. poae	100	74.3
F. sporotrichioides	12	1.2

CROP / CULTURE: Barley
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: BARLEY LEAF SPOT DISEASES IN 2011 IN MANITOBA

INTRODUCTION AND METHODS: In 2011, leaf spot diseases of barley in Manitoba were assessed by surveying 26 farm fields (17 two-row, 9 six-row) from August 1-8, when most crops were at the early- to soft-dough stages of growth (ZGS 79-86). Fields were sampled at regular intervals along the survey routes, depending on availability. The area sampled was bounded by Highway #s 227, 16 and 45 to the north, the Manitoba/North Dakota border to the south, Hwy #12 to the east and Hwy #21 to the west. Disease incidence and severity were recorded by averaging their occurrence on 10-20 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, dried, and stored in paper envelopes. Subsequently, 10 surface-sterilized pieces of putatively infected leaf tissue were placed on filter paper in moist chambers for 3-5 days to promote sporulation to identify the causal agent(s) and disease(s).

RESULTS AND COMMENTS: Spring conditions in 2011 throughout southern Manitoba were wetter than normal and particularly in south-central and south-western regions. Flooding was widespread and resulted in considerable land not being seeded, or if seeded, subsequently abandoned due to poor emergence. Despite a difficult start, reasonable crops were harvested in many districts, due in large part to the particularly dry (except in the south-west) and warm mid-July to late September period. Accumulation of growing degree days (May 15 to Sept 15) was near normal in most regions.

Barley was grown on some 96,000 ha (237,000 acres) in 2011, a reduction of 43% compared to 2010 (Tekauz et al. 2011). Two cultivars, both 2-row, made up about half of the area: ‘Conlon’ (33%) and ‘Newdale’ (15%) – ‘Yield Manitoba 2012’, Manitoba Crop Development Council, supplement to the Manitoba Co-operator, Feb. 23, 2012.

Leaf spots were observed in the upper and/or lower leaf canopies of 18 (69%) of the 26 barley crops surveyed. Disease levels in the upper canopy were trace, very slight or slight in 89% of crops and moderate in 11%. Respective severity categories in the lower canopy were estimated as 58% and 27%, with 15% containing only senescent foliage. These severity levels are somewhat lower than those reported for 2010 (Tekauz et al. 2011), but typical of levels found in recent years. The overall low disease levels were likely the result of the generally dry conditions throughout August and September. On average, yield losses attributable to leaf spots were likely only 1%.

Pyrenophora teres (causal agent of net blotch) and *Cochliobolus sativus* (spot blotch) were the principal pathogens, and caused most of the leaf spot damage observed (Table 1), as is typical for barley in Manitoba (Tekauz et al. 2011, 2010). *Septoria passerinii* (speckled leaf blotch), normally a minor component of the leaf spot complex on barley in Manitoba (Tekauz 2011, 2010) was not detected at all in 2011.

REFERENCES:
Tekauz, A., Stulzer, M., Beyene, M., Dupriez, M., Harris, A. and Le-Ba, N. 2011. Leaf spot diseases in Manitoba barley crops in 2010. Can. Plant Dis. Surv. 89: 64-65. (cps-scp.ca/cpds.shtml)

Tekauz, A., Gilbert, J., Mueller, E., Stulzer, M., Beyene, M. and Kaethler, R. 2010. Leaf spot diseases detected in Manitoba barley fields in 2009. Can. Plant Dis. Surv. 90: 62-63. (cps-scp.ca/cpds.shtml)

Table 1. Incidence and isolation frequency of leaf spot pathogens of barley in Manitoba in 2011

Pathogen	**Incidence (% of fields)**	**Frequency (% of isolations)***
Pyrenophora teres	73	52
Cochliobolus sativus	54	48

*indicative of the relative foliar damage caused

CROP / CULTURE: Barley
LOCATION / RÉGION: Ontario

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TITLE / TITRE: DISEASES OF BARLEY IN CENTRAL AND EASTERN ONTARIO IN 2011

INTRODUCTION AND METHODS: A survey of barley diseases was conducted in central and eastern Ontario in 2011 in the last week of July when plants were at the soft dough stage of development. Twelve fields were chosen at random in regions of central and 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). Disease diagnosis was based on visual symptoms. Average severity scores of <1, <3, <6, and ≥6 were considered trace, slight, moderate, and severe infection levels, respectively. Severity for covered smut, ergot, leaf stripe, loose smut, and take-all was based on the percent plants infected. Fusarium head blight (FHB) was rated for incidence (% infected spikes) and severity (% infected spikelets in the affected spikes) based on approximately 200 spikes 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 as slight, moderate, severe, and very severe infection levels, respectively. Determination of the causal species of FHB was based on 50 infected spikes collected from each field. The spikes were air-dried at room temperature and subsequently threshed. Fifty discolored kernels per sample were chosen at random, surface sterilized in 1% NaOCl for 60 seconds and plated in 9-cm diameter petri dishes on modified potato dextrose agar (10 g dextrose per litre) amended with 50 ppm of streptomycin sulphate. The plates were incubated for 10-14 days at 22-25ºC and with a 14-hour photoperiod using fluorescent and long wavelength 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 3 two-row and 9 six-row barley crops. A total of 14 diseases or disease complexes were observed (Table 1). Net blotch (*Pyrenophora teres*) and spot blotch (*Cochliobolus sativus*) were the most common foliar diseases, and both were seen in 11 fields at mean disease severities of 3.3 and 2.6, respectively. For each disease a severe infection level was found in one field. Yield reductions due to the two diseases were estimated to have averaged <5% in affected fields. Leaf rust (*Puccinia hordei*) and the septoria/stagonospora blotch complex [including speckled leaf blotch (S*eptoria tritici*) and leaf blotch (*Stagonospora nodorum*)], were observed in 8 and 11 fields at mean severities of 2.1 and 1.5, respectively. Severe levels of these diseases were not found. Other foliar or stem diseases observed included barley yellow dwarf (BYD), powdery mildew *(Erysiphe graminis*), scald (*Rhynchosporium secalis*) and stem rust (*Puccinia graminis* f. sp*. tritici* or f. sp. *secalis*). Their average severities were 1.1, 1.0, 1.0 and 2.6 and the diseases were observed in 10, 4, 3, and 7 fields, respectively. Affected plants all had only trace to slight levels of infection suggesting that none of these diseases caused much damage to the crop.

Covered smut (*Ustilago hordei*), ergot (*Claviceps purpurea*), and leaf stripe (*Pyrenophora graminea*) were observed in 2, 6, and 9 fields at incidence levels of 1.0, 1.3, and 1.1%, respectively. These three diseases likely resulted in minimum damage. Loose smut (*U. nuda*) and take-all root rot (*Gaeumannomyces graminis*) were found in 5 and 12 fields at mean incidences of 1.3 and 4.5%, respectively. One crop had 20% take-all. The incidence of take-all in Ontario increased in 2011 in comparison to 2010 (Xue and Chen 2011).

Fusarium head blight was detected in all fields (Table 1). The FHB index ranged from 0.01 to 0.75% with a mean of 0.1%. Severe levels of FHB were not found. The disease would not have resulted in a significant loss in barley grain yield and quality in 2011. Seven *Fusarium* species were isolated from putatively infected kernels (Table 2). *Fusarium poae* predominated and occurred in 92% of surveyed crops and on 36.3% of putatively infected kernels. *Fusarium graminearum* was found in 54% of surveyed crops and on 4.9 % of affected kernels; the frequency of this species on kernels was lower than in previous years (Xue and Chen 2011). *Fusarium avenaceum, F. equiseti,* and *F. sporotrichioides* were common, occurring in 23 -46% of surveyed fields, but kernel infection only ranged from 1.1 to 3.4%. *Fusarium acuminatum* and *F. oxysporum* occurred in 8% fields and on less than 0.3% of kernels.

Overall, the incidence of foliar diseases in barley in 2011 was similar but less severe than found in 2010 (Xue and Chen 2011). Net blotch and spot blotch continue to be the most prevalent diseases. Take-all became more common, causing an estimated yield reduction of 4.5% in 2011 compared to 3.8% in 2010. FHB was common but less severe in 2011 than in 2010 (Xue and Chen 2011). The high temperatures and low number of rainfall events in June and early July in 2011 were less favorable for development of FHB and likely responsible for the low FHB severity observed.

REFERENCE:

Xue, A.G. and Chen, Y. 2011. Diseases of barley in eastern Ontario in 2010. Can. Plant Dis. Surv. 91: 66-67. (cps-scp.ca/cpds.shtml)

Table1: Prevalence and severity of barley diseases in central and eastern Ontario in 2011.

DISEASE	NO. CROPS AFFECTED (n=13)	DISEASE SEVERITY IN AFFECTED CROPS*	
		MEAN	RANGE
BYD	10	1.1	1.0-1.7
Leaf rust	8	2.1	10-4.0
Net blotch	11	3.3	1.0-6.0
Powdery mildew	4	1.0	1.0-1.0
Scald	3	1.0	1.0-1.0
Septoria complex	11	1.5	1.0-3.0
Spot blotch	11	2.6	1.0-7.0
Stem rust	7	2.6	1.0-4.0
Covered smut (%)	2	1.0	1.0-1.0
Ergot (%)	6	1.3	1.0-2.0
Leaf stripe (%)	9	1.1	1.0-2.0
Loose smut (%)	5	1.3	0.5-3.0
Take-all (%)	12	4.5	1.0-20.0
Fusarium head blight**	12		
Incidence (%)		3.0	1.0-15.0
Severity (%)		2.5	1.0-5.0
Index (%)		0.1	0.01-0.75

*Foliar disease severity was rated on a scale of 0 (no disease) to 9 (severely diseased); leaf stripe, covered smut, ergot, loose smut, and take-all severity was based on % plants infected
** FHB Index = (% incidence x % severity)/100.

Table 2: Frequency of *Fusarium* species isolated from fusarium damaged barley kernels in central and eastern Ontario in 2011.

***Fusarium* spp.**	**% OF FIELDS**	**% OF KERNELS**
Fusarium spp.	100	47.4
F. acuminatum	8	0.3
F. avenaceum	31	1.1
F. equiseti	23	1.2
F. graminearum	54	4.9
F. oxysporum	8	0.2
F. poae	92	36.3
F. sporotrichioides	46	3.4

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

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TITLE /TITRE: SEED-BORNE FUSARIUM ON CEREALS IN SASKATCHEWAN IN 2011

INTRODUCTION AND METHODS: The results of agar plate tests on cereal seed samples from Saskatchewan provided by three companies are summarized. The tests were conducted between early September and mid-December, 2011 and it was assumed that the majority of samples came from the 2011 crop. The tests were conducted either to determine the frequencies of each species of *Fusarium* present or simply to detect *F. graminearum.* Data were tabulated for each Saskatchewan crop district [CD] (5) for *F. graminearum* and for all species combined (total *Fusarium*). The mean percent seed infection levels with *F. graminearum* and with total *Fusarium* were calculated. In addition, the percentages of *F. graminearum*–free samples were calculated. As few of the samples tested were free of all *Fusarium* spp., data on % *Fusarium*-free samples were not tabulated by CD.

The tests were performed on random seed samples, with no attempt to select fusarium-damaged kernels. Plating techniques were as reported previously (3). 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: The 2011 growing season in Saskatchewan was characterized by average to well above average moisture levels in May and June followed by warm dry weather from mid-July to late September. Flooding prevented seeding in many areas of southeast Saskatchewan, but all areas of the province experienced ideal harvest conditions. Cereal yields were generally average to above average, except in the areas flooded in spring, and crop quality and grade were good (5).

No data are available on the proportion of Saskatchewan cereal crops that were sprayed with fungicides to control fusarium head blight (FHB). However, FHB was conspicuous in late summer on wheat and barley in central and eastern CDs (1, 2). With the dry harvest weather saprophytic spread of *Fusarium* spp. into healthly parts of ripening spikes and panicles was probably limited.

The data compiled are based on 953 samples, about double the number reported from a similar time period in 2010. The increase probably reflects concern among Saskatchewan growers about FHB and *Fusarium* infection of seed after the exceptionally high infection levels recorded in 2010 (3). The usual species of *Fusarium* (3) were noted in the samples, with *F. avenaceum* and *F. poae* the most common. *Fusarium graminearum* was found in samples from all CDs except 3BS and 4A.

Mean levels of seed infection (Table 1) both with *F. graminearum* and with total *Fusarium* varied widely among crop districts (Table 1). However in all except the S.W. (CDs 3BS and 4) the mean values for total *Fusarium* reflected a number of samples with unusually high values. For the whole province, about 23% of the samples had >10% and about 46% had >5% total *Fusarium* infection. As for the 2010 crop (3), many heavily infected samples came from areas known for growing high-quality common and durum wheat.

Fusarium graminearum was found in 51% of samples tested, the second highest percent after 2010 of the seven years since 2005 in which this survey has been conducted. The year with the third highest percent, 2005 (4), was also a year with similar provincial mean % infection values with *F. graminearum* and total

Fusarium. Fewer samples were tested in 2005 (4) than in 2011, but the relative distribution among crop districts was similar.

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Table 1. Number of cereal seed samples tested from September to mid- December 2011 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	18	1.7	28%	7.1
1B	3	0.5	67%	12.5
2A	45	2.5	16%	7.6
2B	95	0.7	59%	3.3
3AN	13	0.5	77%	3.7
3AS	73	0.5	67%	3.0
3BN	53	0.5	66%	6.0
3BS	9	0	100%	0.9
4A	2	0	100%	0.8
4B	15	<0.1	93%	1.5
5A	17	1.1	29%	5.0
5B	74	2.3	24%	10.3
6A	92	1.6	27%	7.9
6B	129	0.7	56%	6.8
7A	72	0.4	65%	7.8
7B	30	0.2	77%	5.1
8A	73	3.7	18%	7.7
8B	64	1.0	31%	6.8
9A	56	0.5	68%	5.9
9B	14	<0.1	86%	8.9
TOTAL	953*	1.1	49%	6.3

*Number of samples tested for total *Fusarium* from all crop districts was 839.

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

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TITLE / TITRE: **CEREAL SMUT SURVEYS, 2011**

INTRODUCTION AND METHODS: In July 2011, cereal crops in Manitoba 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 one-day trips around Winnipeg in southern Manitoba and the Red River Valley, and the regions around Brandon, MB and Manitoba's Interlake. Fields were selected at random at approximately 10 - 15 km intervals, depending on the frequency of different cereal 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.

To determine if resistance to carboxin fungicide may be present in the smut populations, an isolate of smut was collected from each infested field and compared with a carboxin-sensitive isolate, '72-66' of *U. nuda* from Canada, and a carboxin-resistant isolate, 'Viva' (Newcombe and Thomas, 1991) from France, using the teliospore germination assay of Leroux (1986) and Leroux and Berthier (1988). Teliospores of each isolate were streaked onto half-strength potato dextrose agar amended with 0 or 1.0 $\mu g\ ml^{-1}$ of carboxin. The cultures were incubated at 20^oC in a controlled environment chamber and examined for teliospore germination after 24 h.

RESULTS AND COMMENTS: Loose smut (*Ustilago tritici*) was found in 9 (35%) of the 26 crops of awnless, common wheat surveyed. Two crops had incidences of 0.1% infection, and one had an incidence of 1.5%. The incidence of smutted plants in the remainder of the infested fields was at trace levels. In awned, common wheat crops, loose smut was found in 2 (4%) of 46 fields. One crop had an incidence of 0.1% and the other a trace level of infection. No durum wheat fields were examined in 2011.

None of the 14 oat fields surveyed was observed to have smutted plants.

Loose smut (*U. nuda*) was found in 4 (67%) of 6 fields of six-row barley. One crop had an incidence of 0.2% infection, while the incidence of smutted plants in the remainder of infested fields was at trace levels. None of the 9 fields of two-row barley surveyed were found to have smutted plants. False loose smut (*Ustilago nigra*) and covered smut (*U. hordei*) were not found in any barley fields in during the 2011 survey.

None of the *Ustilago* spp. isolates collected was able to germinate and grow on agar medium amended with carboxin, suggesting these were all sensitive to the fungicide.

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

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TITLE / TITRE: **CEREAL VIRUS DISEASE SITUATION IN MANITOBA AND EASTERN SASKATCHEWAN IN 2011**

INTRODUCTION AND METHODS:
In 2011 we monitored infections on cereals caused by *barley yellow dwarf virus* (BYDV), *wheat streak mosaic virus* (WSMV), *oat necrotic mottle virus* (ONMV) and *brome mosaic virus* (BMV). Collaborators identified and collected samples from mid-May to early September in cereal crops in Manitoba and parts of eastern Saskatchewan (1); samples were identified as originating from commercial fields or from experimental field trials not subjected to deliberate inoculation with the viruses under investigation. 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, ONMV and BMV was evaluated by transmission to indicator hosts (2) and the identities of the causal viruses confirmed by serological tests (ELISA). The transmission to indicator host plants also served to assess the virulence of isolates against historical benchmarks. For WSMV, transmission was by mechanical inoculation to a range of susceptible wheat hosts. Oat specimens with symptoms that resembled those of oat necrotic mottle, brome mosaic, or of wheat streak mosaic on oat were assayed by mechanical inoculation to a differential set of susceptible bread wheat and oat hosts; confirmation of BMV infection was by assay on maize seedlings. For BYDV, transmission was by cereal aphids to sets of seedlings of the oat cultivar ‘Riel’, a susceptible host.

RESULTS AND COMMENTS:
Barley Yellow Dwarf: In 2011, as in 2010, seeding was delayed in some principal cereal-producing regions of the eastern Prairies by early-season cool, damp conditions. Southerly winds which bring in viruliferous aphids became fairly consistent after mid-June. Crops that were seeded late (after June 1) were at risk of particularly heavy losses from BYD in 2011 as sunny, dry conditions from mid-June onwards amplified the effects of early-growth-stage infection. All isolates that were collected from cereals were similar to the PAV strain (non-specifically transmitted by the oat bird-cherry aphid).

Wheat Streak Mosaic: Outbreaks of WSM in spring wheat crops are especially severe when plants are infected with the virus at early seedling growth stages. In 2011 WSM was detected in many winter wheat fields in southwestern and south-central Manitoba but, in contrast to the situation in recent years (3) low or trace incidences of the disease were found in mid- to late season in fewer than half the spring wheat fields examined. Winter wheat volunteers in spring wheat crops were almost always infected with WSMV. Naturally-occurring outbreaks of WSM on oat, unlike 2010, were not observed in eastern Manitoba in 2011.

Oat Necrotic Mottle (ONM) and disease caused by infection with BMV - The mild streak mosaic symptoms of WSM and ONM on oat are difficult to distinguish and may also resemble those induced by infection with BMV. In 2011, consistent with experience since 2006, oat plants with putative WSM or ONM symptoms were identified at a small number of sites in southeastern Manitoba. Infection of oat with WSMV was confirmed in only two cases, while transmission and serological assays failed altogether to detect ONMV. Infection with BMV was confirmed in one case, but disease symptoms were mild.

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

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TITRE: LES MALADIES PRÉSENTES CHEZ LES CÉRÉALES AU QUÉBEC EN 2011

MÉTHODES: Les symptômes des maladies du feuillage des céréales de printemps ont été notés dans les essais d'enregistrement et de recommandation du Québec. Ces essais, qui sont répartis dans plusieurs régions (CÉROM 2011), ont été visités une fois pendant la saison lorsque le stade de développement des céréales était entre laiteux moyen et pâteux moyen. L'intensité des symptômes a été évaluée selon une échelle de 0 à 9 (0 = aucun symptôme; 9 = symptômes sur plus de 50 % de la surface de la feuille étendard). Une faible intensité correspond à des valeurs variant de 0 à 4, une intensité moyenne aux valeurs de 4 à 6 et une intensité élevée aux valeurs de 6 à 9. Les données de fusariose pour le blé et l'orge proviennent de la Financière agricole du Québec (FADQ). Les dommages causés par la cécidomyie orangée du blé (*Sitodiplosis mosellana*), un insecte associé à la fusariose de l'épi (*Fusarium graminearum*) par la dispersion de l'inoculum de *Fusarium* jusqu'aux épis, ont été notés visuellement sur 11 lots de blé récoltés dans différentes régions du Québec.

RÉSULTATS et COMMENTAIRES: En 2011, dans la plupart des régions du Québec le printemps a été passablement pluvieux ce qui a retardé les semis. Les précipitations sont d'ailleurs demeurées fréquentes jusqu'à la fin du mois de juin. Au mois de juillet cependant, la fréquence des pluies a été très différente d'une région à l'autre et d'une localité à l'autre à l'intérieur d'une même région. Certains champs des régions du sud-ouest de la province n'ont reçu aucune précipitation pendant plus de 40 jours alors que la pluie était au rendez-vous à tous les deux jours dans les régions centrales et presqu'à tous les jours au Saguenay-Lac-Saint-Jean. Les températures sont restées près des moyennes de saison sauf pendant quelques jours autour du 20 juillet où elles ont été plus élevées.

En 2011, les taches foliaires, que ce soit chez l'avoine (*Stagonospora avenae*), le blé (*Drechslera tritici-repentis*, *Stagonospora nodorum* et *Cochliobolus sativus*) ou l'orge ((*Drechslera teres*, *Rhynchosporium secalis* et *Cochliobolus sativus*) ont été beaucoup moins présentes qu'à l'habitude dans les régions du sud de la province où il y a eu peu de précipitations. Dans les autres régions, l'intensité des symptômes de ces maladies variait de moyenne à élevée.

Les rouilles des feuilles (*Puccinica coronata*, *Puccinia triticina* et *Puccinia hordei*), quant à elles, ont été plus répandues et d'intensité plus élevée que par les années passée(Rioux et al. 2010, 2011). Chez l'orge notamment, l'intensité des symptômes était élevée pour certains cultivars/lignées, ce qui est tout de même assez rare au Québec. Mentionnons aussi que la rouille des tiges (*Puccinia graminis*) a été observée sur quelques plantes d'avoine.

Pour une troisième année consécutive, la jaunisse nanisante de l'orge (VJNO) ne s'est pas manifestée dans les essais. Moins répandus qu'en 2010, l'oïdium du blé (*Blumeria graminis* f. sp. *tritici*) a été noté seulement à Princeville (Centre-du-Québec) et l'oïdium de l'orge (*Blumeria graminis* f. sp. *hordei*) à Princeville et Sainte-Hyacinthe (Montérégie-Est). L'intensité des symptômes était faible pour la grande majorité des cultivars/lignées testés.

La fusariose de l'épi chez le blé a été beaucoup moins présente en 2011 qu'elle ne l'a été au cours des trois dernières années (Bertrand Leclerc, communication personnelle). Parmi les producteurs de blé assurés en 2011, 6,9 % (59/852) d'entre eux ont signalé des dommages dus à la fusariose, comparativement à 32,3 % (282/1054) en 2010 et 35,2 % (565/1606) en 2009. Le degré d'infestation de cécidomyie orangée du blé des lots de grains évalués a été moins élevé en 2011 qu'en 2010 avec en moyenne 2,2 larves par épi comparativement à 2,6 en 2010 (Rioux et al. 2011). En moyenne, 0,9 % (0,3 à 2,1 %) des grains présentaient des dommages dus à l'insecte. Sur les 11 échantillons, aucun ne dépassait les 2 % de grains cécidomyiés qui est la norme pour le blé CWRS (Canada Western Red Spring) grade nº1.

