2013

THE CANADIAN PHYTOPATHOLOGICAL SOCIETY

CANADIAN PLANT DISEASE SURVEY

DISEASE HIGHLIGHTS

SOCIÉTÉ CANADIENNE DE PHYTOPATHOLOGIE

INVENTAIRE DES MALADIES DES PLANTES AU CANADA

APERÇU DES MALADIES

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

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

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Canadian Plant Disease Survey

Inventaire des maladies des plantes au Canada

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Contents: **DISEASE HIGHLIGHTS** - 2012 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

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

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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FOREST TREES/ARBRES FORESTIERS

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 2012.

ABSTRACT: The British Columbia Ministry of Agriculture Plant Health Laboratory provides diagnoses and disease management information for diseases of crops in British Columbia. In 2012, the laboratory received 1001 samples of Christmas trees, field crops, greenhouse vegetable and floriculture crops, herbaceous and woody ornamentals, fruit and specialty crops. New disease detections for B.C. included stem rot (*Colletotrichum dracaenophilum*) in *Dracaena sanderiana,* corm rot (*Ceratocystis fimbriata*) in indoor *Ficus microcarpa*, stem rot (*Pythium splendens*) and stem canker (*Lasiodiplodia theobromae*) in pachira and downy mildew (*Peronospora belbahrii*) in basil. Boxwood blight (*Cylindrocladium buxicola*) was a predominant issue in the ornamental industry. These detections were confirmed by molecular tests.

METHODS: The British Columbia Ministry of Agriculture (BCMAGRI), 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 reflects 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 (Polymerase chain reaction (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 2012 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 1001 samples between January and November. Summaries of diseases and their causal agents diagnosed on crop samples submitted to the laboratory are presented in Tables 1-12 listed 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 disorders 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 causal factor was conclusively identified.

Table 1.0 Summary of diseases diagnosed on **woody ornamental** samples submitted to the BCMAGRI Plant Health Laboratory in 2012

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Acer	Anthracnose	*Discula* sp.	3
		Kabatiella apocrypta	1
	Powdery mildew	*Sawadaea tulasnei*	1
	Stem canker	*Phomopsis* sp.	1
	Verticillium wilt	*Verticillium dahliae*	2
Acer palmatum	Stem canker	*Phoma* sp.	1
Acer saccharum	Anthracnose	*Discula* sp.	1
Acer tartarian		*Discula* sp.	1
Alnus rubra	Rust	*Melamsporidium* sp.	1
Betula	Crown rot	*Phytophthora* sp.	1
	Root rot	Oomycete and *Rhizoctonia* sp.	1
		Rhizoctonia solani	1
Buxus	Boxwood blight	*Cylindrocladium buxicola**	6
	Branch dieback	*Colletotrichum* sp.	1
	Foliar blight	*Clonostachys* sp.	4
	Volutella blight	*Volutella buxi*	20
	Leaf spot	*Phyllosticta* sp.	1
	Root rot	*Phytophthora* sp.	1
	Stem canker	*Nectria* sp.	1
Cornus	Anthracnose	*Discula destructiva*	1
	Root rot	*Phytophthora* sp.	1
Cotoneaster	Bacterial blight	*Pseudomonas syringae*	1
	Fire blight	*Erwinia amylovora*	1
Crataegus	Fire blight	*Erwinia amylovora*	1
Daphne	Root rot	*Thielaviopsis basicola*	1
Euonymus	Root rot	*Thielaviopsis basicola*	1
Hydrangea	Root rot	*Pythium* sp.	1
Juniperus	Twig blight	*Lophodermium* sp. and *Monochaetia* sp.	1
		Lophodermium sp.	1
Laurel	Foliar anthracnose	*Gloeosporium* sp.	1
Lonicera	Bacterial blight	*Pseudomonas syringae*	1
Malus	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	4
	Leaf spot	*Alternaria alternata*	1
Oleaster	Stem canker	*Cytospora* sp.	1
Picea	Needle blight	*Rhizosphaera kalkhoffii*	1
	Sirococcus blight	*Sirococcus* sp.	1
Pinus	Needle cast	*Lophodermium* sp.	1
Populus	Foliar blight	*Venturia populina*	1
	Leaf blight	*Alternaria* sp. and *Cladosporium* sp.	1

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Populus	Leaf spot	*Marssonina* sp.	1
		Phyllosticta sp.	1
	Shoot blight	*Venturia populina*	3
Prunus	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	8
	Botrytis blight	*Botrytis cinerea*	2
	Brown rot	*Monilinia* sp.	1
	Leaf spot	*Discosia* sp.	1
	Phomopsis canker	*Phomopsis* sp.	1
	Shot hole	*Wilsonomyces carpophilus*	1
	Stem canker	*Phomopsis* sp.	1
Pseudotsuga menziesii	Seedling root rot	*Fusarium sporotrichiodes*	2
Rhododendron	Phomopsis dieback	*Phomopsis* sp.	1
Robinia	Branch dieback	*Phomopsis* sp.	1
	Stem canker	*Coniothyrium* sp.	1
Rosa	Black spot	*Diplocarpon rosae*	1
	Botrytis canker	*Botrytis cinerea*	2
	Stem canker (dieback)	*Phomopsis* sp.	1
Rubus	Leaf spot	*Septoria* sp.	1
	Root rot	*Pythium* sp.	1
Salix	Anthracnose	*Colletotrichum gloeosporioides*	1
	Cytospora canker	*Cytospora* sp.	1
Salix matsudana	Black canker	*Glomerella miyabeana*	1
	Branch canker	*Diatrypella* sp.	1
	Leaf scab	*Venturia saliciperda*	1
Salix tortuosa	Stem canker	*Cryptodiaporthe* sp.	1
		Cytospora sp.	1
Sambucus racemosa	Phomopsis dieback	*Phomopsis* sp.	1
Sorbaria	Leaf spot	*Phyllosticta* sp.	1
Stewartia pseudocamellia	Branch dieback	*Phomopsis* sp.	1
Syringa	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	3
	Root rot	*Phytophthora* sp.	1
Taxus	Leaf blight	*Macrophoma* sp.	4
	Root rot	*Phytophthora* sp.	1
	Twig blight	*Pestalotiopsis* sp.	1
Taxus hicksii	Root rot	Oomycete	1
	Root rot	*Phytophthora* sp.	1
Thuja	Canker	*Diaporthe /Phomopsis* sp.	1
	Root rot	*Phytophthora* sp.	3
	Root rot	Oomycete	1
	Seiridium blight	*Seiridium* sp.	1
	Tip dieback	*Cladosporium* sp.	1