Chez l'orge, la fusariose de l'épi n'a pas été un grave problème selon les informations obtenues de la FADQ (Bertrand Leclerc, communication personnelle). Tout comme chez le blé, 6,9 % des producteurs assurés (58/838) ont signalé des dommages à leur culture attribuables à cette maladie. Rappelons que cette proportion était de 7,1 % en 2010 et 30,5 % en 2009 (Rioux et al. 2010, 2011).

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

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TITLE / TITRE: SURVEY OF CORN DISEASES AND PESTS IN ONTARIO AND QUÉBEC IN 2011

INTRODUCTION AND METHODS: A survey was conducted September 7 to 22 to document the diseases and pests on corn in Ontario and Québec in 2011. As in previous years (1, 2, 3, 4), the emphasis of this year's survey was to determine the distribution and severity of diseases including northern leaf blight (*Exserohilum turcicum*), anthracnose leaf blight (*Colletotrichum graminicola*), grey leaf spot (*Cercospora zeae-maydis*), common rust (*Puccinia sorghi*), eyespot (*Aureobasidium zeae*), common smut (*Ustilago maydis*), head smut (*Sporisorium holci-sorghi = Sphacelotheca reiliana*), ear rot (*Fusarium spp*.), stalk rot (*Fusarium spp*., and *C. graminicola*), and Stewart's wilt (*Pantoea stewartii = Erwinia stewartii*). Information also was collected on insect pests such as the European corn borer (*Ostrinia nubilalis*), corn rootworm (*Diabrotica longicornis* and/or *D. virgifera*), and corn flea beetle (*Chaetocnema pulicaria*), as well as any newer diseases or insects pests to Canada such as Goss's Wilt (*Clavibacter michiganensis* subsp. *nebraskensis = Corynebacterium michiganense* pv. *nebraskense*), phaeosphaeria leaf spot (*Phaeosphaeria maydis)* and others.

At each of the 165 fields surveyed (120 in Ontario, 45 in Québec) the incidence of each pest and the severity of the predominant pests were recorded. Seven leaf samples with possible Stewart's wilt-like symptoms were collected in southern Ontario, in additional to four corn seedling samples obtained earlier in the growing season. ELISA tests for *P. stewartii*, on these 11 samples were conducted at our AAFC facility using reagent sets, protocols, and antibodies provided by AGDIA Inc. (Elkhart, Indiana 46514, USA).

RESULTS AND COMMENTS:
Fungal leaf diseases: Northern leaf blight (NLB) was detected in 115 fields in Ontario and 42 in Québec. As has been the case in previous years (1, 2, 3, 4), NLB was the most common leaf disease on corn in Ontario and Québec in 2011. The ubiquitous distribution of NLB was reflected by the fact the disease occurred in all but eight of the 165 fields surveyed (Table 1). In Ontario 39 fields were determined to have intermediate to severe levels of infection. This included 10 seed corn fields and 13 commercial fields with very severe infections, located in Chatham-Kent, Huron, Elgin, Oxford, Wellington, Dufferin, Leeds & Grenville, Renfrew, Ottawa-Carleton, and Stormont, Dundas & Glengarry counties, ON. In Québec, 14 commercial grain corn fields were observed to have intermediate to severe levels, including six with very severe NLB in Vaudreuil-Soulanges, Haut Richelieu, D'Acton, Nicolet-Yamaska, and Argenteuil counties.

At the Ontario Corn Committee (OCC) Performance Trials located in Ridgetown, West Lorne, Exeter, Blyth, Dublin, Alma, Ottawa, Winchester, Pakenham, and Lancaster, some hybrids exhibited moderate susceptibility to NLB, while at the Belmont and Orangeville trial sites, several hybrids expressed moderate to highly susceptible NLB reactions. Both resistant and susceptible NLB lesion types were found in 27 fields in Ontario and 7 in Québec, and occasionally, on the same plant leaf. This reinforces the previous notion that pathogenic races of the pathogen exist in both Ontario and Québec. Although the presence of an introgressed NLB resistance gene in selected genotypes did not prevent disease, NLB development and resulting senescence (premature plant death) were delayed, even in severely affected plants. We revisited two locations in Ontario (Elgin and Stormont, Dundas & Glengarry counties) which had had severe NLB epidemics in 2010 and in both instances, 10 or more hectares of corn plantings were dead due primarily to NLB .

Anthracnose leaf blight (ALB) was observed in 92 fields in Ontario and 35 in Québec (Table 1). Overall, ALB was not as prevalent as in previous years, (1, 2, 3, 4) possibly as a result of the delayed 2011 season. Several hybrids at the Pakenham OCC trial expressed moderate susceptibility to ALB, whereas only a single hybrid included in the Orangeville OCC trial appeared to be highly susceptible to the disease.

Typical symptoms of grey leaf spot (GLS) were found in 76 fields in 13 counties of Ontario and in one field in Québec (Table 1). Several hybrids expressed moderate susceptibility to GLS at the Tilbury, Ridgetown, Kerwood, and Woodstock OCC trial locations. In four seed corn fields, female inbred lines were found to be moderately to highly susceptible to GLS. A few leafy silage corn hybrids in Oxford County also showed susceptibility to GLS. Since 2004 (4), GLS has continued to spread and intensify in Ontario and in many instances has become the predominant foliar disease. The 2011 results for GLS also confirm the previous detections of grey leaf spot in the province of Québec.

Common rust was documented in 101 fields in Ontario and 41 in Québec (Table 1). As found in 2010, more common rust was found in southern Ontario than in eastern Ontario or Québec (1). Twenty fields in southern Ontario, including three seed corn fields, showed intermediate to high severities of common rust, while in eastern Ontario and Québec two and nine fields, respectively had moderate severities. Southern rust (*Puccinia polysora* Underw.) was not detected in 2011.

Eyespot was once more a common leaf disease in 201, found in 118 fields, 74 in Ontario and 44 in Québec (Table 1). Twenty-four fields had intermediate eyespot severities, including 4 in southern Ontario, 8 in eastern Ontario, and 12 in Québec. Several hybrids were found to be moderately susceptible to eyespot at the Orangeville, Ottawa, Winchester, and Lancaster OCC trial locations.

Brown spot (*Physoderma maydis*) was seen on sheathes or leaves throughout Ontario and Québec; however, affected leaves remained and were still alive at the time of the survey. Fusarium sheath rot was found often, especially on leaves of secondary ears, and resulted in premature leaf death. Phaeosphaeria leaf spot (PLS), a foliar disease newer to Canada caused by *P. maydis*, was found at 8 sites in Ontario, including 6 OCC trials, and 5 sites in Québec. At each of these sites, disease incidence was low, and only a few plants showed typical symptoms – round to elongated spots with dark brown margins. Northern leaf spot, a disease reported in 2010 (1), was not detected in 2011.

Fungal ear and stalk diseases: Common smut was distributed across 86 fields in Ontario and 25 in Québec in 2011 (Table 1). The disease was most problematic in south-western Ontario, with the highest incidences [5-50%] found in five seed corn fields where gall formation was common in female inbreds on stalks, tassels or ears. Significant differences in female inbred susceptibility to common smut are known to exist. Four grain corn fields in southern Ontario and three in eastern Ontario also had high levels (1 - 30%) of common smut. In Québec common smut was difficult to find and no field in the province had >1% infection. Head smut was seen at three sites in eastern Ontario, with one site in Ottawa-Carleton County having 10 - 70% incidence throughout the field, depending on the genotype affected. Five fields in Québec had a low incidence (<1%) of head smut. In one plant with four ears, three ears were smutted while one had normal kernels and no sign of disease, suggesting head smut may be partly systemically transmitted in plants. Gibberella/Fusarium/Penicillum ear rots were observed in 71 fields in Ontario and 35 fields in Québec (Table 1). Levels in seed corn fields ranged from 5 to 90%. In three grain corn fields with levels as high as 60% multiple pathogens (*Fusarium*, *Penicillum*, and others) were present. As expected, variable levels of genetic resistance to ear rot(s) were observed in corn hybrids. In the OCC trials at Tilbury, Kerwood and Wingham, many hybrids appeared to be moderately to highly susceptible to ear rot. Sprouting of kernels occurred in many rotted ears when moisture was abundant. Overall, the incidence of ear rot in Ontario in 2011 was the highest observed since 2006 (3). Severe levels of ear rot were not found in Québec in 2011. As reported in past surveys, many ears showed evidence of black mold spores (*Cladosporum* spp., *Alternaria* spp., etc.) on kernels after bird or insect damage.

Two fields in the Chatham-Kent area contained plants with symptoms of crazy top downy mildew (Sclerophthora macrospore) at incidences up to 19%. Saturated soils in spring and the resulting delay in seeding had created ideal conditions for infection and subsequent systemic spread of the pathogen.

Symptoms of crazy top included multiple barren ears, distorted leaves, long husk leaves, etc.; in addition common smut readily developed on diseased tassels.

Stalk rot, including anthracnose stalk rot/top die-back, fusarium stalk rot, and pythium stalk rot was observed in 86 and 43 fields in Ontario and Québec, respectively (Table 1). Fourteen fields in Ontario and 16 in Québec had severe levels of top die-back, i.e. incidences of 60-100%. Pythium stalk rot, also called early death, was detected more frequently than usual in 2011, especially in Québec. Incidence levels up to 30% were found in one field in Ontario and six fields in Québec. These fields were low-lying and flooded during the ‘early maturity period’ extending from mid-August to mid-September.

Bacterial diseases: While Stewart’s wilt-like symptoms were observed in 11 samples, the symptoms were not definitive for the disease, and all samples subsequently tested by ELISA were negative for *P. stewartii.* Populations of the corn flea beetle (CFB) vector were lower in southern Ontario in 2011 than in 2010 (1). Symptoms of Goss’s bacterial wilt were not observed in Ontario or Québec in 2011.

Virus diseases: In southern Ontario, one plant with virus-like symptoms of maize dwarf mosaic was observed during the survey, but a confirmatory ELISA test was not done.

Insects: European corn borer (ECB) damage was observed in 80 Ontario and 36 Québec fields (Table 1). Several hybrids grown in the Woodstock, Waterloo, Elora and Winchester OCC trials had incidence levels as high as 20-60%. Corn rootworm (CRW) damage was observed in 114 fields in Ontario and 44 in Québec (Table 1). As found in previous years (1, 2, 3, 4), the main damage from CRW in most fields was leaf feeding, silk pruning, and occasional damage to kernels. ECB and CRW activity was less pronounced in Québec than in Ontario in 2011.

Grasshoppers, most likely the red-legged grasshopper [*Melanoplus femur-rubrum* (De Geer)], were observed in 98 fields in Ontario and 39 fields in Québec (Table 1). As was found in 2010 (1), populations were low in both Ontario and Québec in 2011. Corn flea beetle (*Chaetocnema pulicaria*) was detected in 15 fields in southern Ontario. As also reported for 2010 (1), corn blotch leaf miner (*Agramyza parvicornis* Loew) was not as common in 2011 in either Ontario or Québec as it had been in previous years (2,3,4).

Other insects seen included corn ear worm (*Helicoverpa zea*) in nine Ontario and one Québec field, while aphids, brown stink bug (*Euschistus servus*), picnic beetle (*Glischrochilus quadrisignatus*), Japanese beetle (*Popillia japonica*), and June beetle (*Phyllophaga* spp.) were visible in a few fields in Ontario or Québec, but only at very low populations.

Mites: Two-spotted spider mite (*Tetranychus urticae* Koch = *T. bimaculatus* Harvey) populations remained very low in both Ontario and Québec in 2011.

Other: As reported in the past (1,2,3,4), bird or other animal damage was severe in many fields in both Ontario and Québec. Damage from hail was also observed at numerous locations in both Ontario and Québec. An early frost occurred in eastern Ontario and Québec on September 17, whereas in other parts of Ontario a significant frost did not occur until October 28.

Summary: In 2011, the environmental conditions in mid- to late-season (June to October) consisted of high temperatures and frequent periods of precipitation. While favourable for crop development, these also promoted development of certain corn diseases such as northern leaf blight and grey leaf spot. Ninety-five percent of the corn fields surveyed were affected by northern leaf blight, including 20 rated as severely affected in 15 counties in Ontario and Québec, making 2011 another epidemic year for NLB. Grey leaf spot continued to be more prevalent and is currently endemic in southern Ontario, especially in seed corn fields. Common smut infections, especially in seed corn fields in southern Ontario, were frequent, as were those of head smut in eastern Ontario and Québec. Ear rots, including gibberella ear rot, were seen in Ontario at the highest levels since 2006. Pythium stalk rot was also favoured by the environmental conditions in late summer. Anthracnose leaf blight, rust and eyespot were less prominent in 2011. Stewart’s wilt and Goss’s wilt were not found in 2011. European corn borer, corn rootworm, grasshoppers, and mites were less problematic than usual in both Ontario and Québec.

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Table 1. Distribution of pests in 165 corn fields surveyed in Ontario and Québec in 2011

County	No. of Fields	NLB	ALB	GLS	Rust	Eyespot	PLS	Smut	Head smut	Ear rot	Stalk rot	ECB	CRW	Grass hopper	Mites
Ontario															
Chatham-Kent	35	35	30	35	29	12		26		18	16	25	31	32	9
Dufferin	3	3	3		3	3	1	2		6	3	2	3	3	2
Elgin	6	6	4	6	6	2		4		3	5	3	6	4	
Essex	5	5	3	5	3	1		5		3	3	4	5	2	3
Frontenac	2	1	2			2		1		1	2	2	2	2	2
Huron	7	7	5	3	7	5	3	5		3	6	4	7	4	4
Lambton	2	2	2	2	2			2				1	2	1	
Lanark	4	2	3		3	4		2		2	4	2	3	3	2
Leeds & Grenville	4	3			2	4		1		2	4	3	4	3	3
Middlesex	7	7	7	7	7	4	1	6		5	6	6	7	4	1
Norfolk	2	2	2	1	2	2		1		1	2	1	2	2	1
Ottawa-Carleton	6	6	4	2	6	6		5	2	5	6	4	6	6	3
Oxford	9	9	6	7	8	4	1	7		6	6	6	9	8	2
Perth	4	4	4	1	4	2		3		2	3	1	3	4	1
Prescott & Russell	2	2	1		2	2		2		1	2	2	2	1	1
Renfrew	8	7	5		5	8		3	1	2	5	2	8	5	2
Stormont, Dundas & Glengarry	7	7	4	3	5	7	2	4		5	6	6	7	7	6
Waterloo	1	1	1	1	1	1		1		1	1	1	1	1	
Wellington	6	6	6	3	6	5		6		5	6	5	6	6	1
Total	**120**	**115**	**92**	**76**	**101**	**74**	**8**	**86**	**3**	**71**	**86**	**80**	**114**	**98**	**43**
Québec															
Argenteuil	2	2	1		1	2		2		1	2	1	2	2	
Bas-Richelieu	1	1	1		1	1				1	1	1	1	1	
Becancour	3	2	3		2	3		1	1	3	3	1	3	2	1
Brome-Missisquoi	3	3	2	1	3	3		2			3	3	2	3	1
D'Acton	1	1	1		1	1		1		1	1	1	1	1	
D'Autray	1	1	1		1	1		1	1		1	1	1	1	
Drummond	3	3	3		3	3				3	3	2	3	3	
Haut-Richelieu	4	3	1		4	4	2	2		3	2	4	4	4	1
Jardins-de-Napierville	2	2	2		2	1		1		1	2	2	2	1	1
Joliette	1	1	1		1	1		1		1	1	1	1	1	
Maskinonge	5	4	5		5	5		2	1	3	5	4	5	4	
Maskoutains	5	5	4		4	5	2	1		5	5	5	5	4	1
Mirabel	2	2	2		2	2		2	1	2	2	1	2	2	
Montcalm	2	2	1		2	2		2	1	2	2	2	2	2	1
Nicolet-Yamaska	4	4	3		4	4	1	2		4	4	2	4	4	
Rouville	2	2	1		1	2		2		2	2	2	2	2	
Vaudreuil-Soulanges	4	4	3		4	4		3		3	4	3	4	2	2
Total	**45**	**42**	**35**	**1**	**41**	**44**	**5**	**25**	**5**	**35**	**43**	**36**	**44**	**39**	**8**

NLB = Northern leaf blight; ALB = Anthracnose leaf blight; GLS = Grey leaf spot; Rust = Common rust; PLS = Phaeosphaeria leaf spot; Smut = Common smut; Ear rot = Gibberella ear rot, Fusarium ear rot, Penicillium ear rot etc.; Stalk rot = Fusarium stalk rot, Pythium stalk rot, Anthracnose stalk rot, and Top-die back; ECB = European corn borer; CRW = Corn rootworm, including both western and northern corn rootworm; Grasshoppers = most likely the red-legged grasshopper; and Mites= most likely Two-spotted spider mite.

CROP / CULTURE: Oat
LOCATION / RÉGION: Saskatchewan

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TITLE / TITRE: 2011 SURVEY FOR OAT FHB IN SASKATCHEWAN

INTRODUCTION AND METHODS: To identify and quantify the *Fusarium* species affecting oat crops in Saskatchewan in 2011, 85 fields from crop districts (CD) throughout the province were sampled from August 7 to September 8, when plants were at the late milk to early dough development stage. Twenty panicles were harvested at random from each field, placed in paper bags, and air-dried at room temperature. Samples were hand threshed and a portion of the seed was surface-sterilized in 3% (v/v) NaOCl for 2 minutes, rinsed with water to remove residual NaOCl and air dried. Fifty random kernels were plated on potato dextrose agar in Petri dishes (10 seeds per dish). The *Fusarium* colonies isolated were identified to species based on morphological characteristics (Gerlach and Nirenberg 1982).

The remaining seed was ground to < 40 µm fineness using a Retsch ZM 200 Mill. DNA was extracted using the QIAGEN DNeasy Plant Mini Kit. Primers and TaqMan probes (6-FAM/TAMRA) specific for five *Fusarium* species (*F. graminearum, F. poae, F. sporotrichioides, F. culmorum,* and *F. avenaceum*) were designed based on available DNA sequence information (Halstensen et al., 2006; Yli-Mattila et al., 2008; Nicolaisen et al., 2009) and real-time PCR was performed with the ABI 7900HT Fast Real-Time PCR System (Applied Biosystems Inc.) to detect and quantify each *Fusarium* species.

RESULTS AND COMMENTS: The results of the plate and real-time PCR methods to detect *Fusarium* species are compared in Table 1. *Fusarium poae* was the most common species isolated by the plate method (38.8%), followed by *F. avenaceum, F. graminearum* and *F. sporotrichioides* at 5.9%, 1.2% and 1.2%, respectively. Real-time PCR was more sensitive than the plate method in detecting the various *Fusarium* species. *Fusarium graminearum* and *F. poae* were detected in all samples by real-time PCR, while 90.6% and 11.8% of the crop samples were determined to have *F. avenaceum* and *F. culmorum* at the 0.001 pg/ng detection limit (Table 1). However, except for *F. poae*, the quantity of most *Fusarium* species was low in these samples and *F. sporotrichioides* was not detected at all (Table 1, Fig. 1).

The quantity of *Fusarium* DNA detected by real-time PCR in 2011 ranged from 0.001 to 0.985 pg/ng, which was far lower than in 2009 (0.002 to 3.509 pg/ng) or 2010 (0.010 to 4.793 pg/ng) (Yajima et al. 2011). Mean levels and ranges of *Fusarium* DNA quantity varied among crop districts (Tables 2, 3). The highest mean quantity of *F. graminearum* was detected in CD 5A. *Fusarium poae* levels were greatest in CDs 2A, 6A, 8A and 9A, with mean *Fusarium* quantities of 0.187, 0.204, 0.231 and 0.243 pg/ng, respectively. The highest *F. avenaceum* quantity was found in CD 8A, while CD 8B had the highest mean level. *Fusarium culmorum* was detected at relatively low levels in only CDs 3B, 5B, 6A, 6B and 8A but with the highest quantity and mean levels in CD 8A.

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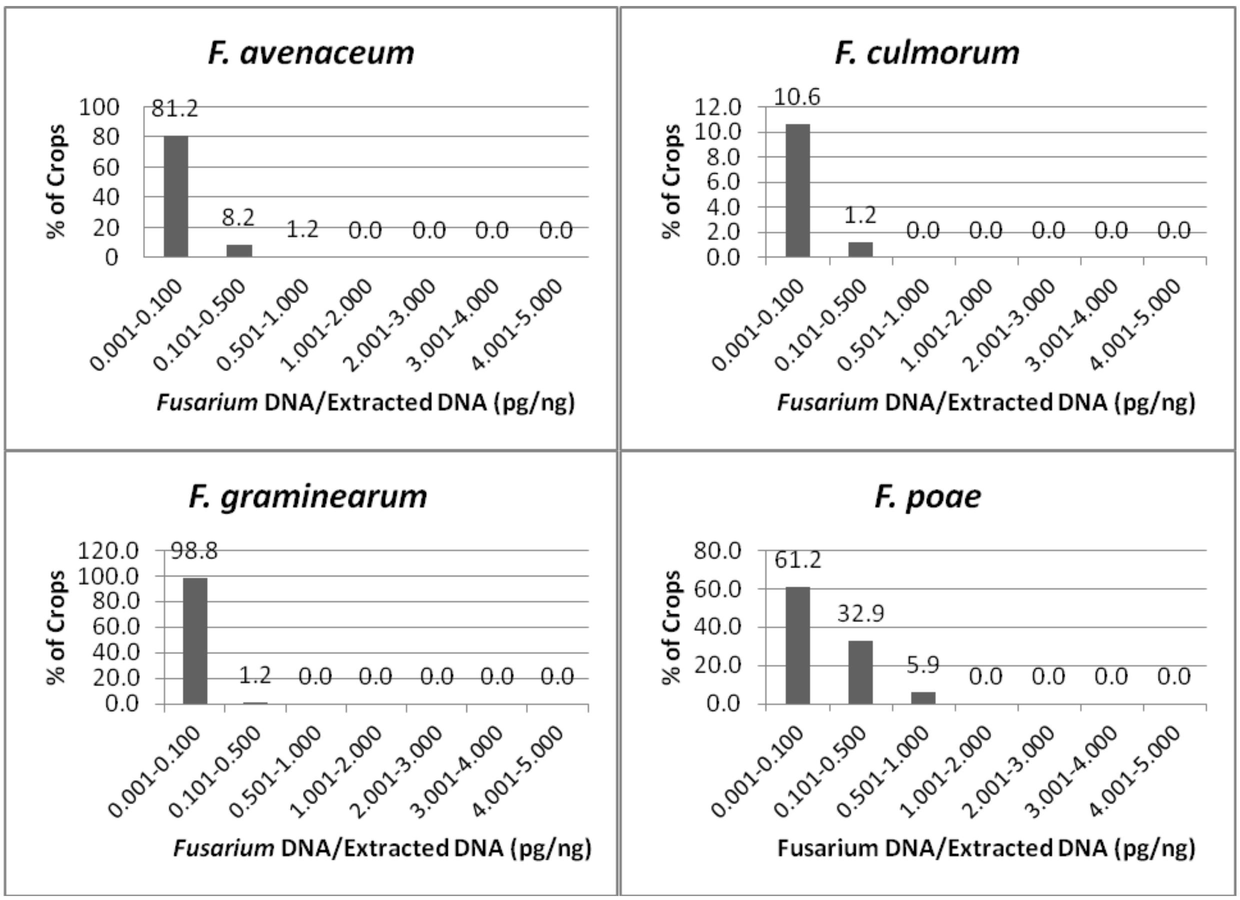

Figure 1. *Fusarium* DNA abundance in Saskatchewan oat crops in 2011 (Note the difference in the y-axis scale for *F. culmorum)*.