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Thuja	Twig blight	*Phomopsis* sp.	1
Tilia flavescens	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	1
Tsuga mertensiana	Foliar blight	*Sclerophoma* sp.	1
	Sirococcus blight	*Sirococcus strobilinus*	1
Ulmus	Stem canker	*Nectria* sp.	1
Viburnum	Bacterial blight	*Pseudomonas syringae*	2
Viburnum opulus	Anthracnose	*Colletotrichum acutatum*	1

Note * Boxwood blight caused by *Cylindrocladium buxicola* was the predominant disease issue in the ornamental industry in B.C. All infected boxwoods (*Buxus* spp.) have been destroyed and monitoring continues.

DISEASED SAMPLES	137
ABIOTIC AND OTHER DISORDERS	111
TOTAL SUBMISSIONS	248

Table 2.0 Summary of diseases diagnosed on **tree fruit** samples submitted to the BCMAGRI Plant Health Laboratory in 2012.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Apple	Anthracnose	*Cryptosporiopsis curvispora*	1
	European canker	*Nectria galligena*	1
	Phomopsis canker	*Phomopsis* sp.	1
Cherry	Bacterial canker	*Pseudomonas syringae* pv. *syringae*	2
	Cytospora canker	*Leucostoma* sp.	1
	Fruit rot	*Botrytis cinerea*	1
	Mottle leaf	*Cherry mottle leaf virus*	1
	Stem canker	*Cytospora* sp.	1
Grape	Botrytis blight	*Botrytis cinerea*	1
	Powdery mildew	*Uncinula necator*	1
Nectarine	Brown rot	*Monilinia* sp.	1
	Coryneum blight	*Wilsonomyces carpophilus*	1
	Cytospora canker	*Cytospora* sp.	1
Peach	Root rot	*Phytophthora* sp.	1
Pear	Pear trellis rust	*Gymnosporangium fuscum*	1
	Stony pit	*Apple stem pitting virus* variant 1 (confirmed by CFIA)	4
Quince	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	1
	Leaf spot	*Entomosporium* sp.	1

DISEASED SAMPLES	20
ABIOTIC AND OTHER DISORDERS	08
TOTAL SUBMISSIONS	28

Table 3.0 Summary of diseases diagnosed on **field vegetable** samples submitted to the BCMAGRI Plant Health Laboratory in 2012.

CROP	**DISEASE/DISORDER**	**CAUSAL/ASSOCIATED ORGANISM**	**No.**
Beet	Root rot	*Phoma betae*	2
Broccoli	Damping off	*Pythium* sp.	1
Cabbage	Club root	*Plasmodiophora brassicae*	2
Cabbage	Damping off	*Rhizoctonia solani*	1
Carrot	Cottony rot	*Sclerotinia sclerotiorum*	1
Cucumber	Damping off	*Pythium* sp.	1
Eggplant	Early blight	*Alternaria solani*	1
	Verticillium wilt	*Verticillium dahliae*	1
Garlic	Embellisia skin blotch	*Embellisia allii*	1
	Leaf streak	*Pseudomonas syringae* pv. *syringae*	1
	White rot	*Sclerotium cepivorum*	3
Parsnip	Leaf blight	*Ramularia* sp.	1
Pea	Fusarium root rot	*Fusarium solani*	1
	Root rot	*Pythium ultimum*	1
Pepper	Root rot	*Phytophthora* sp.	1
		Pythium sp.	1
Potato	Black scurf	*Rhizoctonia solani*	1
	Fusarium dry rot	*Fusarium* sp.	1
		Fusarium sambucinum	1
	Leaf spot	*Botrytis cinerea*	1
	Powdery scab	*Spongospora* sp.	1
Pumpkin	Root rot	*Phytophthora* sp.	1
		Pythium sp.	1
	Seedling rot	*Phytophthora* sp.	3
Rhubarb	Nematode contribution	*Pratylenchus* sp.	3
Soil – Cole crops	Club root	*Plasmodiophora brassicae*	3
Squash	Fruit rot	*Fusarium* sp.	1
Swiss Chard	Leaf spot	*Botrytis cinerea*	1
Tomato	Bacterial canker	*Clavibacter michiganensis* ss. *michiganensis*	1
	Bacterial speck	*Pseudomonas syringae* pv. *tomato*	5
	Deformed leaves	*Tobacco mosaic virus*	1
	Powdery mildew	*Oidium* sp.	1
	Stem canker	*Alternaria alternata*	1
	Stem rot	*Pythium* sp.	1
Zucchini	Chlorotic leaves	*Potyvirus* group	1
	Fusarium wilt	*Fusarium oxysporum*	1

DISEASED SAMPLES	50
ABIOTIC AND OTHER DISORDERS	23
TOTAL SUBMISSIONS	73

Table 4.0 Summary of diseases diagnosed on **greenhouse floriculture** samples submitted to the BCMAGRI Plant Health Laboratory in 2012.