Table 1. *Fusarium* spp. detected in Saskatchewan oat crops in 2011.

Fusarium spp.	Plate method (% of crops)	RT-PCR method (% of crops) >0.001*	>0.10
F. avenaceum	5.9	90.6	9.4
F. culmorum	0.0	11.8	1.2
F. graminearum	1.2	100.0	1.2
F. poae	38.8	100.0	38.8
F. sporotrichioides	1.2	0.0	0.0

**Fusarium* DNA/Extracted DNA (pg/ng)

Table 2. Quantity of *Fusarium graminearum* and *F. poae* (pg/ng; *Fusarium* DNA/Extracted DNA) detected in Saskatchewan Crop Districts in 2011.

		F. graminearum			***F. poae***		
Crop District	**No. of Crops**	**Detected (%)**	**Mean**	**Range**	**Detected (%)**	**Mean**	**Range**
1A	3	100	0.025	0.016-0.030	100	0.042	0.014-0.067
2A	5	100	0.022	0.008-0.029	100	0.187	0.023-0.499
2B	2	100	0.020	0.016-0.025	100	0.078	0.05-0.101
3A	1	100	0.021	0.021	100	0.050	0.050
3B	5	100	0.024	0.017-0.030	100	0.100	0.013-0.416
5A	7	100	0.047	0.015-0.178	100	0.025	0.012-0.055
5B	10	100	0.032	0.02-0.065	100	0.082	0.009-0.323
6A	20	100	0.017	0.004-0.026	100	0.204	0.015-0.798
6B	6	100	0.021	0.014-0.026	100	0.113	0.013-0.266
7A	3	100	0.020	0.017-0.021	100	0.021	0.011-0.038
8A	10	100	0.015	0.005-0.037	100	0.231	0.015-0.985
8B	2	100	0.020	0.019-0.021	100	0.093	0.029-0.157
9A	9	100	0.018	0.015-0.025	100	0.243	0.01-0.958
9B	2	100	0.023	0.017-0.028	100	0.027	0.016-0.039

Table 3. Quantity of *Fusarium avenaceum and F. culmorum* (pg/ng; *Fusarium* DNA/Extracted DNA) detected in Saskatchewan Crop Districts in 2011.

		F. avenaceum			***F. culmorum***		
Crop District	**No. of Crops**	**Detected (%)**	**Mean**	**Range**	**Detected (%)**	**Mean**	**Range**
1A	3	66.6	0.020	0.001-0.039	0	-	-
2A	5	100	0.034	0.001-0.163	0	-	-
2B	2	100	0.006	0.005-0.007	0	-	-
3A	1	100	0.001	0.001	0	-	-
3B	5	80	0.001	0.001-0.002	20	0.003	0.003
5A	7	100	0.034	0.001-0.217	0	-	-
5B	10	90	0.045	0.001-0.282	20	0.002	0.001-0.003
6A	20	90	0.049	0.001-0.403	10	0.001	0.001
6B	6	66.6	0.017	0.001-0.057	16.6	0.001	0.001
7A	3	100	0.002	0.001-0.003	0	-	-
8A	10	100	0.078	0.001-0.680	40	0.093	0.001-0.365
8B	2	100	0.166	0.002-0.329	0	-	-
9A	9	88.9	0.002	0.001-0.011	0	-	-
9B	2	100	0.044	0.002-0.086	0	-	-

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: FUSARIUM HEAD BLIGHT OF OAT - MANITOBA 2011

INTRODUCTION AND METHODS: The occurrence of fusarium head blight (FHB) in oat crops in southern Manitoba in 2011 was assessed by monitoring 23 commercial fields from August 1- 8, when crops were at the early- to soft dough (ZGS 78-85) 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 Highway #s 17 and 16 to the north, the Manitoba/North Dakota border in the south, Hwy #12 to the east, and Hwy #21 to the west. Fusarium head blight in each field was determined by sampling a minimum of 80-100 plants gathered as a clump, at each of 3 locations, and assessing them for the presence of infected spikelets on panicles (disease incidence), and for the average proportion of putatively infected panicles (SPI). Fusarium head blight severity was calculated as the 'FHB Index' (% incidence x % SPI) / 100. Several affected panicles, or 'normal' panicles as necessary, closest to each of the clumps sampled were collected from each location and stored in paper envelopes. Subsequently, 50 putatively infected kernels per field were surface-sterilized in 0.3% NaOCl for 3 min., air-dried, and plated onto potato dextrose agar in petri plates (10 kernels per plate) to identify and quantify the species of *Fusarium* present, based on morphological traits outlined in standard taxonomic keys.

RESULTS AND COMMENTS: In 2011, conditions throughout southern Manitoba were wetter than normal and particularly so in south-central and southwestern regions. Flooding was widespread and resulted in considerable land not being seeded in spring or, if seeded, subsequently abandoned due to poor emergence. Despite a difficult start, reasonable crops were harvested in many districts, due in large part to the particularly dry (except in the southwest) and warm period from mid-July to the end of September. Accumulated growing degree days (May 15 to Sept 15) were near normal in most regions.

Oat was grown on some 162,000 ha (401,000 acres) in Manitoba in 2011, a 16% reduction compared to 2010 (Tekauz et al. 2011), with 90% of the area occupied by seven cultivars: 'Souris' (26%), 'Furlong' (16%), 'Leggett' (12%), 'Triactor' (12%), 'Ronald' (9%), 'Summit' (8%) and 'Pinnacle' (7%) – (Yield Manitoba 2012', Manitoba Agricultural Services Corporation, supplement to the Manitoba Co-operator, Feb 23, 2012).

Fully 18 of the 23 oat crops monitored appeared to be 'free' of FHB, based on the lack of definitive symptoms such as orange-pink or otherwise discoloured spikelets on panicles. Overall, the average incidence of FHB was estimated to be 0.1% (range 0 – 0.6%), SPI 0.9% (range 0 – 5.0%) and the resulting FHB Index <0.01% (range 0 – 0.03%). As such, FHB was estimated to have caused no loss of yield in Manitoba oat crops in 2011. Very low levels of mid-season FHB severity are typical for oat, but the visual levels observed in 2011 were the lowest since systematic monitoring of the crop for FHB began in 2002 (Tekauz and Gilbert 2011). While moisture was abundant early in the growing season, this was accompanied by cool weather which likely curtailed inoculum development on overwintered straw in farm fields. Subsequent very dry and warm conditions in most regions would have further reduced the likelihood of *Fusarium* infection, and as such, manifestation of visual symptoms.

Fusarium colonies developed from 21 of the 23 crops sampled and 9.7% of the oat kernels plated on potato dextrose agar medium. *Fusarium poae* dominated in 2011 (Table 1), as was also the case for barley (Tekauz et al. 2012). *Fusarium graminearum* and *F. sporotrichioides* each were identified from 13% of fields at lower levels than in 2010 (Tekauz et al. 2011). No *F. avenaceum* was found in 2011. Two oat crops with unusual statistics included one 3 km north of Anola with *F. poae* isolated from 32% of randomly selected kernels, and another at Grand Pointe southeast of Winnipeg with 42% of kernels affected by *Fusarium*, of which 32% were *F. graminearum* (next highest level 2%) and 10% were *F. poae*.

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Table 1. *Fusarium* spp. isolated from oat in Manitoba in 2011.

Fusarium spp.	Percent of fields	Percent of kernels
F. graminearum	13	16.5
F. poae	91	79.4
F. sporotrichioides	13	3.1

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

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TITLE / TITRE: LEAF SPOT DISEASES OF MANITOBA AND SASKATCHEWAN OAT IN 2011

INTRODUCTION AND METHODS: In 2011, the occurrence of leaf spot diseases in 23 commercial oat crops in Manitoba and 22 in east-central Saskatchewan was assessed during surveys from August 1-8 (MB) and August 1-29 (SK), at which time plants were at the late-milk to soft-dough (ZGS 78-85) 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 Highway #s 17 and 16 to the north, the Manitoba/North Dakota border in the south, Hwy #12 to the east, and Hwy #21 to the west. 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) and lower leaves, 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 putative leaf spot symptoms were collected at each site and dried and stored in paper envelopes. In Saskatchewan, the fields surveyed were in the east-central region (north and east of Saskatoon) and in some crops only the upper canopy (flag and penultimate leaves) was rated for leaf spot severity. Foliar tissue with typical lesions was collected at each site, placed in paper envelopes and allowed to dry. For all collections, 10 surface-sterilized pieces of putatively infected leaf tissue were subsequently placed in moist chambers for 3-5 days to promote pathogen sporulation, identify the diseases and pathogen(s) present and determine their relative importance.

RESULTS AND COMMENTS: In 2011, conditions throughout southern Manitoba were wetter than normal and particularly in south-central and south-western regions. Flooding was widespread and resulted in considerable land not being seeded in spring, or if seeded, subsequently abandoned due to poor emergence. Despite a difficult start, reasonable crops were harvested in many districts, due in large part to the particularly dry (except in the south-west) and warm conditions from mid-July to the end of September. Accumulated growing degree days (May 15 to Sept 15) were near normal in most regions.

In Saskatchewan the 2011 growing season was characterized by average to well above average moisture levels in May and June followed by warm dry weather from mid-July to late September. Flooding prevented seeding in many areas of southeast Saskatchewan, but all areas of the province experienced ideal harvest conditions. Cereal yields were generally average to above average, except in the areas flooded in spring, and crop quality and grade were good (SK Ministry of Agriculture 2011).

Oat was grown on some 162,000 ha (400,000 acres) in Manitoba in 2011, a 16% reduction compared to 2010 (Tekauz et al. 2011). Most of the area was seeded to 7 cultivars: 'Souris' (26%), 'Furlong' (16%), 'Leggett' (12%), 'Triactor' (12%), 'Ronald' (9%), 'Summit' (8%) and 'Pinnacle' (7%) - 'Yield Manitoba 2012', Manitoba Agricultural Services Corporation, supplement to the Manitoba Co-operator, Feb 23, 2012. In Saskatchewan in 2011, nearly 577, 000 ha (1,400,000 acres) were seeded to oat (Statistics Canada, Field Crop Reporting Series, 2011).

Leaf spots were observed in the upper and/or lower leaf canopies of 17 (74%) of the Manitoba oat crops monitored, a somewhat lower proportion than usual; in Saskatchewan most sampled fields showed some evidence of leaf spotting (Tekauz et al., 2011, 2010). In Manitoba, all crops with visible leaf spotting had levels in the upper canopy rated as trace or slight. In the lower canopy, trace or slight levels were observed in 65% of affected crops, moderate levels in 9%, and the leaves had senesced in the remaining 26%. On average, yield losses from leaf spots in oat is Manitoba would have been minimal, possibly 1%. In Saskatchewan, the 15 fields rated for leaf spot severity were classified in the trace to moderate categories, suggesting that leaf spots may have caused somewhat more damage to oat in east-central Saskatchewan than in southern Manitoba, but that overall they were not particularly damaging to the crop.

In both Manitoba and Saskatchewan, *Pyrenophora avenae*, causal agent of pyrenophora leaf blotch, was the most prevalent pathogen and caused most of the damage observed (Table 1). This is what is typically found (Tekauz et al. 2011), an exception being in 2009 (Tekauz et al. 2010). *Stagonospora avenae* f. sp. *avenaria* (stagonospora leaf blotch) was the second most damaging pathogen identified, while *Cochliobolus sativus* (spot blotch) was found in only a few crops and at very low frequencies. Compared to 2010, in 2011 levels of *S. avenae* f. sp. *avenaria* increased substantially, while those of *C. sativus* decreased markedly, the latter particularly so in Manitoba (Tekauz et al. 2011). *Pyrenophora avenae* remains the dominant component of the leaf spot complex of oat in the eastern Prairies.

ACKNOWLEDGEMENTS:
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Table 1. Incidence and isolation frequency of leaf spot pathogens from oats crops sampled in southern Manitoba and east-central Saskatchewan in 2011.

Pathogen	Manitoba		Saskatchewan	
	Incidence (% crops)	**Frequency (% isolations)**	**Incidence (% crops)**	**Frequency (% isolations)**
Pyrenophora avenae	57	81	59	72
Stagonospora avenae f. sp. *avenae*	26	18	27	24
Cochliobolus sativus	4	2	18	5

*indicative of the relative amount of foliar damage observed

CROP / CULTURE: Oat
LOCATION / RÉGION: Eastern Ontario

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TITLE / TITRE: DISEASES OF OAT IN CENTRAL AND EASTERN ONTARIO IN 2011

INTRODUCTION AND METHODS: A survey of oat diseases was conducted in central and eastern Ontario in the last week of July when plants were at the soft dough stage of development. Twelve fields were chosen at random in regions of central and eastern Ontario where most oat crops are 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). Disease diagnosis was based on visual symptoms. Average severity scores of <1, <3, <6, and ≥6 were considered trace, slight, moderate, and severe infection levels, respectively. Severity for ergot, loose smut, and take-all was based on the percent plants infected. Fusarium head blight (FHB) was rated for incidence (% infected panicles) and severity (% infected spikelets in the affected panicles) based on approximately 200 panicles 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 as slight, moderate, severe, and very severe infection levels, respectively. Determination of the causal species of FHB was based on 50 infected heads (panicles) collected from each field. The panicles were air-dried at room temperature and subsequently threshed. Fifty discolored kernels per sample were chosen at random, surface sterilized in 1% NaOCl for 60 seconds and plated in 9-cm diameter petri dishes on modified potato dextrose agar (10 g dextrose per liter) amended with 50 ppm of streptomycin sulphate. The plates were incubated for 10-14 days at 22-25ºC and a 14-hour photoperiod using fluorescent and long wavelength ultraviolet tubes. *Fusarium* species isolated were identified by microscopic examination using standard taxonomic keys.

RESULTS AND COMMENTS: A total of 10 diseases were observed (Table 1). Crown rust (*Puccinia coronata* f.sp. *avenae*) was the most prevalent disease and was observed in all surveyed fields at a mean severity of 4.5. Severe infection was noted in three fields. Yield reductions from crown rust were estimated to average 10%. Barley yellow dwarf (BYD), pyrenophora leaf blotch (*Pyrenophora avenae*), spot blotch (*Cochliobolus sativus*), and stagonospora leaf blotch (*Stagonospora avenae* f.sp. *avenaria)* also were observed in all surveyed fields while halo blight (*Pseudomonas syringae* pv. *coronafaciens*) was seen in 11 fields. However, severities of these diseases were relatively low, averaging 1.5-1.8 (range 1.0 - 3.0), and either alone or collectively, likely resulted in little crop damage.

Take-all root disease (*Gaeumannomyces graminis* var. *avenae*) was found in all 12 fields at a mean incidence of 2.3% (Table 1); this incidence level was higher than in previous years (Xue and Chen 2011). Ergot (*Claviceps purpurea*) and loose smut (*Ustilago nuda*) were recorded in 8 and 4 fields at mean incidences of 1.6% and 1.0%, respectively; they likely had a minimal impact on the crop.

Fusarium head blight occurred in all fields (Table 1) with an average FHB index of 0.1% (range 0.1-0.3%). Severe levels of infection by FHB were not observed. Five *Fusarium* species were isolated from putatively infected kernels (Table 2) and *F. poae* predominated. It occurred in all fields and was isolated from 56.3% of discolored kernels. *Fusarium graminearum* and *F. sporotrichioides* also were commonly isolated; they were recorded in 33 and 50% of fields and on 3.3 and 4.5% of the discolored kernels, respectively. Other *Fusarium* species, including *F. avenaceum* and *F. equiseti* were isolated from only 0.7 to 1.7% of discolored kernels suggesting these were minor contributors to FHB on oat in 2011.

Overall, the incidence and relative prevalence of foliar diseases in oat in 2011 were similar to those found in 2010 (Xue and Chen. 2011). Crown rust continues to be the predominant disease, causing an estimated annual yield reduction in Ontario of at least 10%. Spot blotch and stagonospora leaf blotch were commonly observed on oat but have had minor impacts on crop yields in recent years. Take-all root disease has become common since 2010 (Xue and Chen 2011). Fusarium head blight, although observed in all the surveyed fields, likely had little effect on crop yields and grain quality in 2011. *Fusarium poae* has been the predominant species recovered from infected kernels in Ontario since 2006 (Xue and Chen. 2011). The high temperatures and low number of rainfall events in June and early July in central and eastern Ontario in 2011 were less favorable for development of FHB and were likely responsible for the low disease severity observed.

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Table1: Prevalence and severity of oat diseases in central and eastern Ontario in 2011.

DISEASE	NO. CROPS AFFECTED (n=12)	DISEASE SEVERITY IN AFFECTED CROPS*	
		MEAN	RANGE
Barley yellow dwarf	12	1.7	1.0-3.0
Crown rust	12	4.5	3.0-6.0
Halo blight	11	1.6	1.0-3.0
Pyrenophora leaf blotch	12	1.8	1.0-3.0
Spot blotch	12	1.8	1.0-4.0
Stagonospora leaf blotch	12	1.5	1.0-2.0
			-
Ergot (%)	8	1.6	1.0-2.0
Loose smut (%)	4	1.0	1.0-1.0
Take-all (%)	12	2.3	1.0-5.0
			-
Fusarium head blight**	12		
Incidence (%)		2.3	2.0-5.0
Severity (%)		3.1	2.0-5.0
Index (%)		0.1	0.1-0.3

*Foliar disease severity was rated on a scale of 0 (no disease) to 9 (severely diseased); ergot, loose smut, and take-all severity was based on % plants infected
** %FHB Index = (% incidence x % severity)/100.

Table 2. Frequency of *Fusarium* species isolated from discoursed kernels of oat in central and eastern Ontario in 2011.

***Fusarium* spp.**	**% OF FIELDS**	**% OF KERNELS**
Fusarium spp.	100	66.5
F. avenaceum	17	0.7
F. equiseti	42	1.7
F. graminearum	33	3.3
F. poae	100	56.3
F. sporotrichioides	50	4.5

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

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
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TITLE / TITRE: **LEAF RUST AND STRIPE RUST OF COMMON WHEAT AND DURUM WHEAT IN SASKATCHEWAN IN 2011**

INTRODUCTION AND METHODS: A survey to assess the prevalence of leaf rust (*Puccinia triticina*) and stripe rust (*Puccinia striiformis* f. sp. *tritici*) on common and durum wheat was conducted in 19 Saskatchewan crop districts (CDs) in 2011. In each of the 108 common wheat and 49 durum wheat crops surveyed, 50 flag leaves were collected at random at the milk to firm dough growth stages. Average percent leaf area affected by each rust was recorded for each field, and a mean percent leaf area (severity) affected was calculated for each crop type and CD.

RESULTS AND COMMENTS: Leaf rust was observed in 45% of the common wheat crops sampled and occurred across most of the province (Table 1). Severity in individual crops ranged from trace to 35%, with a mean for all crops of 5%. By comparison, in 2010 leaf rust was detected in 59% of the wheat crops surveyed, but severity was only 0.9%, ranging from trace to 5% (Fernandez et al., 2011). Highest mean severities in 2011 were observed in CDs 3AS (south), 5A/5B (east-central), and 6A/6B (central). In durum wheat, leaf rust was observed in 10% of the crops sampled, with an overall mean severity of 1% (Table 2).

Stripe rust was detected in 14% of the common wheat crops surveyed at a mean severity of 2.6% (Table 1). The highest mean severities were found in CDs 5A/ 5B (east-central), 7A (west-central), and 9A/9B (north-west). In durum wheat, stripe rust was observed in 6% of crops, at a mean severity of 2.7%. In 2010, stripe rust was found only at trace levels in a similar (13%) proportion of durum crops (Fernandez et al., 2011).

ACKNOWLEDGEMENT:
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.

REFERENCE:
Fernandez, M.R., Dokken-Bouchard, F.L., Northover, P.R. and McCartney, C. 2011. Leaf spotting and rust diseases of common and durum wheat in Saskatchewan in 2010. Can. Plant Dis. Surv. 91: 92-94. (cps-scp.ca/cpds.shtml)

Table 1. Distribution and severity of leaf rust and stripe rust in common wheat crops sampled in Saskatchewan in 2011.

	Leaf rust		Stripe rust	
Crop District	**No. crops affected/ surveyed[1]**	**Mean severity[2]**	**No. crops affected/ surveyed**	**Mean severity**
1A/1B	8/15	1.9	0/15	-
2A/2B	3/5	3.5	0/5	-
3AS	2/2	10.5	0/2	-
3BN	2/6	0.8	1/6	1.0
4A/4B	0/5	-	0/5	-
5A/5B	9/15	11.3	2/15	5.5
6A/6B	16/22	5.3	3/22	1.2
7A	0/5	-	1/5	3.0
8A/8B	4/15	0.6	5/15	1.0
9A/9B	5/18	1.3	3/18	5.2
Mean/total:	**49/108**	**5.0**	**15/108**	**2.6**

[1]Number of common wheat crops with leaf rust or stripe rust pustules on the flag leaf/number of crops sampled.
[2]Mean percent flag leaf area affected.

Table 2. Distribution and severity of leaf rust and stripe rust in durum wheat crops sampled in Saskatchewan in 2011.

	Leaf rust		Stripe rust	
Crop District	**No. crops affected/ surveyed[1]**	**Mean severity[2]**	**No. crops affected/ surveyed**	**Mean severity**
2A/2B	1/11	3.0	0/11	-
3AN/3AS	2/7	0.5	0/7	-
3BN/3BS	0/8	-	1/8	5.0
4A/4B	0/11	-	2/11	1.5
6A/6B	1/4	0.5	0/4	-
7A	1/8	0.5	0/8	-
Mean/total:	**5/49**	**1.0**	**3/49**	**2.7**

[1]Number of durum wheat crops with leaf rust or stripe rust pustules on the flag leaf/number of crops sampled.
[2]Mean percent flag leaf area affected.

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 2011

INTRODUCTION AND METHODS: A survey to assess the prevalence of leaf spotting diseases of common and durum wheat in Saskatchewan in 2011 was conducted when crops were between the milk and mid-dough growth stages. A total of 158 crops (68% common and 32% durum wheat) in 19 Saskatchewan crop districts (CDs) were sampled. In each field, 50 flag leaves were collected at random and air-dried at room temperature. Percent leaf area affected by leaf spots (severity) was recorded for each leaf, and a mean percentage of affected leaf area was calculated for each crop and CD. For crops with the highest leaf spot severity (52 in total), 1 cm^2 surface-disinfested leaf pieces were plated on water agar for identification and quantification of leaf spotting pathogens present.

Information on the previous crop and tillage method was obtained for most fields. Comparisons of disease and fungal levels in relation to previous crops was done for crops in soil zone (SZ) 1 (Brown), SZ2 (Dark Brown), and SZ3 (Black/Grey), while comparisons among tillage systems was done for crops in SZ1 and SZ3. Tillage system was classified as either conventional, minimum, or zero, while previous crops were cereal, non-cereal (oilseed or pulse), or summerfallow.

RESULTS AND COMMENTS: Leaf spotting was observed in all crops surveyed (Table 1). For individual crops, percentage flag leaf area affected ranged from trace to 35%. Overall mean leaf spotting severity (11.6%) was similar to that found 2010 (11.3%), but higher than in 2009 (7.0%) or 2008 (5.6%) (Fernandez et al. 2009, 2010, 2011).