CROP	**DISEASE/DISORDER**	**CAUSAL/ASSOCIATED ORGANISM**	**No.**
Alstroemeria	Necrotic leaf spot	*Impatiens necrotic spot virus*	1
Begonia	Necrotic leaf spot	*Impatiens necrotic spot virus*	1
Calamagrostis	Anthracnose	*Colletotrichum graminicola*	1
Chrysanthemum	Chlorosis/mottled leaves	*Tomato spotted wilt virus*	3
	Root rot	*Rhizoctonia solani*	1
Clarkia amoena	Botrytis blight	*Botrytis cinerea*	1
	Leaf spot	*Discosia* sp.	1
Dahlia	White mold	*Sclerotinia sclerotiorum*	1
Dipladenia	Stem canker	*Botrytis cinerea*	1
Dracaena	Leaf spot	*Colletotrichum gloeosporioides*	2
Dracaena sanderiana	Anthracnose	*Colletotrichum dracaenophilum*	2
Ficus microcarpa	Corm canker	*Ceratocystis fimbriata**	1
	Leaf spot	*Cladosporium* sp.	1
	Leaf spot	*Colletotrichum* sp.	1
	Stem canker	*Bionectria ochroleuca*	1
Helianthus	White smut	*Entyloma polysporum*	1
Hosta	Hosta Virus X	*Hosta virus X*	3
Impatiens	Leaf spot	*Botrytis cinerea*	1
Mandevilla	Root rot	*Thielaviopsis basicola*	1
Ophiopogon	Root rot	*Phytophthora* sp.	1
Oxalis	Root rot	*Pythium* sp. and *Thielaviopsis basicola*	1
Pachira	Stem canker	*Lasiodiplodia theobromae**	1
	Stem rot	*Pythium splendens**	1
Phlox subulata	Root rot	*Thielaviopsis basicola*	1
Populus	Root rot	*Pythium* sp.	1
Schefflera	Root rot	*Fusarium solani*	1
Tradescantia	Leaf blight	*Botrytis cinerea*	1
Yucca	Stem rot	*Fusarium solani*	1
Zinnia	Botrytis blight	*Botrytis cinerea*	1

***** Note first detections for B.C. on Pachira and on *Ficus microcarpa* were from the same indoor tropical plant operation**.**

DISEASED SAMPLES 35
ABIOTIC AND OTHER DISORDERS 31
TOTAL SUBMISSIONS 66

Table 5.0 Summary of diseases diagnosed on **Christmas tree** samples submitted to the BCMAGRI Plant Health Laboratory in 2012.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Abies grandis	Needle rust	*Milesian laeviuscula*	1
		Uredinopsis sp.	2
Pseudotsuga menziesii	Needle blight	*Rhizosphaera kalkhoffii*	2

DISEASED SAMPLES 5
ABIOTIC AND OTHER DISORDERS 1
TOTAL SUBMISSIONS 6

Table 6.0 Summary of diseases diagnosed on f**ield crop** samples submitted to the BCMAGRI Plant Health Laboratory in 2012.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Barley	Covered smut	*Ustilago hordei*	1
	Seedling blight /root rot	*Bipolaris sorokiniana*	1
	Septoria leaf blotch	*Septoria* sp.	1
	Spot blotch	*Bipolaris sorokiniana*	1
Spelt	Dwarf bunt	*Tilletia controversa*	6*
Wheat	Black sooty mold	*Cladosporium* sp. and *Alternaria* sp.	1

***** Note all samples from a known infested area in the interior of British Columbia

DISEASED SAMPLES 11
ABIOTIC AND OTHER DISORDERS 01
TOTAL SUBMISSIONS 12

Table 7.0 Summary of diseases diagnosed on **greenhouse vegetable** samples submitted to the BCMAGRI Plant Health Laboratory in 2012.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Cucumber-org*	Leaf puckering and chlorosis	Potyvirus	2
Lettuce	Downy mildew	*Bremia lactucae*	1
Pepper	Fruit spot	*Impatiens necrotic spot virus*	1
	Internal fruit rot	*Fusarium lactis*	1
Pepper-org*	Malformed fruit	*Tobacco mosaic virus/Tomato mosaic virus*	2
Tomato	Infected seeds	*Tobacco mosaic virus*	1
	Leaf distortion	*Tobacco mosaic virus*	2
Tomato-org*	Root rot	*Phytophthora cryptogea*	1
		Pythium irregulare complex	1
	Bacterial canker	*Clavibacter michiganensis* ss. *michiganensis*	2
	Verticillium wilt	*Verticillium dahliae*	1
	Leaf mosaic	*Tobacco mosaic virus/Tomato mosaic virus*	3

* Note crops from organic greenhouse operation

DISEASED SAMPLES 18
ABIOTIC AND OTHER DISORDERS 10
TOTAL SUBMISSIONS 28

Table 8.0 Summary of diseases diagnosed on **nut crop** samples submitted to the BCMAGRI Plant Health Laboratory in 2012.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Hazelnut	Eastern filbert blight	*Anisogramma anomala*	1
Walnut	Leaf spot/anthracnose	*Colletotrichum gloeosporioides*	1