For all crops combined, mean leaf spot severity was greatest in SZ3 and lowest in SZ1 (Table 1), which agrees with previous survey results (Fernandez et al., 2009, 2010). The CDs with the greatest mean leaf spotting severity were 5A/5B (east), followed by 9A/9B (north), while the CDs with the lowest mean severities were in the south-west (3BN/3BS, 4A/4B).

As found in previous years (Fernandez et al., 2009, 2010, 2011)**,** *Pyrenophora tritici-repentis* (tan spot) was the most prevalent and widespread leaf spotting pathogen isolated. It was followed by *Stagonospora nodorum* (part of the 'septoria' leaf spot complex). The other species in the complex, *Septoria tritici* and *S. avenae* f.sp. *triticea*, as well as *Cochliobolus sativus* (spot blotch) were isolated less frequently and/or from a lower number of crops.

Pyrenophora tritici-repentis was most often isolated from SZ1, and least so from SZ3. The highest mean percent isolations of *P. tritici-repentis* originated from south-central and south-western CDs (3AN/3AS, 4A/4B), while the lowest were from northern CDs (8A/8B and 9A/9B). Conversely, the highest percent isolations of the septoria leaf spot complex were from SZ3, followed by SZ2 and SZ1. *Stagonospora nodorum* was isolated most frequently from southern (1A/1B, 2A/2B, 3BN/3BS), eastern (5A/5B) and northern CDs (8A/8B and 9A/9B). *Cochliobolus sativus* was most commonly isolated from SZ2.

Comparisons (data not tabulated) between the total of common vs. durum wheat crops sampled showed that the former had a somewhat overall higher leaf spotting severity (12.6% vs. 9.4%). *Pyrenophora tritici-repentis* was more prevalent in durum (82% of isolations) than in common (43%) wheat, while the various septoria leaf spot complex pathogens were more often found on common (14 to 30%) than on durum (1 to 8%) wheat; *C. sativus* was more often isolated from durum (11%) than common (5%) wheat. Comparison of common wheat crops among SZs showed the same trend as for all crops combined, with a higher frequency of *P. tritici-repentis* from SZ1 (68%) than from the other SZs (2 to 25%); in contrast the septoria leaf complex was least common in SZ1 (13 to 31%). SZ1 contained the highest number of durum wheat crops sampled. The proportion of durum to total wheat was 67% for SZ1, 37% for SZ2, and 0% for SZ3). This suggests that differences between common and durum wheat crops in this survey cannot be attributed solely to the relative susceptibility of these crop species to the various leaf spot pathogens (Fernandez et al., 2011), but also to the increasing frequency of *P. tritici-repentis* relative to the septoria leaf complex moving from soil zone 3 to 2 to 1.

A species of *Pseudoseptoria* was detected in seven fields in CDs 3AS (1), 4B (3), 5B (1), 7A (1) and 8A (1), at frequencies ranging from <1% to 3.6%, and an overall frequency of 1.5%.

Differences among fields according to tillage system within SZ1 and SZ3 (SZ2 not included because of small sample size for most tillage categories) revealed that leaf spotting severity was lowest under zero-till (Table 2). However, there were few substantive and no consistent differences in isolation frequencies for individual fungal pathogens among tillage systems.

Classification of fields according to previous crop showed that for SZ1 and SZ3, wheat following an oilseed crop had some of the lowest leaf spot severities, while wheat following a cereal crop or summerfallow had some of the highest (Table 3). Lower disease severity after an oilseed crop agrees with some previous observations (Fernandez et al., 2010, 2011). Differences in isolation frequencies among individual pathogens were not very consistent among previous crop categories. Overall, *S. nodorum* was isolated most frequently from wheat preceded by an oilseed crop, least so from wheat grown after a pulse, and with intermediate frequency from wheat after a cereal or summerfallow. This is similar to observations made in 2008 (Fernandez et al., 2009).

ACKNOWLEDGEMENT:
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.

REFERENCES:
Fernandez, M.R., Dokken-Bouchard, F.L., Northover, P.R. and McCartney, C. 2011. Leaf spotting and rust diseases of common and durum wheat in Saskatchewan in 2010. Can. Plant Dis. Surv. 91:92-94. (cps-scp.ca/cpds.shtml)

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Table 1. Incidence and severity of leaf spotting diseases and percentage isolation of the most common leaf spotting pathogens in common and durum wheat crops surveyed in Saskatchewan in 2011.

Soil Zone/ Crop District	No. crops[1]	Mean severity[2]	*Pyrenophora tritici-repentis*[3]	*Stagonospora nodorum*[3]	*Septoria tritici*[3]	*S. avenae* f.sp. *triticea*[3]	*Cochliobolus sativus*[3]
		%					
Soil Zone							
1 (Brown)	45	7.2	82/12	14/9	2/3	4/9	5/9
2 (Dark Brown)	53	10.8	58/15	19/11	14/8	10/13	15/12
3 (Black/Grey)	60	15.6	42/25	31/24	15/23	13/22	4/10
Crop District							
1A/1B	15	10.7	70/5	22/4	5/4	3/4	8/4
2A/2B	16	10.3	68/6	44/3	1/3	4/4	10/4
3AN/3AS	9	9.5	89/3	3/3	1/3	2/2	6/3
3BN/3BS	14	5.4	59/3	37/3	2/1	12/1	<1/1
4A/4B	16	7.6	90/5	3/2	-/0	4/5	5/5
5A/5B	15	18.8	47/7	28/7	9/7	11/7	4/7
6A/6B	26	11.7	53/6	16/5	27/3	13/6	7/6
7A	13	11.1	46/4	3/4	17/4	12/4	44/4
8A/8B	16	13.1	38/6	37/6	12/5	12/5	5/5
9A/9B	16	16.4	27/7	30/7	26/6	22/6	4/3
Mean/total:	**158**	**11.6**	**56/52**	**21/44**	**9/36**	**9/44**	**6/42**

[1] Number of crops sampled. Leaf spotting was evident on flag leaves of plants in all crops.
[2] Mean percent flag leaf area affected.
[3] Mean percentage fungus isolation/number of crops where the species occurred. For each category (soil zone or crop district) the total number of crops plated for fungal identification and quantification is the number of crops where *P. tritici-repentis* was isolated.

Table 2. Incidence and severity of leaf spotting diseases, and mean percent isolation of leaf spotting pathogens, by tillage system, within each soil zone, for common and durum wheat crops surveyed in Saskatchewan in 2011.

Soil Zone/ Tillage system	**No. crops affected[1]**	**Mean severity[2]**	***Pyrenophora tritici-repentis*[3]**	***Stagonospora nodorum*[3]**	***Septoria tritici*[3]**	***S. avenae* f.sp. *triticea*[3]**	***Cochliobolus sativus*[3]**
		----	----	---- % ----	----	----	----
Zone 1 (Brown)							
Minimum	20	8.1	82/8	15/5	5/1	5/5	4/4
Zero	21	6.3	81/4	13/4	1/2	2/2	6/3
Zone 3 (Black/Grey)							
Conventional	12	18.3	49/7	31/7	7/7	12/6	2/7
Minimum	14	18.3	34/6	43/6	6/6	14/5	4/6
Zero	28	13.2	33/9	28/8	25/9	16/7	7/4

[1] Number of wheat crops with leaf spot lesions on the flag leaf, i.e. total number of surveyed crops.
[2] Mean percentage flag leaf area infected estimated on leaf samples that were still green when sampled.
[3] Mean percentage fungal isolation/number of wheat crops in which the species occurred. For each tillage system in each soil zone the total number of crops plated for fungal identification and quantification is the number of crops where *P. tritici-repentis* was isolated.

Table 3. Incidence and severity of leaf spotting diseases, and mean percentage isolation of leaf spotting pathogens, by previous crop, within each soil zone, for common and durum wheat crops surveyed in Saskatchewan in 2011.

Soil Zone/ Tillage system	**No. crops affected[1]**	**Mean severity[2]**	***Pyrenophora tritici-repentis*[3]**	***Stagonospora nodorum*[3]**	***Septoria tritici*[3]**	***S. avenae* f.sp. *triticea*[3]**	***Cochliobolus sativus*[3]**
		----	----	---- % ----	----	----	----
Zone 1 (Brown)							
Cereal	6	11.5	91/3	3/2	-/-	4/3	2/3
Oilseed	8	3.9	54/1	44/1	2/1	-/-	-/-
Pulse	18	5.7	72/3	17/3	1/1	7/2	6/3
Fallow	13	9.4	88/5	8/3	3/2	2/5	5/4
Zone 2 (Dark Brown)							
Oilseed	17	9.7	64/3	44/2	1/1	2/3	7/2
Pulse	8	11.5	94/3	2/2	<1/1	3/2	3/3
Fallow	9	10.0	67/3	26/2	1/1	6/2	17/2
Zone 3 (Black/Grey)							
Cereal	6	18.2	29/3	29/3	31/3	6/3	6/3
Oilseed	27	13.9	30/8	40/8	10/8	20/7	4/4
Pulse	5	17.8	37/3	19/3	33/3	10/3	4/1
Fallow	6	17.5	61/2	34/2	2/1	2/2	2/2

[1] Number of wheat crops with leaf spot lesions on the flag leaf/ i.e. total number of surveyed crops.
[2] Mean percentage flag leaf area affected estimated on leaf samples that were still green when sampled.
[3] Mean percentage fungal isolation/number of wheat crops in which the species occurred. For each crop rotation practice in each soil zone the total number of crops plated for fungal identification and quantification is the number of crops where *P. tritici-repentis* was isolated.

CROP / CULTURE: Wheat
LOCATION / RÉGION: Saskatchewan

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TITLE / TITRE: FUSARIUM HEAD BLIGHT IN COMMON AND DURUM WHEAT IN SASKATCHEWAN IN 2011

INTRODUCTION AND METHODS: Fusarium head blight (FHB) incidence and severity were assessed in 165 wheat crops in Saskatchewan in 2011: 115 common wheat (Canada Western Red Spring, Canada Prairie Spring, and Soft White Spring classes) and 50 durum wheat (Canada Western Amber Durum class). Wheat fields and results were grouped according to soil zone (Zone 1 = Brown; Zone 2 = Dark Brown; Zone 3 = 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 randomly collected 50 spikes from each wheat crop at the late milk to early dough 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 to confirm presence of, and identify, *Fusarium* spp. on infected kernels.

RESULTS AND COMMENTS: Approximately 3 million ha (7.5 million acres) of spring wheat and 1.4 million ha (3.5 million acres) of durum wheat were seeded in Saskatchewan in 2011 (Statistics Canada, 2011). Excess moisture created delays and challenges for farmers in the southeast and other parts of southern Saskatchewan in the spring of 2011. By late June, a reported 2.5 million ha (18 per cent) of the possible 13.8 million seedable ha in the province remained unseeded. Of the area that was seeded, eight per cent (0.9 million ha) were subsequently flooded and unlikely to produce a crop. In most other areas, seeding progressed ahead of or on schedule, and an extended period of warm sunny days through harvest allowed producers to harvest the crop in a timely fashion. Yields in most regions other than the southeast were reported to be average to above-average, and the crop quality good. (Saskatchewan Ministry of Agriculture 2011).

In 2011, FHB occurred in 81% and 72% of the surveyed common and durum wheat crops, respectively (Table 1). Prevalence and severities of FHB in common and durum wheat were lowest in soil zone 1. FHB was most prevalent in the irrigation zone (100% of common and durum wheat samples had some disease) and the highest mean severity (10.8%) was recorded in durum wheat in soil zone 2. Overall, the provincial mean FHB severities for common wheat (0.6%) and durum wheat (0.9%) for 2011 were slightly higher than 2009 (common wheat – 0.5% and durum wheat – 0.3%) but lower than 2010 (common wheat – 1.1% and durum wheat – 2.0%), which was the first year since 2001 that the provincial annual mean FHB severities exceeded 1% (Miller et al. 2011).

Of the 165 wheat survey samples collected, 128 had visible FHB symptoms and 527 isolations were made for *Fusarium* identification. The most frequently isolated causal pathogens identified were *F. poae* and *F. avenaceum* in 62 and 61% of samples, respectively. The two species accounted in similar proportions for 67% of all *Fusarium* isolations. In previous years, either *F. avenaceum* or *F. poae were* the dominant species in the province (Miller et al. 2011). *Fusarium poae* dominated in soil zones 1 and 3, while *F. avenaceum* was the dominant species in soil zone 2.

Fusarium graminearum was detected in 39% of the common wheat samples and 19% of the durum wheat samples with visible symptoms. It accounted for 21% of the *Fusarium* isolations from common wheat and 12% of those from durum, a slightly higher level than found in 2010, when *F. graminearum* was identified from 19% of the total wheat survey samples and accounted for 8% of the *Fusarium* isolations from common wheat and 10% from durum. However, *F. graminearum* continues to represent a smaller proportion (2%) of isolates in soil zone 1, while 9% of isolates in soil zone 2 and 24% of isolates in soil zone 3 were identified as *F. graminearum*. It is not clear why the proportion of *F. graminearum* increased in 2011. However, crop districts in the eastern portion of the black/grey soil zone (8A, 5B, 5A) experienced relatively high levels of *F. graminearum* according to results obtained at seed testing laboratories in 2010, indicating that considerable overwintered inoculum of this species likely was present in the region (Morrall et al. 2011). Most of the samples from the black/grey soil zone with *F. graminearum* originated from the crop districts above.

Other *Fusarium* species isolated from wheat samples included *F. sporotrichioides* (9.7% of isolations), *F. equiseti* (1.9%), *F. culmorum* (1.7%), and *F. acuminatum* (0.4%). *Fusarium moniliforme* was not detected in 2011, while other unknown *Fusarium* species accounted for 1.1% of the isolations. These results are similar to those obtained in 2008-09 (Miller et al. 2011).

Other fungal pathogens observed on wheat spikes collected in 2011 included *Septoria* and *Cochliobolus* spp. Secondary moulds were isolated from 99% of the wheat 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 common and durum wheat crops grouped by soil zone in Saskatchewan, 2011.

Soil Zones	Common Wheat		Durum Wheat	
	Prevalence[1] (No. of Crops Surveyed)	**Mean FHB Severity[2] (range)**	**Prevalence[1] (No. of Crops Surveyed)**	**Mean FHB Severity[1] (range)**
Zone 1 Brown	40% (15)	0.2% (0 – 1.2%)	52% (25)	0.2% (0 – 1.5%)
Zone 2 Dark Brown	79% (28)	0.6% (0 – 3.1%)	90% (21)	1.7% (0 – 10.8%)
Zone 3 Black/Grey	89% (65)	0.8% (0 – 3.5%)	100% (1)	0.8%
Irrigation Zones	100% (7)	0.5% (0.2 – 0.7%)	100% (3)	1.2% (0.3 – 2.6%)
Overall Total/Mean	81% (115)	0.6%	72% (50)	0.9%

1. Prevalence = Number of crops affected / total crops surveyed
2 Percent FHB severity = [% of spikes affected x mean proportion (%) of kernels infected] / 100.

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 2011

INTRODUCTION AND METHODS: Trap nurseries and commercial fields 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 late July and early August 2011.

RESULTS AND COMMENTS: Wheat leaf rust was first observed on spring wheat in early June during 2011. It was found at relatively normal levels in test plots and nurseries throughout southern Manitoba and south-eastern Saskatchewan, despite fairly dry conditions in July, August and September. Most commercial wheat crops in Manitoba were sprayed with foliar fungicides and did not suffer economic losses due to rust infection. However, some were seeded very late as a result of spring flooding and many of these suffered significant economic damage due to rust infection. This was because early excess soil moisture reduced crop yield potential and eliminated the incentive to apply a fungicide.

Wheat stripe rust was found at only low levels at the time of our field survey, but it was reported as higher levels earlier in the growing season, particularly in eastern Saskatchewan near Indian Head. By early August most of the stripe rust pustules had stopped developing and had formed teliospores, whereas leaf rust pustules were still increasing.

Table 1. Average percentage (%) of the flag leaf infected with leaf rust in surveys from 2001 to 2011 in Manitoba and eastern Saskatchewan

Year	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
2009	trace	trace
2010*	25.0	3.0
2011*	37.5	6.0

*Determined from ‘AC Barrie’ spring wheat in nonsprayed nurseries and trap plots. Levels in other years were determined from commercial fields.

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: 2011 SURVEY OF FUSARIUM HEAD BLIGHT OF SPRING WHEAT IN MANITOBA

INTRODUCTION AND METHODS: Forty-three spring wheat fields were surveyed between August 2 and August 10, 2011 in southern Manitoba to monitor the incidence and severity of fusarium head blight (FHB). In each field incidence and severity of symptoms were assessed at growth stage ZGS 80-84 by sampling about 100 spikes at three locations and spikes were collected for pathogen identification. From each field, at least 10 spikes were threshed and 10 kernels selected for analysis. Kernels were surface-sterilized and incubated on potato dextrose agar under continuous cool white light for 4 - 5 days to isolate and identify the *Fusarium* species present. When the species was unclear, single spores were grown on SNA agar to facilitate identification. The FHB index (overall severity) was calculated as follows: (average % incidence X average % severity) /100.

RESULTS AND COMMENTS: Average disease levels were generally low in the regions surveyed, but two crops in the southwest (Manitoba Crop District 1) had higher severities (Table 1). The range in FHB indices among crops varied widely (0.002 to 20.1%), with an average for the province of 2.1%. This level of FHB is similar to levels reported in 2009 and 2010 (Gilbert et al. 2010, 2011).

Fusarium species were isolated from 71.4% (300/420) of kernels examined in 2011. As in other years, *Fusarium graminearum* was the predominant species, accounting for 98.3% of isolations. Other species isolated at low levels included *F. poae* (1.3%) and *F. sporotrichioides* (0.7%); these species represented only 4 and 2 isolations respectively of the total obtained.

Table 1. Levels of fusarium head blight in wheat crops surveyed in southern Manitoba, 2011.

Crop district	No. of fields	Average Incidence (%)	Average Severity (%)	Average FHB Index (%)	Range
1	2	15.8	90.0	14.2	8.4 - 20.1
2	3	6.5	53.0	3.7	3.8 - 6.5
3	2	0.7	58.0	0.4	0.3 - 0.4
7	7	1.9	47.7	0.8	0.1 - 1.6
8	16	14.8	28.0	1.8	<0.1 - 6.2
9	10	1.2	28.8	0.5	<0.1 - 1.8
11	3	0.3	35.7	0.1	<0.1 - 0.1

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Gilbert, J., Tekauz, A., Kaethler, R., Slusarenko, K., Leclerc, C., Grant, R., Stulzer, M. and Beyene, M. 2010. Survey of fusarium head blight of spring wheat in Manitoba in 2009. Can. Plant Dis. Survey 90: 105. (cps-scp.ca/cpds.shtml)

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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 2011

INTRODUCTION AND METHODS: Surveys of producer fields 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 2011. Infected stem tissue samples were collected from the sites surveyed. Urediniospores were obtained from collections and evaluated for virulence specialization on sets of host differential lines (Fetch 2009).

RESULTS AND COMMENTS: Cold conditions in April and May resulted in delayed planting of cereal crops across the Prairie region. Mean temperature was -2 to -3°C below normal in April and May, -1 to -2°C below normal in June, and +1 to +2°C above normal in August and September. Precipitation was well above average across the southern prairies from April to June, with 150-200% of the normal found in the rust area and >200% in central Saskatchewan. However, it was dry (40-80%) to very dry (<40%) in the rust area in July and August. Environmental conditions for stem rust infection were not favourable across the prairies in July or August, thus incidence and severity on susceptible lines in trap nurseries and in commercial oat and barley crops were at trace levels across Western Canada. In addition, most commercial cereal fields in Manitoba were sprayed with foliar fungicides, which limited rust infection. Stem rust infection in the USA also was light in 2011, thus little inoculum migrated from the USA which may explain the light infection found in the trap nurseries.

All spring wheat cultivars recommended for production in western Canada 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 2011. Over 95% of the samples of *P*. *graminis* f. sp. *tritici in* 2011 were race QFCSC, which has been dominant since 2004.

Stem rust in cultivated and wild oat was at trace levels in western Canada in 2011. All oat cultivars except 'Stainless' are susceptible to stem rust races TJG, TJJ, and TJS (Fetch and Jin 2007). Race TGN was dominant in 2011 (43% of total samples, an increase compared to 2010), followed by TJS (16%), and TGD (12%). Race TJJ (NA67), which had been dominant in the population for over 10 years, fell to 5% of the population in 2011.

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CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: 2011 SURVEY FOR LEAF SPOT DISEASES OF SPRING WHEAT IN MANITOBA

INTRODUCTION AND METHODS: A survey of 42 southern Manitoba commercial spring wheat fields was conducted between August 2 and August 10, 2011 to assess the prevalence, severity and identity of foliar diseases. When leaves were sampled for subsequent pathogen and disease identification, crop development ranged between heading and the soft dough stage. Severity of diseases on the upper and lower leaf canopies were each categorized based on the amount of necrotic tissue as 0, trace, 1, 2, 3 or 4, with 4 describing dead leaves and 1 lightly affected. A total of 420 samples of diseased leaf tissue was surface-sterilized and placed in moisture chambers for 5 to 7 days to promote pathogen sporulation and assess relative disease damage.

RESULTS AND COMMENTS: The average level of necrosis caused by leaf spots on the flag and flag -1 leaves was low, likely caused by a combination of hot, dry weather throughout July and August and widespread foliar fungicide use. Spring wheat crops in Crop Reporting district 7 (central Manitoba) had the highest severity levels.

Pyrenophora tritici-repentis was the dominant pathogen in all regions, accounting for 81.5% of isolations (Table 1), similar to levels found in 2009 (Gilbert et al. 2010). The pathogen was isolated from 35 of the 42 fields sampled. Only low levels of *Stagonospora nodorum, Cochliobolus sativus* and *Septoria tritici* were isolated suggesting these had little impact on the leaf spot damage observed.

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Gilbert, J., Tekauz, A., Kaethler, R., Leclerc, C., Slusarenko, K., Grant, R., Stulzer, M. and Beyene, M. 2010. Survey for leaf spot diseases of spring wheat in Manitoba in 2009. Can Plant Dis. Surv. 90: 111-112. (cps-scp.ca/cpds.shtml)

Table 1. Prevalence and isolation frequency (%) of leaf spot pathogens in hard red spring wheat fields in Manitoba in 2011.

	Disease			
	Septoria nodorum blotch *(Stagonospora nodorum*)	**Septoria tritici blotch *(Septoria tritici)***	**Tan spot *(Pyrenophora tritici-repentis*)**	**Spot blotch *(Cochliobolus sativus)***
Wheat crops affected (Total = 42)	10	5	35	7
Isolations (%) (Total = 414 of 420)	8.4	5.2	81.5	4.8

CROP / CULTURE: Spring wheat
LOCATION / RÉGION: Eastern and central Ontario

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TITLE / TITRE: DISEASES OF SPRING WHEAT IN CENTRAL AND EASTERN ONTARIO IN 2011

INTRODUCTION AND METHODS: A survey of spring wheat diseases was conducted in central and eastern Ontario in the last week of July when most plants were at the soft dough stage of development. Twenty-five 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). Disease diagnosis was based on visual symptoms. Average severity scores of <1, <3, <6, and ≥6 were considered trace, slight, moderate, and severe infection levels, respectively. Severity for ergot, loose smut, and take-all was based on the percent plants infected. Fusarium head blight (FHB) was rated for incidence (% infected spikes) and severity (% infected spikelets in the affected spikes) based on approximately 200 spikes 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 as slight, moderate, severe, and very severe infection levels, respectively. Determination of the causal species of FHB was based on 30 infected spikes collected from each field. The spikes were air-dried at room temperature and subsequently threshed. Thirty discolored kernels per sample were chosen at random, surface sterilized in 1% NaOCl for 60 seconds and plated in 9-cm diameter petri dishes on modified potato dextrose agar (10 g dextrose per liter) amended with 50 ppm of streptomycin sulphate. The plates were incubated for 10-14 days at 22-25ºC and with a 14-hour photoperiod using fluorescent and long wavelength ultraviolet tubes. *Fusarium* species isolated from the kernels were identified by microscopic examination using standard taxonomic keys.

RESULTS AND COMMENTS: Twelve diseases or disease complexes were observed (Table 1). Stagonospora glume blotch (*Stagonospora nodorum*) was the most common, found in 23 of 25 fields at a mean severity of 2.3. However, no severe levels of infection were seen and the disease likely caused little or no reduction in yields and grain quality. Septoria/stagonospora leaf blotch (normally associated with infection by *Septoria tritici* and *Stagonospora* spp.), spot blotch (*Cochliobolus sativus*), and tan spot (*Pyrenophora tritici-repentis*) were observed in 22, 22, and 21 fields at mean severities of 1.8, 1.5, and 1.8, respectively. Severe levels of these diseases were not found. Other foliar or stem diseases observed included bacterial leaf blight (*Pseudomonas syringae* pv. *syringae*), leaf rust (*Puccinia triticina),* powdery mildew (*Erysiphe graminis* f.sp. *tritici)*, and stem rust (*Puccinia graminis*); average severities were 1.8, 2.4, 1.3, and 1.8 which were observed in 14, 14, 6, and 4 fields, respectively. Only levels of these diseases below severe were found and none would have resulted in significant damage to the crop.

Ergot (*Claviceps purpurea*) and loose smut (*Ustiago tritici*) were observed in 19 and 3 fields at incidence levels of 2.3 and 1.0 %, respectively. They likely resulted in minimum damage. Take-all root disease (*Gaeumannomyces graminis var. tritici*) was found in 24 fields at a mean incidence 3.5%. Two of the affected crops were estimated to have 10% take-all.

Fusarium head blight was observed in all fields at a mean FHB index of 1.6% (range 0.1 to 8.0%; Table 1). Severe and very severe levels of infection by FHB were not found. The disease would not have resulted in a significant loss of grain yield or quality. Four *Fusarium* species were isolated from infected kernels (Table 2). *Fusarium graminearum* predominated and occurred in 65% of fields and on 48.8% of putatively infected kernels. Other species included *F. avenaceum*, *F. poae* and *F. sporotrichioides* in 12, 19, and 15% of surveyed fields and on 1.5, 1.9, and 2.3% of kernels, respectively. The number of *Fusarium* species and their frequencies of recovery from kernels decreased in 2011 compared with 2010 (Xue and Chen 2011).

Overall, the incidence of foliar diseases in Ontario spring wheat in 2011 was similar but less severe than found in 2010 (Xue and Chen 2011). Take-all was observed in most spring wheat crops in Ontario in 2011 and this was the second consecutive year that take-all was estimated to have reduced yields by more than 3% Xue and Chen 2011). Fusarium head blight, although observed in all the surveyed fields, had little impact on crop yields and grain quality in 2011. The high temperatures and low number of rain events in June and early July in 2011 were less favorable for FHB development and were likely responsible for the low FHB severity observed.

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Table 1. Prevalence and severity of spring wheat diseases in central and eastern Ontario in 2011.

DISEASE	NO. CROPS AFFECTED (n=25)	DISEASE SEVERITY IN AFFECTED CROPS* MEAN	RANGE
Bacterial blight	14	1.8	1.0-5.0
Leaf rust	14	2.4	1.0-5.0
Powdery mildew	6	1.3	1.0-2.0
Septoria glume blotch	23	2.3	1.0-4.0
Septoria/Stagonospora leaf blotch	22	1.8	1.0-3.0
Spot blotch	22	1.5	1.0-4.0
Stem rust	4	1.8	1.0-2.0
Tan spot	21	1.8	1.0-4.0
Ergot (%)	19	2.3	1.0-5.0
Loose smut (%)	3	1.0	1.0-1.0
Take-all (%)	24	3.5	1.0-10.0
Fusarium head blight**	25		
Incidence (%)		7.7	1.0-40.0
Severity (%)		8.8	1.0-40.0
Index (%)		1.6	0.1-8.0

*Foliar disease severity was rated on a scale of 0 (no disease) to 9 (severely diseased); ergot, loose smut, and take-all severity was based on % plants infected.
** FHB Index = (% incidence x % severity)/100.

Table 2. Frequency of *Fusarium* species isolated from fusarium damaged wheat kernels in central and eastern Ontario in 2011.

***Fusarium* spp.**	**% OF CROPS**	**% OF KERNELS**
Fusarium spp.	100	54.6
F. avenaceum	12	1.5
F. graminearum	65	48.8
F. poae	19	1.9
F. sporotrichioides	15	2.3

CROP / CULTURE: Winter Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: FUSARIUM HEAD BLIGHT OF WINTER WHEAT - MANITOBA 2011

INTRODUCTION AND METHODS: The prevalence of fusarium head blight (FHB) in winter wheat in Manitoba in 2011 was assessed by monitoring 46 farm fields from July 11-18 when most crops were at the early dough stage of growth (ZGS 79-83). Because winter wheat is not grown extensively in Manitoba (in 2011 it was grown on about 9% of the total wheat acreage of 0.9M ha (1.95M acres) in the province ('Yield Manitoba 2012', Manitoba Agricultural Services Corporation, supplement to The Manitoba Co-operator, Feb 23, 2012) the fields were not surveyed at random; rather, information on their location was obtained from Manitoba Agriculture, Food and Rural Initiatives extension personnel. The fields surveyed were located in southern Manitoba, in an area bounded by Highway #s 44, 67 and 16 to the north, the Manitoba/North Dakota border to the south, Hwy #12 to the east, and Hwy #s 18 (southern) and 83 (central) to the west.

Fusarium head blight in each field was assessed by non-destructive sampling of a minimum of 80-120 plants at each of three locations to determine the percentage of infected spikes (disease incidence), and the mean 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 site monitored 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 spikes per location. The kernels were surface-sterilized in 0.3% NaOCl for 3 min., air-dried, and plated on potato dextrose agar in petri plates (10 kernels/plate) to quantify and identify the *Fusarium* spp. present, based on morphological traits described in standard taxonomic keys.

RESULTS AND COMMENTS: In 2011 conditions throughout southern Manitoba were wetter than normal and particularly so in south-central and south-western regions. Flooding was widespread and resulted in considerable land not being seeded in spring or, if seeded, subsequently abandoned due to poor emergence. Despite a difficult start, satisfactory crops were harvested in many districts, due in large part to the particularly dry (except in the south-west) and warm August and September. Accumulation of growing degree days (May 15 to Sept 15) was near normal in most regions.

Winter wheat was grown on some 72,000 ha (179,000 acres) in Manitoba in 2010/11, a reduction of 15% compared to 2009/10 ('Yield Manitoba 2012', and 2011, Manitoba Agricultural Services Corporation, supplement to the Manitoba Co-operator, Feb 24, 2011 and Feb 23, 2012). CDC Falcon once again was the predominant winter wheat cultivar planted in Manitoba, occupying 71% of the winter wheat area. It was grown in 33 of the 42 fields sampled and for which cultivar information was available. The cultivars CDC Buteo and McClintock were grown on 11% and 4% of the acreage, respectively. Foliar fungicides are applied routinely to most winter wheat crops in Manitoba, and for the 24 crops for which information was available in 2011, most had been sprayed once or twice with a propiconazole-, tebuconazole-, metconazole- or prothioconazole + tebuconazole-based product.

Symptoms of FHB (bleaching of spikes) were observed in 45 of the 46 winter wheat crops sampled. Overall, incidence of FHB was 1.6% (range 0 - 7%), SPI 66% (range 0 - 80%) and the resulting FHB Index (%incidence x %SPI / 100) 0.9% (range 0 – 5.5%). As such, FHB was estimated to have caused minimal yield loss in commercial winter wheat in 2011. The severity of FHB in 2011 was much lower than in 2010 (Tekauz et al. 2011) and below the 10-year average (2001-2010) of 3.8% (Tekauz and Gilbert 2011). Deoxynivalenol accumulation in harvested grain likely was low, except from fields in the south-west where moist conditions persisted throughout the growing season. While moisture was abundant early in the growing season, this was accompanied by cool weather which likely curtailed inoculum development on overwintered straw in farm fields. Subsequent very dry and warm conditions in most regions would have further reduced the likelihood of *Fusarium* infection. However, in the absence of foliar fungicide use, FHB severity levels would likely have been somewhat higher.

Fusarium colonies developed from 82% of the selected kernels plated on potato dextrose agar medium. As occurs annually (Tekauz et al. 2011), *Fusarium graminearum* was the dominant *Fusarium* species isolated, and in 2011 it was the sole species. It was found in all fields with visible FHB symptoms (45 of 46), and isolated from every *Fusarium*-positive kernel.

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CROP / CULTURE: Winter Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: LEAF SPOT DISEASES OF WINTER WHEAT IN MANITOBA IN 2011

INTRODUCTION AND METHODS: The occurrence and severity of leaf spot diseases of winter wheat in Manitoba in 2011 were assessed by surveying 46 farm fields from July 11-18 when most crops were at the early-dough stage of growth (ZGS 79-83). Because winter wheat is not grown intensively in Manitoba (in 2010 it was grown on about 8% of the total Manitoba wheat acreage of 1.1 million ha (2.7 million acres) – 'Yield Manitoba 2011', Manitoba Agricultural Services Corporation, supplement to The Manitoba Co-operator, Feb 24, 2011) the fields were not surveyed at random; rather, information on their location was obtained from Manitoba Agriculture, Food and Rural Initiatives (MAFRI). The fields surveyed were located in southern Manitoba, within an area bounded by Highway #s 44, 67 and 16 to the north, the Manitoba/North Dakota border to the south, Hwy #12 to the east, and Hwy #s 21 and 83 to the west. 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%). Leaves with leaf spot symptoms were collected at 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 and allow for identification of the causal pathogen(s), so as to determine the disease(s) present.

RESULTS AND COMMENTS: Conditions during the 2010 growing season in southern Manitoba were wetter than normal (up to 200% total rainfall), but with near normal growing degree day accumulation. Seeding of some spring crops was delayed or abandoned due to wet fields (primarily in parts of the Interlake and the South-west) and crop development was slowed by early-season cool weather. Despite difficult conditions, reasonable crops were harvested in many districts, due in large part to an unusually long period without a killing frost. Frequent rain showers throughout the growing season were expected to favour the development of foliar diseases.

Winter wheat was grown on some 72,000 ha (179,000 acres) in Manitoba in 2010/11, a reduction of 15% compared to 2009/10 ('Yield Manitoba 2012', and 2011, Manitoba Agricultural Services Corporation, supplement to the Manitoba Co-operator, Feb 24, 2011 and Feb 23, 2012. 'CDC Falcon' once again was the predominant winter wheat cultivar planted, occupying 71% of the winter wheat area. It was grown in 33 of the 42 fields sampled for which cultivar information was available. The cultivars 'CDC Buteo' and 'McClintock' were grown on 11% and 4% of the area, respectively. Foliar fungicides are applied routinely to most winter wheat crops in Manitoba, and for the 24 crops for which information was available in 2011, most had been sprayed with a propiconazole-, tebuconazole-, metconazole- and (or) a prothioconazole + tebuconazole-based product.

Leaf spotting was evident in the upper and(or) lower canopies of all crops surveyed. Levels in the upper canopy were trace to slight in 53% of fields, moderate in 40% and severe in 6%. In the lower canopy, trace to slight levels were present in 26% of the fields and moderate in 17%, while in 57% the leaves had senesced. The upper canopy severity levels suggest that leaf spots caused some damage to winter wheat in 2010, probably an average yield loss of 2-3%. The widespread use of foliar fungicides likely reduced leaf spot damage.

Pyrenophora tritici-repentis, causal agent of tan spot, was the dominant leaf spot pathogen in 2010 (Table 1), as has been the case in spring wheat, and particularly in winter wheat, in Manitoba in most years (Gilbert et al. 2011, 2010; Tekauz et al. 2011, 2010). This pathogen was recovered from 70% of crop leaf samples and probably caused almost all the foliar damage observed. *Cochliobolus sativus,* causal agent of spot blotch, was also isolated, but from only a few crops. Uncharacteristically, no *Stagonospora* or *Septoria* species were recovered in 2010. In several fields with trace levels of leaf spotting no recognized pathogen could be isolated from the air-dried leaf samples.

ACKNOWLEDGEMENT:
We thank Patti Cuthbert and other MAFRI personnel for supplying information on the geographical location of the winter wheat crops sampled.

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Table 1. Incidence and isolation frequency of leaf spot pathogens from Manitoba winter wheat in 2010.

Pathogen	Incidence (% of fields)	Frequency (% of isolations)*
Pyrenophora tritici-repentis	70	98
Cochliobolus sativus	4	2
Stagonospora avenae f. sp. *tritici*	2	2

*indicative of the relative foliar damage caused

CROP / CULTURE: Winter wheat
LOCATION / RÉGION: Ontario

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TITLE / TITRE: 2011 SURVEY FOR FUSARIUM HEAD BLIGHT OF WINTER WHEAT IN ONTARIO

INTRODUCTION AND METHODS: Six winter wheat field trials included in the '2011 Ontario Performance Trial' were chosen to determine the deoxynivalenol (DON) content and percent *Fusarium graminearum*-infected kernels in 2011 Ontario winter wheat grain. The assessment was based on harvested seed from a total of 8 winter wheat cultivars: soft winter wheat cvs. 'AC Mackinnon', 'Superior', 'Emmit', 'Ava', 'E0028W' and '25R51', and hard winter wheat cvs. 'Princeton' and 'AC Morley'. 'AC Mackinnon' and 'E0028W' are listed as highly susceptible cultivars, 'Superior' susceptible, 'Emmit' and 'Princeton' moderately susceptible, and '25R51', 'Ava' and 'AC Morley' as moderately resistant (www.gocereals.ca). DON content was measured using a ground 20-g sub-sample of the harvested grain, using ELISA (EZ-TOX DON kit; www.diagnostix.ca). To determine the percent seed infected by *F. graminearum,* 60 kernels per cultivar were surface-sterilized in 0.16% NaOCl (diluted commercial bleach) for three minutes, air dried, and placed on acidified potato dextrose agar in four replications of 15 seeds per petri plate. The kernels and agar plates were incubated for seven days at room temperature with a 12:12 hr light:dark cycle. The presence of *F. graminearum* was confirmed using standard reference taxonomic keys.

RESULTS AND COMMENTS: The highest average level of DON was detected at the Elora field trial location (0.43 ppm) while the lowest (0.18) was found at Woodstock (Table 1). Average DON levels across all trials in 2011 were similar to those found in 2010 (0.32 ppm vs. 0.42 ppm), but lower than in 2008 or 2009 (Tamburic-Ilincic 2009, Tamburic-Ilincic and Schaafsma 2010). Average percent *Fusarium graminearum*-infected kernels ranged from 0.6% at Ridgetown to 3.3% at Elora. The highest level of *F. graminearum*-infected kernels (6.7%) was found in the highly susceptible cv. 'E0028W' growing at Elora (Table 2). However, differences in FHB levels based on DON and *F. graminearum* among the cultivars were not clear because of the overall low level of infection. In general, both DON levels and those of *F. graminearum*-infected kernels were low in winter wheat grown in Ontario in 2011.

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Table 1. Deoxynivalenol levels (ppm) in grain of 8 winter wheat cultivars collected across 6 trial locations in Ontario, 2011.

Location	‘AC Mackinnon’	‘Superior’	‘Princeton’	‘Emmit’	‘Ava’	‘AC Morley’	‘E0028W’	‘25R51’	Av.	SD
Ridgetown	0.35	0.73	0.08	0.06	0.20	0.27	0.72	0.02	0.30	0.28
Elora	n/a	0.22	0.76	0.35	0.72	0.24	0.58	0.15	0.43	0.25
Palmerston	n/a	0.57	0.57	0.28	0.52	0.50	0.33	0.15	0.42	0.16
Inwood	0.19	0.55	0.18	0.03	0.19	0.04	0.36	0.21	0.22	0.17
Woodstock	n/a	0.03	0.27	0.12	0.13	0.46	0.14	0.12	0.18	0.14
Kemptville	n/a	0.67	0.44	0.22	0.24	0.19	n/a	n/a	0.35	0.20
Average	0.27	0.46	0.38	0.18	0.33	0.28	0.43	0.13	0.32	0.12

n/a= not available
SD= standard deviation

Table 2. Percent *Fusarium graminearum*-infected kernels in 8 winter wheat cultivars collected across 6 trial locations in Ontario, 2011.

Locations	‘AC Mackinnon’	‘Superior’	‘Princeton’	‘Emmit’	‘Ava’	‘AC Morley’	‘E0028W’	‘25R51’	Av.	SD
Ridgetown	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.6	1.8
Elora	n/a	8.3	0.0	0.0	3.3	3.3	6.7	1.7	3.3	3.2
Palmerston	n/a	3.3	5.0	1.7	3.3	0.0	5.0	1.7	2.9	1.8
Inwood	1.7	5.0	1.7	1.7	3.3	0.0	1.7	3.3	2.3	1.5
Woodstock	n/a	3.3	0.0	0.0	0.0	1.7	1.7	0.0	1.0	1.3
Kemptville	n/a	3.3	1.7	1.7	0.0	3.3	n/a	n/a	2.0	1.4
Average	0.9	3.9	1.4	0.9	1.7	1.4	4.0	1.3	2.0	1.3

n/a= not available
SD= standard deviation

CROP / CULTURE: Winter durum wheat
LOCATION / RÉGION: Ontario

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TITLE / TITRE: 2011 SURVEY FOR LEAF DISEASES OF WINTER DURUM WHEAT IN ONTARIO

INTRODUCTION AND METHODS: A survey was conducted to identify the leaf diseases affecting 'OAC Amber' winter durum wheat in Ontario in 2011. Crops growing at four locations, Palmerston, Ridgetown, Centralia and Inwood were sampled in mid-June and again in early July for the presence of powdery mildew (*Blumeria graminis*) and septoria tritici blotch (*Septoria tritici*), respectively. Thirty-six individual leaf ratings were recorded and averaged at each location, per sampling period, using a 0-9 severity scale where 0 = no disease and 9 = leaf severely affected. Only the two diseases were considered as no others were observed.

RESULTS AND COMMENTS: The highest severity level for either disease was recorded at Palmerston, (Table 1). The lowest average severity of septoria tritici blotch (2.5) occurred at Inwood, where powdery mildew was not detected. In general, a moderate level of both powdery mildew and septoria tritici blotch, was detected in 'OAC Amber' winter durum wheat in Ontario in 2011, but no other foliar diseases were present.

Table 1. Average severity of septoria tritici blotch and powdery mildew in 'OAC Amber' winter durum wheat in Ontario in 2011.

Location	**Septoria tritici blotch (0-9 scale)**	**Powdery mildew (0-9 scale)**
Palmerston	5.0 (0.5)	4.4 (0.7)
Ridgetown	3.9 (0.4)	4.3 (0.4)
Centralia	3.1 (0.3)	2.9 (0.6)
Inwood	2.5 (0.3)	nd
Average	3.6 (1.1)	2.9 (2.1)

( ) = standard deviation
nd = not detected

Oilseeds & Special Crops/Oléagineux et Cultures Spéciales

CROP: Dry Bean
LOCATION: Alberta

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TITLE: SURVEY OF DISEASES OF DRY BEAN IN SOUTHERN ALBERTA IN 2011

METHODS: Thirty irrigated dry bean crops were surveyed for diseases during the third week of August, 2011 in the bean production areas surrounding Bow Island and Taber, Alberta. Each crop was sampled in a U-shaped pattern by selecting ten sites approximately 20 m apart, with each site consisting of a 3 m long section of row (Howard and Huang, 1983). The incidences of white mold (*Sclerotinia sclerotiorum*) and bacterial blights (*Xanthomonas axonopodis* pv. *phaseoli* and *Pseudomonas syringae* pv. *phaseolicola* (*syn. P. savastanoi* pv. *phaseolicola*)) in each crop were calculated as percent infected plants by averaging scores from the ten sites. Each disease was scored at each site according to the following scale: (1) none (0% of plants infected), (2) trace (<1%), (3) light (1-10%), (4) moderate (11-25%), (5) high (26-50%), (6) very high (>50%).

RESULTS: Diseases of dry bean observed in 2011 were white mold, bacterial blights and grey mold (*Botrytis cinerea*). White mold was found in 27 of the 30 crops surveyed (Table 1), with disease incidence ranging from 0 to 76%. Most of the crops surveyed had light or moderate incidence of white mold. Grey mold (*Botrytis cinerea*) was observed in only two of the crops surveyed.

Bacterial blights were found in 27 of the crops (Table 1) with incidence ranging from 0 to 10%. The frequency of crops with trace and light incidence of bacterial blights was 83 and 7%, respectively. Both common blight and halo blight were observed in the surveyed area. Bacterial wilt (*Curtobacterium flaccumfaciens* pv. *flaccumfaciens*) of bean was not found.

DISCUSSION: Previous surveys of dry bean crops in southern Alberta have indicated the occurrence of fungal diseases such as white mold and grey mold, as well as bacterial diseases such as common blight and halo blight (Huang and Erickson, 2000). Bacterial wilt has been previously reported (Huang et al., 2007; Erickson and Balasubramanian, 2008; 2010), but was not observed in the 2011 survey. The relatively light incidence of fungal and bacterial diseases this year was likely due to the low precipitation in southern Alberta during July and August.

Although the incidences of white mold and bacterial blights were low this year, the diseases were still present in most of the fields surveyed. This finding suggests that continued vigilance is needed, as favourable conditions for infection could lead to severe infestations in future years. Further research on control of these diseases is warranted.

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Table 1. Incidence of dry bean diseases in southern Alberta in 2011.

	Number of crops[1] with disease incidence of					
Disease	**None 0%**	**Trace (<1%)**	**Light (1-10%)**	**Moderate (11-25%)**	**High (26-50%)**	**Very High (>50%)**
White mold	3	0	17	7	2	1
Bacterial blights	3	25	2	0	0	0

[1]out of a total of 30 crops surveyed.

CROP: Field bean
LOCATION: Manitoba

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TITLE: DISEASES OF FIELD BEAN IN MANITOBA IN 2011

METHODS: Crops of field bean in Manitoba were surveyed for root diseases at 33 different locations and for foliar diseases at 45 locations. The severity of halo blight (*Pseudomonas syringae* pv. *phaseolicola*) also was assessed during the root disease survey as a percentage of leaf tissue with symptoms. The survey for root diseases and halo blight was conducted in mid- to late July when most plants were at the early bloom stage. For foliar diseases, the survey was carried out in late August and early 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, at least 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). Fifteen to 20 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: The 2011 cropping season in Manitoba started with spring flooding, elevated moisture and cool conditions, followed by a dry summer and fall (Manitoba Crop Report, 2011), which reduced prevalence and severity of some diseases.