DISEASED SAMPLES 2
ABIOTIC AND OTHER DISORDERS 2
TOTAL SUBMISSIONS 4

Table 9.0 Summary of diseases diagnosed on **herbaceous perennial** samples submitted to the BCMAGRI Plant Health Laboratory in 2012.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Calamagrostis	Anthracnose	*Colletotrichum graminicola*	1
Caragana	Root rot	*Thielaviopsis basicola*	1
Clematis	Root rot	*Pythium* sp.	1
Erica	Grey mold	*Botrytis cinerea*	1
Fargesia nitida	Leaf blight	*Alternaria* sp.	2
Lyonia	Branch death	*Phomopsis* sp.	1
Lyonia ovalifolia	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	1
Pennisetum	Take-all-patch	*Gaeumannomyces graminis*	1
Phlox	Leaf spot	*Cladosporium* sp., *Botyris cinerea*	1
Pittosporum	Root rot	*Pythium* sp.	1

DISEASED SAMPLES 11
ABIOTIC AND OTHER DISORDERS 07
TOTAL SUBMISSIONS 18

Table 10.0 Summary of diseases diagnosed on **small fruit (berry crop)** samples submitted to the BCMAGRI Plant Health Laboratory in 2012.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Blackberry	Downy mildew	*Peronospora sparsa*	2
	Purple blotch	*Septocyta ruborum*	3
Blueberry	Anthracnose	*Colletotrichum acutatum*	2
	Armillaria root rot	*Armillaria nabsnona*	2
		Armillaria ostoyae	1
		Armillaria sp.	2
	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	6
	Blueberry Scorch Virus	*Blueberry scorch virus*	6
	Blueberry Shock Virus	*Blueberry shock virus*	7
	Botrytis blight/tip dieback	*Botrytis cinerea*	13
	Branch canker	*Coryneum* sp.	1

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Blueberry	Coniothyrium canker	*Coniothyrium* sp.	1
	Crown damage	*Phomopsis* sp. and *Coniothyrium* sp.	1
	Crown gall	*Agrobacterium tumefaciens*	1
	Branch dieback and silvery leaves	*Phomopsis* sp.	1
	Fruit rot	*Colletotrichum acutatum* and *Botrytis cinerea*	1
	Godronia canker	*Godronia cassandrae*	4
	Leaf spot	*Botrytis cinerea*	2
		Gloeosporium sp.	1
		Septoria sp.	1
	Mummy berry	*Monilinia vaccinii-corymbosi*	5
	Nematode contribution	*Paratrichodorus* sp.	1
		Paratrichodorus sp. and *Xiphinema* sp.	1
		Pratylenchus sp.	3
		Pratylenchus crenatus	1
	Phomopsis canker	*Phomopsis* sp.	16
	Root rot	*Phytophthora* sp.	9
Cranberry	Bitter rot	*Colletotrichum gloeosporioides*	1
	Blotch rot	*Physalospora vaccinii*	3
	Cotton ball	*Monilinia oxycocci*	1
	Leaf spot	*Allantophomopsis* sp. and *Godronia* sp.	1
		Allantophomopsis sp. and *Macrophoma* sp.	2
		Botryosphaeria sp.	1
		Godronia sp.	4
		Macrophoma sp.	3
		Godronia sp. and *Macrophoma* sp.	1
	Nematode contribution	*Pratylenchus* sp.	2
	Red leaf spot	*Exobasidium* sp.	2
	Ripe rot	*Coleophoma* sp.	2
	Stem canker	*Diapleella* sp.	1
	Upright dieback	*Phomopsis* sp.	4
Raspberry	Ascospora dieback	*Seimatosporium* sp.	1
	Cane canker	*Botryodiplodia* sp.	2
	Cane blight	*Coniothyrium* sp.	15*
	Crown gall	*Agrobacterium tumefaciens*	12*
	Cytospora sp.	*Cytospora* sp.	1
	Fire blight	*Erwinia amylovora*	1
	Nematode contribution	*Pratylenchus* sp.	9
	Nematode damage	*Pratylenchus* sp. and *Xiphinema* sp.	3
	Stem lesions	*Phomopsis* sp.	1
	Root rot	*Cylindrocarpon* sp.	23*
		Fusarium sp	13*

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Raspberry	Root rot	*Phytophthora* sp.	14
		Pythium sp.	2
Strawberry	Black root rot complex	Multiple fungi	1
	Nematode contribution	*Pratylenchus* sp.	4
		Tylenchorhynchus sp.	1
	Root rot	*Phytophthora* sp.	1
		Rhizoctonia sp.	3
	Verticillium wilt	*Verticillium* sp.	

***** Note these results are part of a survey conducted by a local researcher. Extensive sampling was done in two fields where plant health was declining and Verticillium wilt was thought to be the cause. No Verticillium wilt was detected in 48 samples collected from two varieties grown in two different farms.

DISEASED SAMPLES 253
ABIOTIC AND OTHER DISORDERS 156
TOTAL SUBMISSIONS 409

Table 11.0 Summary of diseases diagnosed on **specialty crop** samples submitted to the BCMAGRI Plant Health Laboratory in 2012.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Basil	Botrytis blight	*Botrytis cinerea*	1
	Downy mildew	*Peronospora belbahrii**	3
Dill	Foliar blight	*Alternaria* sp.	1
	Foliar blight	*Itersonilia perplexans**	1
Lavender	Bacterial blight	*Pseudomonas syringae*	1
Mentha	Foliar nematode	*Aphelenchoides* sp.	1
Oregano	Stem canker	*Botrytis cinerea*	1
Rice (Saki)	Basal/root rot	*Fusarium proliferatum**	1
	Leaf spot	*Alternaria* sp.	1
	Leaf spot	*Alternaria sp., Ascochyta* sp. and *Cercospora* sp.	1
Tarragon	Rust	*Puccinia tanaceti* var. *dracunculina*	1

* Note first detections in British Columbia

DISEASED SAMPLES 13
ABIOTIC AND OTHER DISORDERS 04
TOTAL SUBMISSIONS 17

Table 12.0 Summary of diseases diagnosed on **golf course, sports fields and lawn** samples submitted to the BCMAGRI Plant Health Laboratory in 2012.