Three root diseases were observed (Table 1). Fusarium root rot (*Fusarium* spp.) was detected in all of the 33 crops surveyed for root diseases. It has remained the most prevalent root disease of dry bean for several years (Conner et al. 2010; 2011). Fields in which *Fusarium* spp. were isolated had root rot severity ratings that ranged from 0.8 to 6.8 with an average of 3.7. Rhizoctonia root rot (*Rhizoctonia solani*) was detected in 13 of the 33 crops surveyed with severity ratings of 0.8 to 5.8 and an average severity of 3.2. Pythium root rot was detected in two of the crops surveyed. Thirteen crops had average root rot ratings above a severity value of 4 (i.e., symptoms were present on 50% of the root system and plants were stunted) and this would have a detrimental effect on yield. Halo blight was not detected in any of the crops surveyed.

Three diseases were observed during the foliar disease survey (Table 2). Common bacterial blight was the most prevalent foliar disease and symptoms were observed in 38 crops. In seven of the 45 crops, the leaves had completely senesced, so the incidence and severity of CBB or rust could not be assessed. The incidence of CBB leaf infection ranged from 6.7 to 28.3% with an average of 18.5%, while severity ranged from 1.3 to 3.0, with an average of 2.4. Incidences of 20% or above were observed in 22 crops. Anthracnose was detected in one field bean crop with a disease severity of 3.3%. Bean rust was not observed in any of the dry bean crops surveyed. White mould symptoms were detected in 19 crops with an incidence of plant tissue infection that ranged from 0.3 to 26.7% with an average of 10.1%. This represents a decrease in the incidence and severity from the two previous years (Conner et al. 2010; 2011) in which frequent showers promoted the spread of this disease. Incidences of white mould of 10.0% or higher were observed in 10 dry bean crops and would have adversely affected crop yield.

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Table 1. Prevalence and severity of root diseases and halo blight in 33 crops of field bean in Manitoba in 2011.

Disease	No. crops affected	Disease Severity Mean[1]	Disease Severity Range
Fusarium root rot[2]	33	3.7	0.8-6.8
Rhizoctonia root rot[2]	13	3.2	0.8-5.8
Pythium root rot[2]	2	3.8	3.1-4.6
Halo blight (%)	0	0.0	0.0

[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).

Table 2. Prevalence and severity of foliar diseases in 45 crops of field bean in Manitoba in 2011.

Disease	No. crops affected	Disease Severity[1] Mean[2]	Disease Severity[1] Range	Incidence of Leaf Infection Mean[2]	Incidence of Leaf Infection Range
Common bacterial blight[3]	38	2.4	1.3-3.0	18.5%	6.7-28.3%
Anthracnose (%)	1	3.3	3.3		
Rust[3] (%)	0	0	0		
White mould (%)	19	10.1	0.3-26.7%		

[1]Anthracnose 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.
[3]Mean of 38 dry bean crops, since all the leaves had senesced in seven crops.

CROP: Canola
LOCATION: Alberta

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TITLE: THE OCCURRENCE OF CLUBROOT ON CANOLA IN ALBERTA IN 2011

METHODS: A total of 447 commercial canola (*Brassica napus* L.) crops in 21 counties in central Alberta were surveyed for the incidence of clubroot (Table 1), caused by the obligate parasite *Plasmodiophora brassicae* Woronin. Of these crops, 23 were confirmed to be clubroot-resistant canola hybrids. The survey was conducted from late August to late October, 2011, with the crops usually 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. The severity of root infection on each sampled plant was assessed on a scale of 0 to 3, adapted from Kuginuki et al. (1), where 0 = no galling, 1 = a few small galls, 2 = moderate galling and 3 = severe galling. The individual ratings were then used to calculate an index of disease (ID) for each field, according to the method of Horiuchi and Hori (2) as modified by Strelkov et al. (3). Visits to fields were coordinated with the agricultural fieldman in each municipality.

RESULTS AND COMMENTS: One hundred and three of the 447 canola crops surveyed were found to be clubroot-infested, all of which represented new records of the disease in the specific fields. This number included a record in the County of Vermillion River and another in Red Deer County, representing the first confirmed cases of clubroot in those municipalities (Table 1). Clubroot was detected in nine of 23 fields cropped to a resistant canola hybrid, and in 94 of 424 fields cropped to susceptible hybrids or hybrids of unknown resistance. Clubroot severity in the infested resistant crops was generally very low to low, with average ID values ranging from 0.2 to 10.2%. In the infested susceptible crops or crops of unknown resistance, the average ID was below 10% in 50 fields, between 10 and 60% in 32 fields and above 60% in 12 fields. In addition to the 103 infested canola crops found in this survey, another 162 new records of clubroot were identified in surveys conducted independently in Barrhead, Leduc, Parkland, and Strathcona counties. A total of 831 fields are now confirmed to be infested with clubroot in Alberta, distributed over 20 counties and a rural area of northeast Edmonton (Fig. 1). The outbreak remains most severe in the central part of the province, although the number of cases in counties formerly considered to be peripheral to the main outbreak continues to rise.

The number of new records (265) of clubroot identified in 2011 is the greatest found in a single year since surveying commenced in 2003 (with the second highest being 155 in 2008 (4)). Conditions early in the growing season were favorable for clubroot development, with abundant rainfall throughout much of central Alberta. However, the increasing prevalence of this disease also likely reflects continued spread of *P. brassicae*. This year (2011) also marked the first confirmed cases of clubroot in Saskatchewan, although the pathogen (but no disease symptoms) was first identified in that province in 2008 (5). The cropping of clubroot-resistant canola hybrids should be considered as an important disease management tool in affected counties and neighboring regions, although resistance will have to be carefully managed to ensure its longevity.

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Table 1. Distribution of clubroot-infested canola fields identified in Alberta in 2011

County	Number of fields surveyed	Number of new cases of clubroot-infested fields
Barrhead	20	6[a]
Beaver	21	0
Camrose	25	10
Flagstaff	20	7
Kneehill	16	0
Lacombe	16	2
Lac Ste. Anne	18	4
Lamont	21	5
Leduc	25	12[b]
Minburn	22	0
Parkland	20	9[c]
Ponoka	21	3
Red Deer	16	1
Strathcona	26	9[d]
Sturgeon	23	15
Thorhild	24	2
Vermillion River	30	1
Wainwright	23	0
Westlock	21	9
Wetaskiwin	18	6
Yellowhead	21	2
TOTAL	447	103

[a] 3 clubroot-infested fields were identified in a survey conducted by the County of Barrhead, bringing the total new cases in that county to 9; [b] 139 clubroot-infested fields were identified in a survey conducted by the County of Leduc, bringing the total new cases in that county to 151; [c] 11 clubroot-infested fields were identified in a survey conducted by Parkland County, bringing the total new cases in that county to 20; [d] 9 clubroot-infested fields were identified in a survey conducted by Strathcona County, bringing the total new cases in that municipality to 18

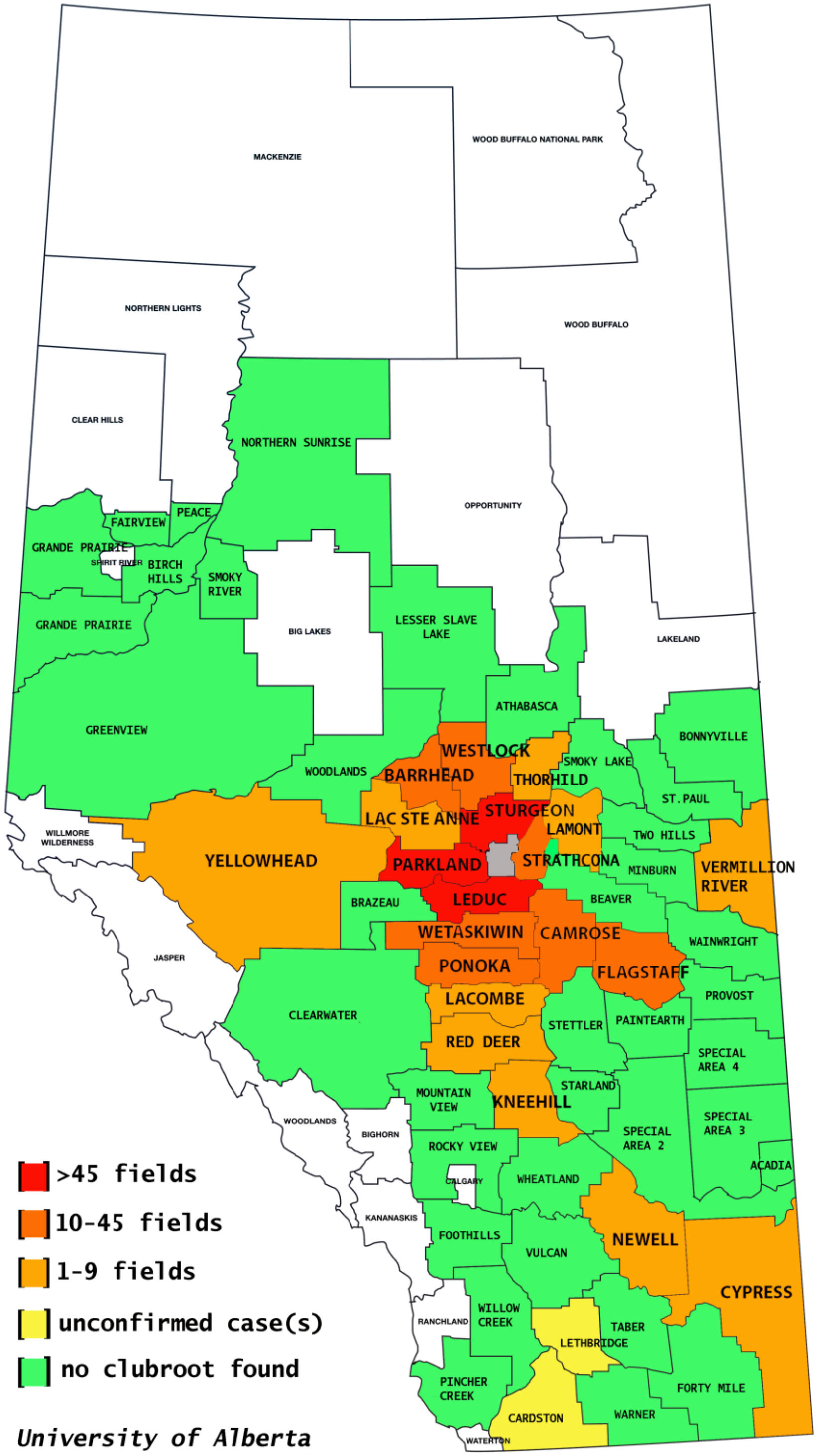

Figure 1. The occurrence of clubroot on canola in Alberta as of November 2011. Since clubroot surveys were initiated in 2003, the disease has been confirmed in a total of 831 fields representing 20 counties and a rural area of the City of Edmonton.

CROP: Canola
LOCATION: Saskatchewan

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TITLE: SURVEY OF CANOLA DISEASES IN SASKATCHEWAN, 2011

METHODS: A total of 241 canola (*Brassica napus*) fields were surveyed between August 8 and September 25 in the major canola production regions of Saskatchewan. The number of canola fields surveyed per region was targeted to be approximately proportionate to the amount of canola grown in each of the regions, which consisted of northwest (21 fields in Saskatchewan crop districts (CD) 9AW and 9B), northeast (66 fields in CD 8 and 9AE), west-central (58 fields in CD 6B and 7), east-central (65 fields in CD 5 and 6B), southwest (15 fields in CD 3ASW, 3BN and 4B), and southeast (16 fields in CD 1 and 2B) Saskatchewan. Most of the fields 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.), fusarium wilt (*F. oxysporum* f.sp. *conglutinans*), and clubroot (*Plasmodiophora brassicae*). For sclerotinia stem rot, each plant was also rated for disease severity using the 0 to 5 scale in Table 1 (Kutcher and Wolf 2006). For blackleg, plants were scored for either severe basal stem cankers or any other type of blackleg stem lesion. Plants with severe basal stem cankers were also rated for disease severity using the 0 to 5 scale in Table 2 (Western Canada Canola/Rapeseed Recommending Committee 2009). 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 field, 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 equal to or less than 0.1% were reported as “trace”. Soil samples (~1L) from 100 of the fields surveyed were analyzed using the PCR-based diagnostic test of Cao et al. (2007) for the presence of *P. brassicae*. Positive samples were further assessed using a quantitative PCR (qPCR) and bioassay for the amount of pathogen inoculum and its ability to cause clubroot symptoms

RESULTS AND COMMENTS: Prairie canola production reached an all-time high in 2011 and approximately 3.96 million ha (9.79 million acres) of canola were seeded in Saskatchewan (Statistics Canada 2011). In the northern crop districts, seeding progressed ahead of or on schedule, whereas excess moisture created delays and challenges for farmers in the southeast and other parts of southern Saskatchewan. In most areas, warm summer weather and an extended period of high temperatures at harvest allowed producers to harvest the crop in a timely fashion. Many crop reporters in regions other than the southeast reported average to above-average yields and good quality (Saskatchewan Ministry of Agriculture 2011).

Sclerotinia stem rot was observed in 81% of the fields surveyed. Incidence ranged from 0 to 92% and mean severity ranged from 0 to 5. Mean incidence (10.6%) and mean severity (3.2) were highest in the northeast, a region that experienced excess moisture in 2009 and 2010 but had less precipitation in 2011. In southwest, west-central, and east-central Saskatchewan mean incidence was also higher than the provincial mean. This contrasts with 2010, when sclerotinia levels there were below the provincial mean; however, moisture levels were not a limiting factor for production in most areas of southwest Saskatchewan in 2011. Sclerotinia was lowest in the southeast, with a mean incidence of 2.2% and a mean severity of 0.9. Mean incidence for the province in 2011 was lower than in 2010, but similar to 2009 when moisture levels were not excessive (Dokken-Bouchard et al. 2011).

Blackleg (stem lesions and/or basal cankers) was observed in 24% of the fields surveyed, with incidence of basal stem cankers ranging from 0 to 24%. Stem lesion incidence ranged from 0 to 100% and was often associated with hail injury. Mean incidence for the province (1.4% basal cankers and 1.8% upper stem lesions) was within the range experienced from 2000 to 2010 (1.5 to 5% total blackleg). Outside this range, blackleg was reported at 11% incidence in 1999 and trace in 2002 (Dokken-Bouchard et al. 2011). The mean incidence was highest in the northwest (3.8%) and lowest in the east-central region (0.4%). The mean severity of blackleg basal cankers in the province was 0.4; however, occasionally individual plants were rated as 5. Overall, the disease does not appear to be causing severe damage to the lower stems. This is likely due to cultivar resistance.

Aster yellows was observed in 13% of the fields surveyed, with incidence ranging from 0 to 12%. Mean incidence for the province was 0.3%, which was similar to 2010 but slightly higher than in 2009 and 2008 (trace and 0.2%, respectively). The highest recent incidence of aster yellows (2%) occurred in 2007 (Pearse et al. 2008). Incidence of aster yellows in the northwest (0.5%), east-central (0.5%), and southeast (1.1%) parts of the province was higher than the provincial mean.

Fusarium wilt was observed in 2.5% of the fields surveyed, with mean incidence at a trace. The disease was not observed in the northeast and was observed at higher than trace levels only in the south, but no plant samples were taken to confirm the observations. Foot rot prevalence was highest in the southeast (18.7%) and lowest in the northeast (4.5%). Provincial prevalence (9.5%) and mean incidence (0.4%) of foot rot were similar to previous years other than 2009 (36% prevalence and 2% mean incidence). Alternaria black spot was observed in 31% of the fields surveyed, which was higher than in 2010 but lower than in 2008 (64%) and 2009 (53%). However, the severity rating was 0.3, which is similar to previous years. Since province-wide surveys began in 1999, the mean severity of alternaria black spot has remained less than 1% and for many years has been at trace levels. Brown girdling root rot was not observed in this survey in 2011, whereas in previous years it was reported at trace levels in some regions (Dokken-Bouchard et al. 2010).

Clubroot symptoms were not observed in any of the fields surveyed in 2011 and the pathogen inoculum was not detected by PCR or was below levels quantifiable by qPCR and unable to cause disease in bioassays for the soil samples collected in 2011. However, clubroot symptoms were reported for the first time at low levels on the roots of canola plants in two blackleg disease nurseries in north-central Saskatchewan.

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Table 1. Sclerotinia rating scale (Kutcher and Wolf 2005)

Disease Rating	**Lesion Location**	**Symptoms**
0	None	No symptoms
1	Pod	Infection of pods only
2	Upper plant Parts	Lesion situated on main stem or branch(es) with potential to affect up to ¼ of seed formation and filling on plant
3		Lesion situated on main stem or on a number of branches with potential affect up to ½ of seed formation and filling on plant
4		Lesion situated on main stem or on a number of branches with potential to affect up to ¾ of seed formation and filling on plant
5	Lower plant Part	Main stem lesion with potential effects on seed formation and filling of entire plant

Table 2. Blackleg rating scale (WCC/RRC 2009)

Rating	Description
0	No disease visible in the cross section
1	Diseased tissue occupies up to 25% of cross-section
2	Diseased tissue occupies 26 to 50% of cross-section
3	Diseased tissue occupies 51 to 75% of cross-section
4	Diseased tissue occupies more than 75% of cross-section with little or no constriction of affected tissues
5	Diseased tissue occupies 100% of cross-section with significant constriction of affected tissues; tissue dry and brittle; plant dead

Table 3. Mean incidence and severity of sclerotinia and blackleg of canola in Saskatchewan in 2011

REGION[1] (NO. OF FIELDS)	**Sclerotinia**		**Blackleg**		
	Incidence	**Severity[2]**	**Upper Stem Lesions**	**Basal Cankers**	**Basal Canker Severity[3]**
Northwest (21)	6.2	2.4	6.0	3.8	0.6
Northeast (66)	10.6	3.2	0.5	2.1	0.4
West-central (58)	10.2	2.2	0.9	0.7	0.3
East-central (65)	9.9	2.2	1.5	0.4	0.2
Southwest (15)	10.5	1.6	1.5	1.3	0.4
Southeast (16)	2.2	0.9	7.4	1.5	0.4
Overall mean (241)	9.4	2.4	1.8	1.4	0.4

[1] Fields were surveyed in major canola production regions in the following rural municipalities of Saskatchewan: Northwest = 468, 471, 472, 498, 502, 561, 588, 622; Northeast = 369, 370 to 373, 394, 397, 399 to 402, 426 to 431, 434, 435, 439, 458 to 461, 464, 468, 471, 472, 486, 488, 490, 491, 493, 496, 498, 499, 520, 588; East-central = 152, 181, 183, 184, 189, 190, 214, 219 to 222, 243 to 245, 250 to 252, 271, 273, 276, 279 to 282, 301, 305, 307 to 310, 312, 313, 334 to 338, 340, 341, 367, 368; West-central = 223, 253, 254, 259, 261, 282 to 285, 287, 288, 290, 315, 320, 344, 345, 347, 349 to 351, 376 to 379, 381, 409, 410, 438; Southwest = 17, 71, 134, 141, 167, 193, 224, 228, 229; Southeast = 5, 6, 67, 97, 125, 129, 160, 162, 191.
[2] Sclerotinia rating as per Table 1.
[3] Blackleg rating as per Table 2.

Table 4. Mean incidence of alternaria pod spot, aster yellows, foot rot, and fusarium wilt of canola in Saskatchewan in 2011

REGION[1] (NO. OF FIELDS)	**Alternaria Black Spot**	**Aster Yellows**	**Foot Rot**	**Fusarium Wilt**
Northwest (21)	4.3	0.5	Trace	Trace
Northeast (66)	7.8	0.2	Trace	0
West-central (58)	4.7	Trace	Trace	Trace
East-central (65)	24.2	0.5	0.7	Trace
Southwest (15)	5.7	Trace	0.6	0.5
Southeast (16)	12.0	1.1	2.1	0.4
Overall mean (241)	11.3	0.3	0.4	Trace

CROP: Canola
LOCATION: Manitoba

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TITLE: SURVEY OF CANOLA DISEASES IN MANITOBA IN 2011

METHODS: A total of 121 canola crops were surveyed in the southwest (24), northwest (38), eastern/interlake (36) and central (23) regions of Manitoba from July 27 to mid-September. All crops were *Brassica napus* and were surveyed before swathing while plants were between growth stages 5.1 and 5.5 (Harper and Berkenkamp, 1975). They were assessed for the prevalence (percent crops infested) and incidence (percent plants infected per crop) of sclerotinia stem rot (*Sclerotinia sclerotiorum*), aster yellows (AY phytoplasma), foot rot (*Fusarium* spp. and *Rhizoctonia* sp.), blackleg (*Leptosphaeria maculans*), fusarium wilt (*F. oxysporum* f.sp. *conglutinans*) and clubroot (*Plasmodiophora brassicae*). For sclerotinia stem rot, each plant was scored based on the possible impact of infection on yield using a disease severity scale of 0 (no symptoms) to 5 (main stem lesion with potential effects on seed formation and filling of entire plant) (Kutcher and Wolf, 2006). Blackleg lesions that occurred on the upper portions of the stem were assessed separately from basal stem cankers. Stem lesions were recorded as present or absent. Basal stem cankers were scored using a disease severity scale based on area of diseased tissue in the cross-section of the stem where 0 = no diseased tissue visible in the cross section and 5 = diseased tissue occupied 100% of cross section with plant dead (WCC/RRC, 2009). The prevalence and percent severity (Conn et al. 1990) of alternaria pod spot (*Alternaria* spp.) were also determined. 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. In addition to the visual assessment of canola diseases, approximately 70 soil samples were collected from Manitoba canola fields for DNA analysis (Cao et al., 2007) to test for the presence of the clubroot pathogen.

In each canola crop, 100 plants were selected in a regular pattern starting at a corner of the field or at a convenient access point. The edges of the fields were avoided. Twenty plants were removed from each of five points of a “W” pattern in the field. Points of the “W” were at least 20 paces apart. All plants were pulled up, removed from the field and examined for the presence of diseases. For soil collection, samples were obtained from each of the five points of the “W”, or if the field entrance was visible, they were collected at 5 points near this entrance.

RESULTS: A number of diseases were present in each of the four regions of Manitoba, but clubroot symptoms were not observed in any of the crops surveyed in 2011. No clubroot spores were detected in soil samples from 60 and 79 Manitoba canola fields collected for DNA analysis in 2009 and 2010, respectively. Results from analyses of soil samples collected in 2011 will be available in the near future.

Sclerotinia stem rot and blackleg were the most prevalent diseases throughout the province (Table 1) in 2011. The prevalence of sclerotinia-infested crops ranged from a high of 64% in the eastern/interlake region to 21% in the southwest, with a provincial mean of 45%. This was lower than the prevalence of 88% in 2010 (McLaren et al., 2011) and reflects the dry conditions experienced in Manitoba during July and August of 2011. Mean disease incidence averaged across all crops was 5% and ranged from 11% in the eastern/interlake region to 2% in both the northwest and southwest regions. For infested crops only, mean disease incidence was 12%. Throughout the province, mean severity of sclerotinia stem rot was <2%.

Blackleg basal cankers occurred in 69% of the crops surveyed in 2011, with the prevalence ranging from 83% in the southwest region to 61% in the northwest region. The mean incidence of basal cankers averaged across all crops was 9.2%, while the incidence in infested crops was 13%. In 2010, basal cankers were found in 58% of crops surveyed with a mean disease incidence of 13%. The severity of blackleg basal cankers was similar in both years, with average ratings of 2 or less. A disease severity rating of 2 is equivalent to diseased tissue occupying 26-50% of the basal stem cross section.

The mean prevalence of blackleg stem lesions in 2011 was 64%. In previous years, 65%, 54% and 56% and 66% of crops had stem lesions in 2007, 2008, 2009 and 2010, respectively (McLaren et al.2008; 2009; 2010; 2011). The mean incidence of blackleg stem lesions was 10% in infested crops, with a provincial mean of 7%. The incidence of stem lesions was consistently associated with hail damage to canola stems. The number of canola crops affected by hail was the highest in the southeast part (37%) of the eastern/interlake region.

The mean prevalence of alternaria pod spot in 2011 was 35%, 19%, 17% and 16% for crops surveyed in the central, eastern/interlake, southwest and northwest regions, respectively (Table 2). The severity of alternaria pod spot was low with means <2%.

The mean prevalence of aster yellows in the crops surveyed in 2011 was 18% and was similar to the mean prevalence of 14% observed in 2010. Aster yellows was observed in all regions in 2011, with the exception of the southwest region, with a mean disease incidence of <1% for the province.

Fusarium wilt was observed in 9% of canola crops surveyed in Manitoba, with a mean incidence of 4% in these fields. No fusarium wilt was observed in the southwest region (Table 1). This disease was found in 21%, 18%, 15%, 9%, 4% and 3% of fields in 2005 through 2010, respectively, illustrating a reduction in disease prevalence that was likely due to the use of wilt-resistant canola cultivars.

Foot rot occurred in 3% of canola crops surveyed with a provincial mean of <1%. No foot rot was observed in either the southwest or eastern/interlake regions. White rust (*Albugo candida*) was confirmed in one field of *B. napus* in the northwest region. *Albugo candida* normally affects only *B. rapa* and *B. juncea* and is not generally found in commercial *B. napus.*

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Table 1. Mean prevalence, incidence and severity of sclerotinia stem rot and blackleg in Manitoba in 2011.

Crop Region	**Sclerotinia stem rot**					**Blackleg basal cankers**					**Blackleg stem lesions**		
(No. of crops)	P[1]	Inc.[2]	Inc[3]	Sev.[2]	Sev.[3]	P[1]	DI[2]	DI[3]	Sev.[2]	Sev.[3]	P[1]	DI[2]	DI[3]
Central	57	6.7	11.9	1.3	2.3	65	6.6	10.1	1.3	1.9	61	4.7	7.6
(23)													
East./Inter.	64	10.9	17.0	0.9	1.4	69	8.8	12.6	1.0	1.5	67	6.1	9.2
(36)													
Northwest	34	1.5	4.5	0.6	1.6	61	5.7	9.4	0.8	1.3	55	6.6	12.0
(38)													
Southwest	21	2.0	9.8	0.5	2.4	83	17.8	21.4	1.6	1.9	75	8.8	11.8
(24)													
All regions	45	5.4	12.1	0.8	1.8	69	9.2	13.4	1.1	1.6	64	6.5	10.3
(121)													

[1] Prevalence (P).
[2] Disease incidence (DI) and severity (Sev.) across all surveyed crops.
[3] Disease incidence and severity in infested crops.

CROP: Chickpea (*Cicer arietinum*)
LOCATION: Saskatchewan

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TITLE ASCOCHYTA BLIGHT ON CHICKPEA IN SASKATCHEWAN, 2011

METHODS: A survey of seven chickpea crops was conducted at the pod stage to maturity (August 16 and September 08, 2011) to assess the severity of ascochyta blight (*Didymella rabiei*, anamorph *Ascochyta rabiei*). The survey covered parts of south-central, south-west and central portions of the grain belt in Saskatchewan (Crop Districts 3A, 3B and 6B). Ten plants were assessed at each of 10 sites along a teardrop-shaped circuit in each field. The severity of ascochyta blight on each plant was assessed using the 0–11 Horsfall-Barratt scale (1).

RESULTS AND COMMENTS: The chickpea crops examined in the survey had been sprayed with foliar fungicide (up to four times). In the survey region in 2011, precipitation levels early in the growing season were quite high (2). This provided conditions that were conducive for initial infection, and the incidence of ascochyta blight (Table 1) within each field was high (up to 96%). However, weather in late July and August was hot and dry. The hot dry conditions appear to have limited secondary spread of the disease. Severity was generally lower than normal, but varied substantially from field to field and within individual fields (Table 1). Symptoms ranged from flecking and scattered lesions on lower leaves to stem breakage and large lesions on pods. Other diseases included root rot and traces of white mold (*Sclerotinia sclerotiorum*) and grey mold (*Botrytis cinerea*) within the canopy in dense crops. Chickpea acreage across the region was down substantially from previous years.

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Table 1. Mean incidence and severity (range in brackets) of ascochyta blight in commercial chickpea crops in Saskatchewan, 2011

Region and Crop District (CD)	No. of fields	Incidence % (range)	Severity % (range)
South-central (CD 3A)	4	79% (50–100)	5% (0–12)
South-west (CD 3B)	2	96% (90–100)	3% (0–6)
Central (CD 6B)	1	95%	14%

CROP: Flax
LOCATION: Manitoba/Saskatchewan

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TITLE: DISEASES OF FLAX IN MANITOBA AND SASKATCHEWAN IN 2011

METHODS: A total of 28 flax crops were surveyed in 2011, 12 in southern Manitoba, and 16 in southern and eastern Saskatchewan. Four crops were surveyed in mid-August, 19 crops in the last week of August, and 5 crops in the first week of September. Ninety-two percent of the crops were the brown seed-colour linseed flax, and only eight percent 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 to each other 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, nine 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; six samples were submitted to the Saskatchewan Ministry of Agriculture Crop Protection Laboratory.

RESULTS AND COMMENTS: Ninety-three percent of the flax crops surveyed in 2011 had excellent stands and the remainder were good to fair. Thirty-three percent of the crops surveyed in Manitoba and 75% in Saskatchewan were maturing early with excellent to good vigour, while the other crops had poor vigour and were expected to mature late. The 2011 growing season started with high soil moisture conditions and some locally flooded fields that resulted in a record low area of flax seeded, especially in Manitoba (total flax area 280,000 ha, mostly in SK, according to Statistics Canada). Above normal temperatures and below normal precipitation in August no doubt contributed to the early maturity and low yield in some crops, especially in Saskatchewan. The 2011 survey showed only minor differences between Manitoba and Saskatchewan in the incidence and severity of the major diseases; fusarium wilt was more prevalent in Manitoba (58% of crops in MB and 31% of crops in SK) while pasmo and aster yellows were more prevalent in Saskatchewan (75% and 44% respectively in SK, and 50% and 25% respectively in MB) Lodging was at record low with only trace levels in both provinces.

Pasmo, the most prevalent disease in 2011, was observed in 79% of crops surveyed (Table 1), 100% of the crops in Saskatchewan and 50% of the crops surveyed in Manitoba. The prevalence and severity on stems were generally lower than in previous years (1, 2, 3, 4), due perhaps to the dry and warm weather in August. Pasmo severity ranged from trace to 20% of the stem area affected in most infested crops and was >30% in 25% of the crops (Table 1).

Some root infections and fusarium wilt were observed in 43% of flax crops in 2011. Incidence was very low (trace to 5%) in most crops (Table 1). Prevalence of these diseases in 2011 was similar to that of 2010 but lower than in the previous years probably due to below-normal temperatures early in the season which do not favour root infection (1, 2, 3, 4).
Powdery mildew was present in 50% of the crops surveyed in Manitoba and Saskatchewan in 2011 (Table 1); severity ranged from trace to 10% leaf area affected in most crops with >30% leaf area infected

in 14% of the crops surveyed. Powdery mildew infections started late in 2011 but resulted in higher incidence and severity than in 2010 (1, 2, 3, 4).

Rust was not observed in any of the crops surveyed in 2011, nor in flax rust trap nurseries planted at Morden and Portage la Prairie in Manitoba, and at Indian Head and Saskatoon in Saskatchewan.

Aster yellows (phytoplasma) was observed in 36% of the flax crops with incidence ranging from trace to 5% affected plants. This disease is transmitted by the aster leafhopper **(Macrosteles quadrilineatus)** which usually migrates from the south during the growing season. Alternaria blight was observed in 29% of the crops surveyed with a severity range from trace to 5% leaf area affected. No sclerotinia stem infections were evident in any of the crops surveyed in 2011.

Of the nine flax samples submitted to the Manitoba Crop Diagnostic Centre, one was identified with pasmo, one with stem fasciation, and seven with chemical injury. The six flax samples submitted to the Saskatchewan Agriculture Crop Protection Laboratory were identified with chemical injury.

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Table 1. Incidence and severity of fusarium wilt, pasmo, and powdery mildew in 28 crops of flax in Manitoba and Saskatchewan in 2011

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%	16	57	0%	0%	6	21	0%	0%	14	50
1-5%	1-5%	12	43	1-10%	1-5%	7	25	1-10%	1-5%	9	32
5-20%	5-10%	0	0	10-30%	5-10%	8	29	10-30%	5-10%	1	3
2-40%	10-20%	0	0	30-60%	10-20%	5	18	30-60%	10-20%	3	11
>40%	10-40%	0	0	>60%	20-50%	2	7	>60%	20-50%	1	3

[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: SURVEY OF LENTIL DISEASES IN SASKATCHEWAN, 2010 AND 2011

METHODS: A total of 29 Saskatchewan lentil crops were randomly chosen for survey between August 10 and August 19, 2010 and a total of 38 crops were randomly chosen for survey between August 3 and August 26, 2011. Regions surveyed and number of crops in 2010 included west-central (16) and south-west (13) Saskatchewan. Regions and crops surveyed in 2011 included west-central (11), south-west (23), and south-east (4) Saskatchewan. Most of the crops were surveyed shortly before harvest when the lentil plants were between BBCH growth stages 69 and 89 (Lancashire et al. 1991). Disease assessments were made qualitatively in each crop by observing several representative plants to ascertain general health and presence or absence of symptoms. Prevalence of the following diseases was recorded: root rot (*Fusarium* spp. / *Pythium* spp. / *Rhizoctonia solani*), anthracnose (*Colletotrichum truncatum),* ascochyta blight (*Ascochyta lentis*), sclerotinia stem and pod rot (*Sclerotinia sclerotiorum*), botrytis stem and pod rot (*Botrytis cinerea)* and stemphylium blight (*Stemphylium botryosum* and other *Stemphylium* spp.). Percentages of the crops surveyed showing symptoms of each of these diseases were calculated for each region (Tables 1 and 2).

RESULTS AND COMMENTS: Lentil acreage was high in 2010 with an estimated 1.35 million ha (3.34 million acres) (Statistics Canada, 2011). However, much of the crop was adversely affected by excess rain and harvestable acres were substantially fewer and variable across the province. Diseases and sprouted lentils negatively affected crop yield and quality in 2010.

Slightly less than 1 million ha (2.46 million acres) of lentil were seeded in Saskatchewan in 2011 (Statistics Canada, 2011). Most of the southern and west-central regions of the province received above average precipitation in 2011 (Agriculture Agri-Food Canada, 2011). Early in the growing season, excess precipitation combined with lack of both heat and sunlight created many challenges for farmers in 2011. Lentils crops were stressed from excess moisture and flooding, particularly in the southern part of the province. However, warm weather and good growing conditions later in the growing season reduced the impact of diseases and lentil quality was improved compared to 2010.

Root rot was the most prevalent disease observed in 2011. Symptoms were found in 87% of the lentil crops surveyed. This number appears to reflect a concern that was raised by farmers in Saskatchewan during the spring. Root rot had been observed in only 14% of the crops surveyed in 2010; however fewer crops were surveyed and those in which it was not identified may have sustained earlier root infections that were no longer visible when the survey was conducted. Furthermore, root rot may have been masked by environmental stress in lentil crops that had been flooded.

Ascochyta blight was most prevalent in the west-central region in 2010 with symptoms observed in 31% of crops surveyed, and in the south-west region in 2011 where 30% of the crops showed symptoms. Anthracnose was reported in 52% of the lentil crops surveyed in 2010 and 50% of the lentil crops surveyed in 2011, but was not observed in the four crops surveyed in the south-east region in 2011. Prevalence was highest in the west-central region in 2011 at 73%. Stemphylium blight was the most prevalent disease reported in 2010 but was found in a lower percentage of crops surveyed in 2011. The year-to-year reductions were from 88% to 45% in the west-central and from 77% to 39% in the south-west region. This disease was not observed in the four lentil crops surveyed in the south-east region in 2011.

Sclerotinia stem and pod rot was reported in 59% of the lentil crops surveyed in 2010 and 24% of the lentil crops surveyed in 2011; prevalence was highest in the west-central region at 69% in 2010 and at 27% in 2011. Botrytis stem and pod rot was observed in 56% (2010) and 27% (2011) of surveyed crops in the west-central region and 23% (2010) and 17% (2011) of crops in the south-east region. These diseases were not observed in the four crops surveyed in the south-east region in 2011.

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Table 1. Prevalence of lentil diseases in crops surveyed in Saskatchewan in 2010.

Region (No. of Crops)	Percentage (%) of Lentil Crops Surveyed with Disease Symptoms					
	Root Rot	Anthracnose	Ascochyta Blight	Sclerotinia Stem and Pod Rot	Botrytis Stem and Pod Rot	Stemphylium Blight
West-central (16)	13	56	31	69	56	88
South-west (13)	15	46	15	46	23	77
Overall mean (29)	14	52	24	59	41	83

Table 2. Prevalence of lentil diseases in crops surveyed in Saskatchewan in 2011.

Region (No. of Crops)	Percentage (%) of Lentil Crops Surveyed with Disease Symptoms					
	Root Rot	Anthracnose	Ascochyta Blight	Sclerotinia Stem and Pod Rot	Botrytis Stem and Pod Rot	Stemphylium Blight
West-central (11)	91	73	18	27	27	45
South-west (23)	83	48	30	26	17	39
South-east (4)	100	0	25	0	0	0
Overall mean (38)	87	50	26	24	18	37

CROP: Lentil
LOCATION: Saskatchewan

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TITLE: SEED-BORNE PATHOGENS OF LENTIL IN SASKATCHEWAN IN 2011

METHODS: Results were summarized from agar plate tests on seed samples from Saskatchewan conducted by three companies between September and mid-December 2011. The seed samples were assumed to be predominantly from the 2011 crop. The tests were conducted to detect 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* and *Botrytis* mean % seed infection and % samples free of infection were calculated for each crop district [CD] in Saskatchewan (6). For *Colletotrichum* and *Sclerotinia* only the % infected samples for the whole province were calculated. Anthracnose and sclerotinia stem and pod rot are not highly seed-borne on lentil and are generally at low levels even in seed from severely infested crops (1).

The seed samples could not all be classified according to cultivar or whether the crops had been treated with seed treatments or foliar fungicides. However, lentil growers in Saskatchewan commonly use ascochyta-resistant cultivars and spray with foliar fungicides to control ascochyta blight and anthracnose.

RESULTS AND COMMENTS: The 2011 growing season in Saskatchewan was characterized by average to well above average moisture levels in May and June followed by warm dry weather from mid-July to late September. Early flooding prevented seeding in many areas of southeast Saskatchewan, but all areas of the province experienced ideal harvest conditions. Provincial lentil yields averaged 6% above the 2010 figure and 22% above the 10-year average (6). Crop quality and grade were above average and, in marked contrast with 2010 (4), discoloration, earth tag and infestation by seed-borne pathogens were rare in the samples received for testing.

During the period covered by this report 570 samples were processed. This is less than half the number reported for a slightly shorter period in 2010 (4) and more similar to numbers reported in drier years like 2008 (2) and 2009 (5). Mean levels of seed-borne *Ascochyta* varied among CDs from 0 to 4.8% (in a CD represented by very few samples). The provincial mean of 0.4% (Table 1) was similar to the five previous years (4). The percentage of ascochyta-free samples was high in most CDs, with a provincial mean value of 85%. Given the widespread use of ascochyta-resistant cultivars and foliar fungicide applications, the few infected seed samples probably resulted from poor farm management practices. These include using outdated ascochyta-susceptible cultivars or very short rotations, such as planting lentil crops on lentil stubble.

Low levels (3% or less) of *Colletotrichum* were found in 15% of the total lentil samples, about double the percentages in several recent years (2, 5). However, 15% is similar to the number in wet years like 2004 (3) and 2010 (4), when harvests were delayed and there was more time for anthracnose to spread to lentil pods.

Mean *Botrytis* levels in seed varied from 0% in CDs 1A, 4A and 5A to 4.8% in CD 5B. However, these were all CDs represented by very few samples and in most CDs the means ranged from 0.3 to 1.5% (Table 1). The provincial mean value was 0.8% and the provincial mean percentage of *Botrytis* -free samples was 51%. These values differ substantially from 2010 (4) and reflect the difference between years with difficult wet (2010) and perfect dry (2011) harvest conditions.

Low levels of *Sclerotinia* were found in 22% of total lentil samples. Most of these samples (20% of the total) had only 0.25% infection. Although many fields are infested with inoculum of *S. sclerotiorum* Saskatchewan (4), these figures confirm that sclerotinia stem and pod rot is not a significant cause of loss under favorable harvest conditions.

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Table 1. Numbers of lentil samples tested from September to December, 2011 by three commercial companies, and levels of infection with *Ascochyta* and *Botrytis* in relation to Saskatchewan Crop Districts.

Crop District	*Ascochyta lentis*			*Botrytis* spp.		
	Number of samples tested	Mean % infection	% samples with 0% infection	Number of samples tested	Mean % infection	% samples with 0% infection
1A	1	0	100	1	0	100
1B	0	-	-	0	-	-
2A	21	0.1	90	21	0.4	70
2B	86	0.1	86	83	0.3	72
3AN	18	0.1	78	17	0.5	47
3AS	58	0.5	83	54	0.1	83
3BN	95	0.3	86	93	0.9	41
3BS	11	0.1	82	10	0.6	70
4A	3	4.8	0	3	0	100
4B	13	0	62	13	1.6	31
5A	6	0	100	6	0	100
5B	1	0	100	1	4.8	0
6A	30	<0.1	77	29	0.8	55
6B	126	<0.1	96	126	1.1	33
7A	84	0.3	76	85	1.1	31
7B	10	0	100	10	2.1	0
8A	1	0	100	-	-	-
8B	3	0	100	3	1.5	33
9A	2	0.1	50	-	-	-
9B	0	-	-	-	-	-
TOTAL	570	0.2	85	545	0.8	51

CROP: Field pea
LOCATION: Alberta

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TITLE: THE OCCURRENCE OF ASCOCHYTA BLIGHT ON FIELD PEA IN ALBERTA IN 2011

METHODS: In July and August of 2011, a total of 54 commercial pea (*Pisum sativum*) crops in seven counties in central Alberta were surveyed for the incidence and severity of ascochyta blight, caused by a complex of pathogens including *Mycosphaerella pinodes, Phoma pinodella*, and *Ascochyta pisi* (1). The survey was conducted by inspecting five random sites along the arms of a 'W' sampling pattern in each field. At each of the five sampling sites, 30 pea plants were randomly selected and carefully pulled from the ground. Ascochyta blight severity on the top, middle and bottom portions of each plant was then assessed on a 0 to 3 scale, where 0 = healthy (no leaf blight lesions), 1 = blight lesions cover less than 10% of the entire leafy area, 2 = blight lesions cover between 10 and 30% of the entire leafy area, and 3 = blight lesions cover more than 30% of the entire leafy area. The ratings were used to calculate an index of disease (ID) (2) for the top, middle and lower portions of the canopy. Average IDs were used to compare disease severity between locations. In addition, the roots of the sampled plants were evaluated for the presence or absence of root rot symptoms.

RESULTS AND COMMENTS: The survey revealed the occurrence of ascochyta blight in all 54 commercial pea crops visited (Table 1). Disease severity was generally high, with IDs ranging from an average of 59% in the County of Minburn to 94% in Strathcona County. Indices of disease could not be calculated for two of the 54 pea crops, in which all of the plants had died prematurely as a consequence of severe root rot. Nonetheless, signs and symptoms of ascochyta blight infection were also apparent on those crops. Analysis of variance was conducted using the disease rating data from the other 52 pea crops. Across fields, the average ID in the top third of the canopy was 62%, which was significantly ($P<0.0001$) lower than in the middle (83%) and bottom (89%) portions of the canopy. The average ID in the middle portion of the canopy was also significantly ($P<0.0001$) lower than in the bottom of the canopy.

The geographical distribution of the surveyed regions is illustrated in Fig. 1. Typically, purplish and brown colored lesions were observed on leaves that were alive, while brownish to black lesions were observed on leaves and stems that were dead. Purplish lesions, spots or light green blisters were found on green pods in some fields, while black lesions with pycnidia were frequently observed on dried pods. Patches of prematurely yellow and lodged plants were also noted. In addition to ascochyta blight, symptoms of root rot were identified in half of the surveyed pea crops, while downy mildew, caused by *Peronospora viciae* f. sp. *pisi*, was found in 14 of the crops (data not shown).

ACKNOWLEDGEMENTS:
We are grateful to Normand Boulet of the Municipal District of Smoky River and Ivan Adamyk from ICMS, Inc. for their assistance in the field survey. We also acknowledge the financial support provided by Agriculture and Agri-Food Canada, the Saskatchewan Pulse Growers, Manitoba Pulse Growers and Alberta Pulse Growers through the Pulse Science Cluster, as well as by the Government of Canada through the Agri-Flex Program.

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Table 1. Severity of ascochyta blight in 54 commercial pea crops surveyed in Alberta in 2011

County	Number of commercial pea crops surveyed†	Average index of disease (%)‡
Strathcona	4	94 a
Westlock	4	88 b
Parkland	4	88 b
Smoky River	17	85 bc
High Prairie	3	81 cd
Sturgeon	9	77 d
Minburn	13	59 e

†All crops visited exhibited symptoms and signs of ascochyta blight
‡Averages followed by the same letter are not significantly different at P=0.05, as determined by Duncan's multiple range test

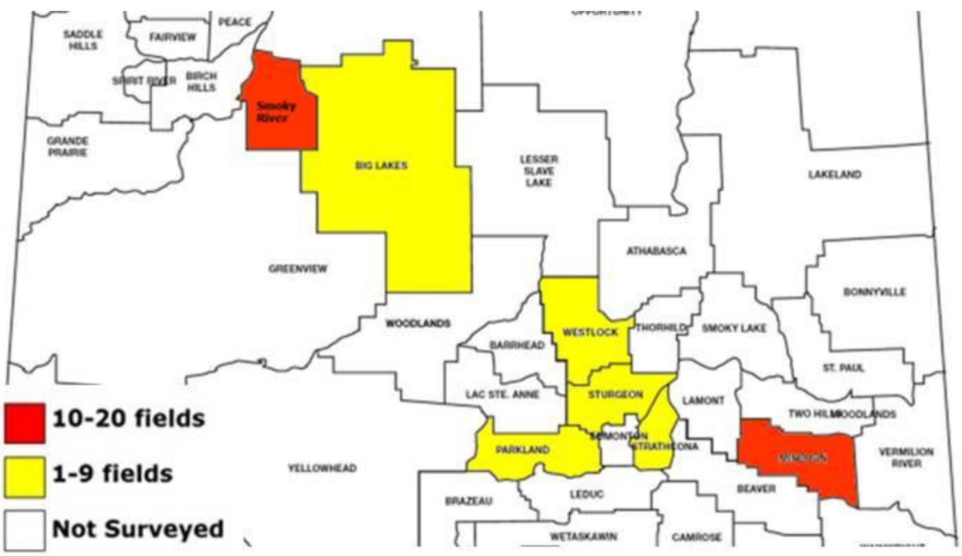

Figure 1. Counties surveyed in central Alberta for the occurrence of ascochyta blight of field pea and numbers of infested crops identified.