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Greens	Algae	Algae	1
	Anthracnose	*Colletotrichum graminicola*	2
	Brown patch	*Rhizoctonia solani*	1

CROP	DISEASE/DISORDER	CAUSAL/ASSOCIATED ORGANISM	No.
Greens	Leaf spot	*Leptosphaerulina* sp.	1
	Nematode contribution	*Helicotylenchus* sp.	1
		Helicotylenchus sp., *Meloidogyne* sp. and *Mesocriconema* sp.	1
Greens	Nematode contribution	*Meloidogyne* sp.	2
	Nematode damage	*Helicotylenchus* sp., *Meloidogyne* sp. and *Paratylenchus* sp.	10
	Nematode damage	*Helicotylenchus* sp. and *Meloidogyne* sp.	3
		Meloidogyne sp.	2
		Meloidogyne sp. and *Paratrichodorus* sp.	1
	Pythium root rot	*Pythium* sp.	8
	Yellow patch	*Rhizoctonia cerealis*	1
Lawn	Basal anthracnose	*Colletotrichum graminicola*	1
	Brown patch	*Rhizoctonia solani*	1
	Nematode damage	*Helicotylenchus* sp., *Mesocriconema* sp. and *Paratylenchus* sp.	2
Sod	Bipolaris leaf spot	*Bipolaris* sp.	2
	Downy mildew	*Sclerophthora* sp.	1
	Foliar Anthracnose	*Colletotrichum graminicola*	1
	Slime mould	Protozoa	1
	Yellow patch	*Rhizoctonia cerealis*	2

DISEASED SAMPLES 34
ABIOTIC AND OTHER DISORDERS 01
TOTAL SUBMISSIONS 35

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

NAME AND AGENCY:
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TITLE: DISEASES DIAGNOSED ON COMMERCIAL ORNAMENTAL NURSERY CROPS IN BRITISH COLUMBIA IN 2012

ABSTRACT: Diseases in coastal British Columbia of commercial nursery ornamental crops and their causal agents diagnosed by Elmhirst Diagnostics & Research are listed for 2012. New or significant pathogens recorded in British Columbia include *Erysiphe magnifica* causing powdery mildew of magnolia and *Pseudocercospora lilacis* causing leaf spot of lilac.

METHODS: Elmhirst Diagnostics & Research (EDR) provides diagnosis of diseases of commercial horticultural crops in British Columbia caused by fungi, bacteria, viruses, plant parasitic nematodes, arthropod and mite pests and abiotic factors. Disease diagnosis is performed primarily by association of known symptoms with the presence of a pathogen known to cause these symptoms, based on microscopic examination. If the diagnosis is uncertain or if further identification or confirmation is needed, fungal and bacterial pathogens are isolated in pure culture for identification by morphological characteristics, or plant tissue or cultured specimens are sent to other certified laboratories for identification by enzyme-linked immunosorbent assay (ELISA), polymerase chain reaction (PCR) or DNA sequencing.

RESULTS AND COMMENTS: 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.

Powdery mildew of maple has appeared to be more severe in coastal British Columbia in recent years. Previously, the disease has been caused primarily by *Phyllactinia guttata* (Pacific Northwest Plant Disease Management Handbook, 2011 Edition. Edited by J. Pscheidt and C. Ocamb, pp. 341). In 2012, *Sawadaea bicornis* was identified as the cause of powdery mildew of *Acer macrophyllum* (big-leaf maple) on both container-grown nursery plants and landscape trees in the BC Fraser Valley. The species was identified by conidial size (J. F. Elmhirst, Elmhirst Diagnostics & Research) and sequencing of the rDNA ITS region (L. A. Wegener, Institute for Sustainable Horticulture, Kwantlen Polytechnic University, Langley, BC). The sequence from the container nursery plants (submitted as GenBank Accession No. KC291614) was 100% identical to *Sawadaea bicornis* (GenBank Accession No. AB193380.1) and the sequence from the landscape tree was 99% similar to the same accession.

This paper is also the first report in British Columbia of *Pseudocercospora lilacis (Cercospora lilacis*) causing leaf spot of *Syringa vulgari*s: the disease was found on two cultivars at one wholesale nursery in the BC Fraser Valley. It is also the first report in British Columbia of powdery mildew of magnolia (*M. soulangiana*) caused by *Erysiphe magnifica*. This disease, which was found at one wholesale nursery, has been known in Europe and the United States since 2002.

Table 1: Diseases diagnosed in 2012 on commercial ornamental nursery crops in British Columbia by Elmhirst Diagnostics & Research.

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO OF SAMPLES
Abies balsamea nana	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Abies fraseri	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Abies procera	Root rot/ yellowing	*Pythium* sp. / *Phytophthora* sp.	1
Acer circinatum	Bacterial leaf spot/ blight	*Pseudomonas syringae*	3
Acer circinatum	Powdery mildew	Erysiphales	2
Acer glabrum	Bacterial leaf spot/ blight	*Pseudomonas syringae*	1
Acer griseum	Bacterial leaf spot/ blight	*Pseudomonas syringae*	2
Acer macrophyllum	Powdery mildew	*Sawadaea bicornis**	2
Acer macrophyllum	Bacterial leaf spot/ blight	*Pseudomonas syringae*	2
Acer palmatum 'Emperor One'	Bacterial leaf spot	*Pseudomonas syringae*	1
Acer rubrum 'Red Rocket'	Powdery mildew	Erysiphales	1
Acer tataricum 'Hot Wings'	Bacterial leaf spot/ blight	*Pseudomonas syringae*	2
Agave 'Baja'	Root and crown rot	*Pythium* sp. and soft rot bacteria	1
Ajuga tenorii	Crown rot	Soft rot bacteria	1
Alnus rubra	Rust	*Melampsoridium* sp.	1
Alnus sinuate	Bacterial leaf spot	*Pseudomonas syringae*	1
Amelanchier alnifolia	Powdery mildew	*Podosphaera clandestina*	2
Amelanchier alnifolia	Rust	*Gymnosporangium* sp.	1
Amelanchier canadensis	Powdery mildew	Erysiphales	1
Andromeda polifolia 'Blue Ice'	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Arbutus menziesii	Root rot	*Phytophthora cinnamomi*	1
Arctostaphylos uva-ursi	Anthracnose	*Colletotrichum gloeosporioides*	5
Arctostaphylos uva-ursi	Black root rot/ dieback	*Thielaviopsis basicola*	2
Arrhenatherum elatius var. bulbosum 'Variegatum'	Rust	*Puccinia* sp.	1
Aruncus sylvester	Bacterial leaf spot/ shothole	*Pseudomonas syringae*	1
Athyrium sp.	Root rot/ dieback	*Pythium* sp.	2