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 2009, 2010 AND 2011

METHODS: From July 15 to July 24, 2009, 37 commercial field pea crops were surveyed for the incidence and severity of downy mildew (*Peronospora viciae* L.) including 16 crops in the Mannville area, 12 in the Fort Saskatchewan area, and nine near Vermilion (Table 1). In 2010, three research crops and 18 commercial crops of pea were surveyed for the disease near Gibbons, Lacombe, Mannville and Namao in late June, mid-July and early August. In the same period of 2011, the surveys were conducted in three research crops at Lacombe and 27 commercial crops near Legal, Redwater and Mannville. Crops were surveyed at the early flowering or podding stage, by examining 20 plants within a 1 m^2 area at each of five locations along the arms of a 'W' sampling pattern in each field. Downy mildew severity was assessed in the top, middle and lower portion of each plant on a 0 to 3 scale, where 0 = no infection, 1 = less than 25% of the plant surface covered with mycelium, 2 = 25% to 50% of the plant area infected, and 3 = more than 50% of the plant surface infected. The incidence of disease in each field was calculated as: [Number of infected plants / Total of plants sampled within a field] × 100%. The final severity on each plant was determined following the scales designed by Chang et al. (3). To estimate the impact of downy mildew on seed yield, totals of 150 healthy or diseased plants were collected in a W-pattern from an infested crop near Mannville on July 27, 2010. Over 300 plants in infested commercial crops of pea were similarly sampled in the same pattern on September 2, 2010. Numbers of seeds per plant were recorded to estimate the yield of healthy and diseased plants.

RESULTS AND COMMENTS:
The weather in June 2009 was hotter and drier than in previous years, creating conditions that were not conducive for downy mildew infection. As such, downy mildew was not detected in that month. The disease began to develop, however, after four days of continuous rain in central and eastern Alberta in early July. Downy mildew was detected in 34 commercial pea crops visited, although severity varied from slight to severe among fields (Table 1). The most heavily infected crop, with a 100% incidence and a plant mortality of 26%, was located near Fort Saskatchewan. Yield losses in that crop from downy mildew infection were estimated at 20 - 25% after harvest (Mr. Mike Kalisvaart, farmer, *personal communication*). The disease incidence in three pea crops in the Vermillion area, nine crops near Mannville and one crop near Fort Saskatchewan was 100%. The highest average disease severity (3.3) occurred in a crop near Fort Saskatchewan. Overall, crops in the Mannville area had a higher average disease incidence and severity than those near Vermilion and Fort Saskatchewan.

In 2010, downy mildew was observed in all 21 pea crops surveyed. However, it was unevenly distributed in many of the fields (Table 2). Heavy infections occurred in pea crops near Namao, Mannville and Gibbons. At the Lacombe experimental site, pea line P0509-3382 was highly susceptible to downy mildew and conidia and aerial mycelia were observed on the adaxial surfaces of the leaves and stipules after a period of frequent and intense rains in July and August. The development of signs of the pathogen on the upper surfaces is not common under field conditions, and suggests conditions highly conducive for disease. Nevertheless, the majority of conidia and mycelia were produced on the abaxial surfaces. Large necrotic lesions formed on many infected leaves and stipules when weather conditions became hot and dry. These infected plants may have served as a source of inoculum for adjacent pea lines and cultivars. However, when the pea canopy closed, only the young terminal shoot tissue developed disease and the mature foliage appeared to be resistant. Among the 54 lines and cultivars tested in a nearby research field, 14 were infected, mostly on the shoots. Tendril infection was not included in the survey data due to the common occurrence of mycosphaerella blight (MB) on the tendrils as well. Once plants were infected with MB, fewer signs and symptoms of downy mildew were observed. At Namao, one crop was severely infected with downy mildew (100% incidence) by mid-June. Many systemically infected plants were stunted and died in late July. Approximately 20% of the plants exhibited tendril infections in early August. One large pea crop located near Mannville suffered 90% downy mildew infection of the shoots and some infection of pods. This is the first record of severe pod infection; it followed the release of abundant conidia during the flowering to early podding stages after frequent rain showers. In one field, where drift damage from the herbicide Frontline XL (florasulam + MCPA ester; 500mL/ac) was observed, the herbicide-damaged pea plants were severely stunted and had a higher incidence of downy mildew than plants growing further away from the herbicide source. Moderately severe downy mildew probably reduced yield by 50-75%. At Vermilion and Willingdon, pea plants in several fields had mild downy mildew infections ranging from 0 to 20% and from 0 to 10% incidence at the two locations, respectively. Disease severity in these areas, as well as at Lacombe, was low.

In 2011, with the prevalence of cool weather and frequent rain showers between July 8 and July 20, downy mildew spread rapidly in many fields and 13 infected crops were found (Table 3). Near Redwater, very mild infection was observed in early June, while near Mannville, over 90% of the crops in eight fields were severely infected by mid-June. In one field at Legal, the crop had 100% disease incidence with a very high rate of pod infection. Many diseased pea pods had a distorted and pale appearance. Later in the growing season, many shoots had become infected, resulting in short internodes and aborted flowers. As in 2010, pea line 0509-3382 was noted as the most susceptible to the disease at the Lacombe Research Centre. The yield of this line was very low, in part as a result of downy mildew infection. Mycosphaerella blight appeared on most of the pea crops surveyed in August. In a survey for MB conducted in 2011, some pea crops were also found to be infected with downy mildew, including 4 in Sturgeon County, 4 in Minburn County, 2 in Parkland County, 3 in Smoky River and 1 in High Prairie.

Overall, downy mildew was severe in some fields in central Alberta in 2009, 2010 and 2011, as was found in previous years (1, 2, 3). The disease remains a potential threat to pea yield in this region.

ACKNOWLEDGEMENTS:
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Table 1. Incidence and severity of downy mildew in 37 pea crops at three locations in central Alberta in 2009.

Location	No. fields surveyed	Incidence (%)		Severity (0-4)	
		Range	Mean	Range	Mean
Fort Saskatchewan	12	0 - 100	33.3	0 - 3.3	0.6
Mannville	16	45 - 100	85.8	0.5 - 2.7	1.6
Vermilion	9	25 - 100	76.3	0.3 - 2.4	1.5

Table 2. Incidence and severity of downy mildew in 21 pea crops at six locations in central Alberta in 2010.

Location	No. fields surveyed	Incidence (%)		Severity (0-4)	
		Range	Mean	Range	Mean
Gibbons	3	0 - 70	50.0	0 - 4	1.8
Lacombe	3	0 - 40	16.7	0 – 1.4	0.8
Mannville	7	0 - 100	47.9	0 - 4	1.5
Namao	3	0 - 100	33.3	0 - 4	1.0
Vermilion	3	0 - 20	9.7	0 - 1	0.6
Willingdon	2	0 - 10	6.2	0 - 1	0.6

Table 3. Incidence and severity of downy mildew in 30 pea crops at four locations in central Alberta in 2011.

Location	No. fields surveyed	Incidence (%)		Severity (0-4)	
		Range	Mean	Range	Mean
Lacombe	3	0 - 100	21.3	0 – 4.0	0.5
Legal	5	100	100	2.2 – 3.0	2.7
Mannville	13	0 - 100	59.5	0 – 3.0	1.4
Redwater	9	0 - 2	0.8	0 – 0.1	0.02

CROP: Pea
LOCATION: Saskatchewan

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TITLE: SEED-BORNE PATHOGENS OF PEA IN SASKATCHEWAN IN 2011

METHODS: Results were summarized from agar plate tests on seed samples from Saskatchewan conducted by three companies between September and mid-December 2011. The samples usually consisted of 200 seeds and were assumed to be predominantly from the 2010 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. It is unknown which of the seed samples came from pea crops that had been treated with registered seed treatments or foliar fungicides. In 2011 strobilurin fungicides were commonly sprayed on pea crops in Saskatchewan.

RESULTS AND COMMENTS: The 2011 growing season in Saskatchewan was characterized by average to well above average moisture levels in May and June followed by warm dry weather from mid-July to late September. Early flooding prevented seeding in many areas of southeast Saskatchewan, but all areas of the province experienced ideal harvest weather. Provincial pea yields averaged 9% above the 2010 figure and 13% above the 10-year average, although green pea yields generally declined (7). Crop quality and grade were also generally above average after a very early completion of harvest.

Although pea acreage declined in 2011 (7), the number of seed samples tested by the three companies was 301, similar to the number reported in 2010 (5) and more than in 2009 (4). For *Ascochyta* spp. the mean % seed infection and the % samples free of infection were calculated for each Saskatchewan crop district [CD] (7) (Table 1). However, this was not done for *Botrytis* and *Sclerotinia* because of low mean infection levels in all CDs. The majority of samples from all crop districts had 1% or less infection with either *Botrytis* or *Sclerotinia*.

Mean levels of seed-borne *Ascochyta* in individual crop districts from which at least 10 samples has been tested varied from 0.3 to 9.7% (Table 1). The mean provincial level of infection (3.0%) was much lower than in 2010 (5) but similar to 2009 (4) and other recent years (1, 2, 3, 6).The percentage of samples in which no *Ascochyta* was detected was 23%, much higher than the 4% in 2010 (5).This increase appears to be a reversal of 10-year downward trend noted in 2010 (5) and may relate to excellent harvest conditions in 2011 as well as increased foliar fungicide use on pea crops.

A separate set of samples of pea seed was used to compare the frequency of two *Ascochyta* spp. in CDs in Saskatchewan. For the 11th consecutive year (1, 2, 3, 4, 5, 6,) *A. pinodes* was the dominant species in central and northern CDs, while *A. pisi* was more commonly found in seed from southern areas (Table 2). However, as in 2010 (5), the geographic separation of species was less clear than observed in 2009 (4).

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Table 1. Number of pea seed samples tested from September to mid-December, 2011 by three 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	4.8	33
1B	1	0	100
2A	2	0.5	50
2B	20	0.3	75
3AN	5	1.0	40
3AS	35	1.5	26
3BN	15	1.4	27
3BS	4	1.1	50
4A	0	-	-
4B	4	3.0	0
5A	9	0.9	67
5B	4	4.3	0
6A	18	1.4	33
6B	87	3.2	20
7A	17	2.0	6
7B	23	5.6	4
8A	9	3.3	22
8B	13	3.7	8
9A	18	7.4	0
9B	14	9.7	9
TOTAL	301	3.0	23

Table 2. Mean levels of *Ascochyta pinodes* and of *Ascochyta pisi* in pea seed samples tested from September 2011 to March 2012 by one commercial company in relation to Saskatchewan Crop Districts

Crop district	**Mean % infection with *Ascochyta pinodes***	**Mean % infection with *Ascochyta pisi***
1A	-	-
1B	-	-
2A	-	-
2B	0.4*	0.2*
3AN	0.6*	0.6*
3AS	0.2	1.1
3BN	1.1	0.6
3BS	0*	0.4*
4A	0*	2.0*
4B	1.0*	1.9*
5A	0.5*	0.3*
5B	1.6	0.1
6A	1.5	0.2
6B	3.1	0.4
7A	2.9	0.6
7B	6.2	0.2
8A	5.0	0.4
8B	3.7	0.3
9A	7.6	0.4
9B	6.4	0.4
OVERALL	3.5	0.4

* Based on fewer than 10 samples

CROP: Field pea
LOCATION: Manitoba

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TITLE: FIELD PEA DISEASES IN MANITOBA IN 2011

METHODS: Field pea crops were surveyed for root and foliar diseases at 24 and 23 different locations, respectively, in Manitoba. The crops surveyed were randomly chosen from regions in south-central and southwest Manitoba, where field pea is commonly grown. May and June were extremely wet in Manitoba, and seeded field pea area in the province was estimated to be reduced by 56% from the previous year. Many grower contacts in the SW region of Manitoba were not able to seed at all.

The survey for root diseases was conducted from late June to the third week of July when most plants were at the mid- to late flowering stage. At least ten 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). To confirm the visual disease identification, 15 to 20 symptomatic roots were collected per field for isolation of fungi in the laboratory. *Fusarium* species were identified based on the methods of Nelson et al. (1983). Foliar diseases were assessed during late July and early August when most plants were at the round pod stage. A minimum of 30 plants (10 plants at 3 sites) was assessed in each field. Foliar diseases were identified by symptoms. The severity of foliar diseases observed was estimated using a scale of 0 (no disease) to 9 (whole plant severely diseased). Powdery mildew and downy mildew severity were rated as the percentage of foliar area infected.

RESULTS AND COMMENTS: Three diseases were observed during the survey for root diseases (Table 1). Fusarium root rot *(Fusarium solani* f. sp. *pisi and F. avenaceum*) was the most prevalent and was observed in all crops surveyed, as in previous years (McLaren et al. 2010, 2011). *Fusarium avenaceum* was more frequently isolated from symptomatic roots than *F. solani* f. sp. *pisi* in 2009, 2010 and 2011. Rhizoctonia root rot (*Rhizoctonia solani*) was detected in five crops. In 2011, wet soils and cool conditions early in the season favoured root rot development and resulted in higher average root rot severity ratings than in 2010. Nine pea crops had average root rot severity ratings above 4 (i.e. symptoms were present on 50% of the root system and seedling growth was retarded) and this would have had a detrimental effect on crop yield. Fusarium wilt (*F. oxysporum*) was also detected in 24 crops during the survey for root diseases.

Four foliar diseases were observed (Table 2). Mycosphaerella blight (*Mycosphaerella pinodes*) was the most prevalent, as in previous years (McLaren et al. 2010, 2011), and was present in all crops surveyed. Sclerotinia stem and pod rot (*Sclerotinia sclerotiorum*) was detected in eight crops at trace levels. The prevalence of sclerotinia-infested crops was 88% in 2010 (McLaren et al. 2011) compared with 26% in 2011. Warm, dry weather prevailed in July and August of 2011 and reduced the risk of development of stem and pod rot. Downy mildew (*Peronospora viciae*) was detected in 13% of the fields surveyed with a mean disease severity of 0.1. Anthracnose (*Colletotrichum pisi*) was found in six crops with a mean disease severity rating of 0.2. Powdery mildew (*Erysiphe pisi*) was not observed in any of the surveyed fields. Because all newly registered pea cultivars are required to have resistance to powdery mildew, the absence of this disease can be attributed, in part, to the use of new cultivars by growers. However, powdery mildew was observed very late in the growing season on a few susceptible lines at AAFC-Morden, which suggests that there may have been crops that developed powdery mildew after the date of the disease survey. Other foliar diseases, such as septoria blotch (*Septoria pisi*) and bacterial blight (*Pseudomonas syringae* pv. *pisi*) were not observed in the surveyed crops.

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Table 1. Prevalence and severity of root diseases in 24 crops of field pea in Manitoba in 2011.

		Disease severity (0-9)[1]	
Disease	**No. crops affected**	**Mean**	**Range**
Fusarium root rot	24	3.6	1.3-6.6
Rhizoctonia root rot	5	4.4	3.2-6.4
Fusarium wilt	24	n/a	n/a

[1]All diseases were rated on a scale of 0 (no disease) to 9 (death of plant). Mean values are based only on crops in which the disease was observed.

Table 2. Prevalence and severity of foliar diseases in 23 crops of field pea in Manitoba in 2011.

		Disease severity (0-9)[1]	
Disease	**No. crops affected**	**Mean**	**Range**
Mycosphaerella blight	23	3.5	2.0-5.5
Sclerotinia stem rot	8	0.1	<0.1-0.2
Powdery mildew	0	0	0
Downy mildew	4	0.1	0-0.3
Anthracnose	6	0.2	<0.1-1.0

[1]Powdery and downy mildew severity were 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). Mean values are based only on crops in which the disease was observed.

CROP: Sunflower
LOCATION: Manitoba

NAMES AND AGENCY:
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TITLE: DISEASES OF SUNFLOWER IN MANITOBA IN 2011

METHODS: A total of 11 sunflower crops were surveyed in 2011 in Manitoba. Sixty-seven percent were confectionery hybrids and 33% were oilseed hybrids, an increase in the oilseed acreage in 2011 in comparison with previous years (1, 2, 3). Four crops were surveyed in mid-August, four in late August, and three in the first week of September. The 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 to each other 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 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, seven 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: Eighty-two percent of the sunflower crops surveyed in 2011 had excellent to good stands and vigour, while the rest had fair to poor stands and vigour. Forty-six percent of the crops were maturing early, and only 27% maturing very late (Table 1). The 2011 growing season started with high soil moisture conditions and local flooding in many fields that resulted in a record low area of sunflower seeded especially in Manitoba (total sunflower area 15,000 ha mostly in MB, according to Statistics Canada). Above normal temperatures and below normal precipitation in August probably contributed to the early maturity and low yield in some crops in spite of the low incidence and severity of the various sunflower diseases. Traces of infestation with the sunflower beetle (*Zygogramma exclamationis*) were observed in a few crops. Infestations at trace to 5% levels with sunflower midge (*Contarinia schulzi*) were encountered in 64% of the crops. Traces of infestation with aphids were observed in 18% of the crops.

Sclerotinia wilt was present in 46% of the crops surveyed in 2011 with incidence ranging from trace to 1% infected plants (Table 1). Sclerotinia head rot and mid-stem infection, caused by ascospore infections, were observed at trace levels in a few crops surveyed in the first week of September. The prevalence and incidence of head rot in 2011 were at a record low compared with the 10 previous years (1, 2, 3, 4).

Rust was present in 46% of the crops surveyed, with severity ranging from trace to 5% leaf area affected (Table 1). Preliminary analysis of rust isolates collected indicates the prevalence of race-group 700 including mostly Race 726, which is virulent on most commercial sunflower hybrids. Rust infections started relatively late in 2011 and did not develop rapidly in most of the crops surveyed. Rust incidence and severity in 2011 were also at a record low in 2011 compared with recent years (1, 2, 3), probably due to late onset of infection and the above-normal temperatures and dry weather in August.
Verticillium wilt was present in 64% of the crops surveyed, with incidence ranging from trace to 10% (Table 1). Incidence was higher in 2011 than in 2010 but similar to 2009 and previous years (1, 2, 3).

Downy mildew was the most prevalent disease in sunflower in 2011, and was observed in 82% of crops with incidence ranging from trace to 10% (Table 1). Preliminary analysis of the isolates collected indicates the predominance of races 730, 720, 700, and 330. Fifty percent of the downy mildew isolates collected in 2011 are insensitive to metalaxyl seed treatment. Downy mildew was more prevalent in 2011 than in the previous years due perhaps to the above normal soil moisture conditions at the seedling stage but the severity was lower in 2010 than in previous years (1, 2, 3)

Traces to 5% leaf area infected by *Septoria helianthi* and *Alternaria* spp. were observed in a few crops surveyed in 2011 (Table 1). These are lower severity and prevalence values than in previous years (1, 2, 3). Traces to 5% of stem lesions caused by *Phoma* and *Phomopsis* spp. were present in a few crops.

Of the seven samples submitted to the Manitoba Crop Diagnostic Centre, two were identified as infected with downy mildew, two with sclerotinia head rot, two with sclerotinia stem rot, one with verticillium wilt, and two with chemical injury.

ACKNOWLEDGMENTS: The technical assistance of Tricia Cabernel, Maurice Penner, and Jamie Carlson is gratefully acknowledged.

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Table 1. Prevalence and index of diseases in 11 crops of sunflower in Manitoba in 2011.

Disease	Crops Affected		Disease Index[1]	
	No. of crops	% of crops	Mean	Range
Sclerotinia wilt	5	46%	0,5	T –1
Sclerotinia head rot/stem rot	3	27%	0.5	T
Verticillium wilt	7	64%	1.1	T – 3
Downy mildew	9	82%	1.1	T – 2
Rust	5	46%	0.5	T – 1
Leaf spots (Septoria & Alternaria)	1	9%	0.5	T
Lateness[2]	3	27%	2.6	1 – 4
Stand	2	18%	1.9	1 – 3
Vigour	2	18%	2.6	1 – 4

[1] Disease index on a scale of T to 5: T (Trace) = < 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 % 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: Carrot
LOCATION: Bradford/Holland Marsh, Ontario

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TITLE: DISEASES AND PHYSIOLOGICAL DISORDERS OF CARROTS IN THE HOLLAND/ BRADFORD MARSH, ONTARIO, IN 2011

INTRODUCTION AND METHODS: A survey of carrot for the presence of diseases and physiological damage was conducted in late August and September 2011 when the harvest season for early and late carrots respectively started in the Bradford/Holland Marsh, Ontario. The survey was conducted as part of the Integrated Pest Management program of the Muck Crops Research Station, University of Guelph in order to identify and quantify root damage caused by pathogens, environmental conditions and insect pests. One hundred carrots were randomly collected from five sites (20 per site) of each of the 32 commercial carrot farms surveyed. Tops were removed and the carrot roots were immediately placed into a cold storage facility (0^oC; 95% relative humidity) for 4-7 weeks prior to evaluation. Carrot roots were washed and assessed for diseases in mid October 2011. Diseases and physiological damage were identified by visual symptoms.

RESULTS AND COMMENTS: Weather conditions in the 2011 growing season were conducive for most pathogens including species of *Pythium*, *Sclerotinia and Rhizoctonia.* Total monthly rainfall was below the previous long term (10-year) average in June and July, average in September, and above average in May and August and likely resulted in excessive soil moisture. The excessive soil moisture, especially in August, in turn created ideal conditions for soil borne pathogens, particularly *Pythium*, resulting in a high incidence of cavity spot and pythium root dieback. All 32 carrot fields surveyed showed pythium root dieback and cavity spot.

Carrots in 15 (47%) of the fields sampled had crown gall (*Agrobacterium tumefaciens*) with disease incidence ranging from 1 to 26%. Fusarium rot (*Fusarium* spp.) was found on carrots from one field with an incidence of 1%. Sclerotinia rot (*Sclerotinia sclerotiorum*) was not found on carrots sampled; however, the weather conditions were ideal for sclerotinia rot development and the disease was observed in carrot fields around the Holland/Bradford Marsh.

Crater rot (*Rhizoctonia carotae*) was found in three of the 32 carrot fields surveyed, which was less than the 11 fields (46%) of those surveyed in 2010 (Tesfaendrias and McDonald 2011). No aster yellows was found in carrots from the surveyed fields, which coincided with a very low infestation of aster leaf hoppers during the growing season (personal observations).

Carrot roots from 86% of the fields surveyed showed splitting (growth cracks) which most likely resulted from fluctuating moisture levels during the growing season. Forking of carrots was observed in 97% of the fields surveyed with incidence ranging from 1 to 36%. The incidence of splitting and forking was higher on carrots surveyed in 2011 than in 2010 (Tesfaendrias and McDonald 2011). This increased incidence of splitting and forking may in turn affect marketable yield of the fresh market type of carrot.

REFERENCE:

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Table 1. Disease incidence on carrot samples collected from commercial fields in the Bradford/Holland Marsh, Ontario in 2011.

Disease	Mean incidence (%) (n = 32)	Fields affected
Cavity spot	17.8	32
Pythium root dieback	5.3	32
Crown gall	1.4	15
Crater rot	0.1	3
Fusarium rot	0.03	1
Sclerotinia rot	0.0	0
Aster yellows	0.0	0
Forking	6.2	31
Splitting (Growth cracks)	3.8	28

LIST OF CPDS AUTHORS IN ALPHABETICAL ORDER

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