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO.OF SAMPLES
Betula occidentalis	Rust	*Melampsoridium betulinum*	1
Betula papyrifera	Leaf spot	*Cylindrosporium betulae*	1
Betula papyrifera	Rust	*Melampsoridium betulinum*	1
Betula pendula 'Burgundy Wine', 'Trost's Dwarf'	Rust	*Melampsoridium betulinum*	2
Betula platyphylla 'Dakota Pinnacle'	Rust	*Melampsoridium betulinum*	2
Blechnum spicant	Root rot/ dieback	*Pythium* sp.	2
Borealis Haskap	Leaf spot	*Ascochyta* or *Phoma* sp.	1
Borealis Haskap	Powdery mildew	Erysiphales	1
Buddleia davidii 'Santana'	Bacterial leaf spot	*Pseudomonas syringae*	1
Buddleia davidii 'Santana'	Downy mildew	*Peronospora* sp.	1
Buxus sempervirens 'Suffruticosa'	Volutella blight	*Volutella buxi*	1
Buxus sinica x sempervirens 'Green Velvet'	Box blight	*Cylindrocladium pseudonaviculatum*	1
Buxus sinica x sempervirens 'Green Velvet', 'Green Mountain', 'Green Gem'	Volutella blight	*Volutella buxi*	5
Calamagrostis x acutiflora 'Avalanche', 'Eldorado','Karl Foerster', 'Overdam'	Rust	*Puccinia* sp.	4
Calluna vulgaris 'Alba Jae'	Root and crown rot/ dieback	*Phytophthora cinnamomi*	1
Calluna vulgaris 'Alba Jae', 'Darkness', 'Dark Star', 'Kinlocruel', 'Mair's Variety', 'Leonie', 'Selly', 'Sir John Charrington'	Root rot/ dieback	*Phytophthora* sp.	8
Calluna vulgaris 'Selly'	Leaf blight/ root rot	*Rhizoctonia solani*	1
Campanula x 'Kent Belle'	Leaf spot	*Ascochyta bohemica*	1
Campanula x 'Kent Belle'	Blossom blight	*Botrytis cinerea*	1
Carex comans 'Amazon Mist'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Ceanothus gloriosus 'Pink Reyes'	Leaf spot	*Coniothyrium* sp.	1
Ceanothus griseus horizontalis 'Diamond Heights'	Bacterial stem canker	unidentified bacterium	1
Ceanothus impressus	Black root rot	*Thielaviopsis basicola*	1
Ceanothus impressus 'Vandenberg'	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Celastrus scandens 'Autumn Revolution'	Bacterial leaf spot	*Pseudomonas* sp.	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO, OF SAMPLES
Chamaecyparis lawsoniana 'Ellwoodii'	Root rot/ dieback	*Phytophthora* sp.	2
Chamaecyparis nootkatensis	Root rot/ dieback	*Phytophthora* sp.	1
Chamaecyparis pisifera 'Golden Mops', 'King's Gold', 'Sungold'	Root rot/ dieback	*Phytophthora* sp.	3
Chamaecyparis sp.	Root rot/ yellowing	*Phytophthora* sp.	1
Clematis 'Chantilly', 'Fleuri', 'Parisenne'	Botrytis blight	*Botrytis cinerea*	1
Clematis 'Chantilly', 'Fleuri', 'Parisenne'	Leaf spot and wilt	*Phoma clematidina*	2
Clematis columbiana	Leaf spot and wilt	*Botrytis cinerea and Phoma clematidina*	1
Clematis sp.	Botrytis blight	*Botrytis cinerea*	2
Clematis sp.	Leaf spot and wilt	*Phoma clematidina*	3
Cornus alba 'Gouchaltii', 'Ivory Halo', 'Kelseyi', 'Prairie Fire', 'Sibirica	Septoria leaf spot	*Septoria cornicola*	6
Cornus alba 'Sibirica'	Bacterial leaf spot	*Pseudomonas syringae*	1
Cornus canadensis	Black root rot	*Thielaviopsis basicola*	3
Cornus florida	Powdery mildew	Erysiphales	1
Cornus nuttallii	Bacterial leaf spot	*Pseudomonas syringae*	1
Cornus sericea	Septoria leaf spot	*Septoria cornicola*	1
Cornus sp.	Bacterial blight	*Pseudomonas syringae*	1
Cornus stolonifera	Bacterial leaf spot	*Pseudomonas syringae*	1
Corynephorus canescens 'Spiky Blue'	Root rot/ crown rot/ dieback	*Fusarium* sp.	1
Cotinus coggyria 'Golden Spirit'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Cotinus coggyria 'Royal Purple'	Bacterial blight/ shoot dieback	*Pseudomonas syringae*	1
Cotoneaster acutifolia	Fire blight	*Erwinia amylovora*	1
Cotoneaster dammeri	Fire blight	*Erwinia amylovora*	2
Crataegus douglasii	Shoot dieback	*Botrytis cinerea*	1
Cupressus macrocarpa	Root rot	*Pythium* sp. / *Phytophthora* sp.	2
Cupressus macrocarpa 'Goldcrest'', 'Wilma Goldcrest'	Phomopsis blight	*Phomopsis juniperova*	2
Daphne x houtteana	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Daphne x transatlantica 'Eternal Fragrance'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Daphne x transatlantica 'Eternal Fragrance'	Shoot tip dieback	*Fusarium lateritium / Phoma* sp.	1
Dianthus sp.	Dieback/ root and crown rot	*Phytophthora* sp.	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO, OF SAMPLES
Dryopteris erythrosora	Root rot/ dieback	*Pythium* sp.	2
Echinacea purpurea 'Polar Breeze'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Echinacea purpurea 'Prairie Splendor'	Leaf spot	*Cercospora rudbeckiae*	1
Echinacea purpurea	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Eleagnus commutata	Powdery mildew	Erysiphales	1
Erica carnea 'Kramer's Red'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	2
Erica x darleyensis	Dieback/ yellowing/ root and crown rot	*Phytophthora* sp.	2
Escallonia x 'Gold Brian', 'Newport Dwarf', 'Pink Princess'	Foliar nematodes	*Aphelenchoides* sp.	3
Euonymus fortunei 'Canadale Gold', 'Emerald Gaiety', 'Emerald 'N Gold', 'Silver King'	Bacterial leaf spot/ blight	*Pseudomonas syringae*	6
Euonymus japonicus 'Aureo-marginatus', 'Gold Queen', 'President Gauthier'	Bacterial leaf spot/ blight	*Pseudomonas syringae*	4
Euonymus japonicus 'Aureo-marginatus', 'Gold Queen', 'President Gauthier'	Leaf blight	*Botrytis cinerea*	3
Fargesia murielae	Root rot	*Pythium* sp.	1
Festuca glauca 'Elijah Blue'	Root rot	*Pythium* sp.	1
Forsythia sp.	Bacterial leaf spot	*Pseudomonas syringae*	1
Forsythia viridissima var. koreana 'Kumson'	Leaf spot	*Phomopsis* sp.	1
Forsythia viridissima var. koreana 'Kumson'	Bacterial blight	*Pseudomonas syringae*	1
Forsythia x intermedia	Bacterial blight/ dieback	*Pseudomonas syringae*	1
Forsythia x intermedia 'Fiesta'	Bacterial leaf spot	*Pseudomonas syringae*	1
Fragaria chiloensis	Leaf spot	*Mycosphaerella fragariae*	1
Fragaria chiloensis	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Gaillardia 'Arizona Sun'	White smut	*Entyloma polysporum*	1
Gardenia sp.	Leaf spot	*Botrytis cinerea*	2
Gaultheria procumbens	Anthracnose	*Colletotrichum acutatum*	2
Gaultheria procumbens	Fruit rot/ grey mould	*Botrytis cinerea*	2
Gaultheria procumbens	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Geum macrophyllum	Powdery mildew	*Podosphaera aphanis*	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Gerbera jamesonii	Powdery mildew	*Oidium* sp.	6
Hebe x hybrida	Downy mildew	*Peronospora grisea*	4
Helleborus sp.	Leaf spot	*Botrytis cinerea*	1
Helleborus x 'Picotee Lady', 'Pink Beauty', 'Pink Lady', 'Yellow Lady'	Leaf spot	*Coniothyrium hellebori*	4
Helleborus x 'Pink Beauty'	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Heuchera micrantha	Black root rot	*Thielaviopsis basicola*	1
Heuchera micrantha	Leaf spot	*Ascochyta* sp.	1
Heuchera micrantha 'Caramel', 'Cascade Dawn', 'Frosted Violet', 'Jade Gloss', 'Palace Purple','Plum Pudding', 'Rave on Coral Bells', 'Silver Scrolls'	Rust	*Puccinia heucherae*	10
Hibiscus rosa-sinensis	Blossom blight	*Botrytis cinerea*	1
Holodiscus discolor	Bacterial leaf spot	*Pseudomonas* sp.	1
Hosta sieboldiana	Transparent leaf edges/ bacterial soft rot	Soft rot bacteria	6
Hosta sieboldiana 'Earth Angel', 'First Frost', 'Frosted Jade', 'Gold Standard', 'Guacamole', 'June', 'Rainforest Sunrise', 'Stained Glass'	Botrytis leaf spot	*Botrytis cinerea*	8
Hydrangea arborescens 'Annabelle',	Powdery mildew	Erysiphales	1
Hydrangea arborescens 'Annabelle', 'Invincibelle Spirit', 'Limelight'	Bacterial leaf spot	*Pseudomonas syringae*	3
Hydrangea macrophylla "Bluebird"	Stem rot/ grey mould	*Botrytis cinerea*	1
Hydrangea macrophylla "Pink Beauty"	Fungal stem canker	*Fusarium* sp.	1
Hydrangea macrophylla 'Nikko Blue'	Bacterial leaf spot	*Pseudomonas sp.*	1
Hydrangea macrophylla 'Pink Beauty'	Ascochyta leaf spot	*Ascochyta hydrangeae*	1
Hydrangea macrophylla ssp. serrata 'Amagi Amacha'	Bacterial leaf spot	*Pseudomonas syringae*	1
Hydrangea petiolaris	Leaf spot/ blotch	*Botrytis cinerea*	1
Hydrangea quercifolia x 'Pee Wee'	Bacterial leaf spot	*Pseudomonas syringae*	1
Hydrangea serrata 'Bluebird'	Leaf distortion, puckering	Unidentified virus	1
Hydrangea sp.	Leaf blight / shoot tip dieback	*Botrytis cinerea*	2
Ixora coccinea	Bacterial leaf spot	*Pseudomonas* sp.	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO, OF SAMPLES
Juniperus horizontalis	Root rot/ dieback	*Phytophthora* sp.	2
Juniperus communis	Root rot/ dieback	*Phytophthora* sp.	2
Juniperus communis 'Green Carpet'	Root rot/ dieback	*Phytophthora* sp.	1
Juniperus horizontalis 'Blue Chip', 'Gold Strike', 'Hugues', 'Icee Blue', 'Lime Glow', 'Mother Lode', 'Prince of Wales', 'Wiltonii', 'Youngstown', 'Yukon Belle'	Root rot/ dieback	*Phytophthora* sp.	10
Juniperus procumbens 'Nana'	Root rot/ dieback	*Phytophthora* sp.	1
Juniperus sabina 'Blue Danube', 'Blue Forest', 'Broadmoor', 'Buffalo', 'Calgary Carpet', 'Moor-Dense', 'Tamariscifolia', 'Tamariscifolia New Blue'	Root rot/ dieback	*Phytophthora* sp.	9
Juniperus sabina 'Blue Danube', 'Tamariscifolia New Blue'	Kabatina blight	*Kabatina* sp.	3
Juniperus scopulorum 'Medora'	Kabatina blight	*Kabatina* sp.	1
Juniperus scopulorum 'Medora', 'Wichita Blue'	Root rot/ dieback	*Phytophthora* sp.	4
Juniperus sp.	Root rot/ dieback	*Phytophthora* sp.	5
Juniperus squamata 'Blue Star', 'Holger'	Root rot	*Phytophthora* sp.	5
Kalmia latifolia 'Heart of Fire', Olympic Fire', 'Ostbo Red'	Leaf spot	*Fusarium* sp. / *Pestalotia* sp. / *Phoma* sp.	3
Kalmia latifolia 'Ostbo Red'	Reddish line pattern on leaves	Necrotic Ringspot Virus	1
Larix decidua	Shoot tip dieback	*Botrytis cinerea*	1
Lavandula angustifolia "Hidcote Blue", 'Lodden Blue', 'Munstead', 'Peter Pan'	Root rot	*Pythium* sp. / *Phytophthora* sp.	10
Lavandula angustifolia 'Hidcote Blue', 'Loddon Blue', 'Melissa Lilac', 'Pacific Blue', 'Peter Pan'	Powdery mildew	Erysiphales	5
Lavandula angustifolia 'Hidcote Blue', 'Munstead'	Bacterial leaf spot/ blight	*Pseudomonas syringae*	2
Lavandula angustifolia 'Lodden Blue','Munstead'	Shoot blight/ grey mould	*Botrytis cinerea*	3
Lavandula stoechas	Bacterial leaf spot/ blight	*Pseudomonas syringae*	2
Lavandula stoechas 'Green Summer'	Shoot blight/ grey mould	*Botrytis cinerea*	2
Lavandula stoechas 'Anouk', 'Green Summer', 'Silver Anouk', 'Silver Summer', 'Winter Bee'	Black root rot	*Thielaviopsis basicola*	12
Linnaea borealis	Black root rot	*Thielaviopsis basicola*	2

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Lithodora diffusa 'Grace Ward', 'Star'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	2
Lithodora diffusa 'Star'	Leaf spot/ botrytis blight	*Botrytis cinerea*	1
Lithodora diffusa 'Star'	Yellowing/ black root rot	*Thielaviopsis basicola*	2
Lonicera caerulea	Honeysuckle leaf blight	*Insolibasidium deformans*	1
Lonicera caerulea 'Tundra'	Bacterial blight	*Pseudomonas syringae*	1
Lonicera involucrata	Honeysuckle leaf blight	*Insolibasidium deformans*	1
Lonicera sp.	Powdery mildew	Erysiphales	1
Lupinus polyphyllus	Downy mildew	*Peronospora trifoliorum*	1
Lupinus polyphyllus	Powdery mildew	Erysiphales	1
Magnolia kobus	Bacterial leaf spot	*Pseudomonas syringae*	1
Magnolia sieboldii	Bacterial leaf spot	*Pseudomonas syringae*	1
Magnolia stellata 'Royal Star'	Bacterial leaf spot	*Pseudomonas syringae*	1
Magnolia x brooklynensis 'Yellow Bird'	Bacterial blight	*Pseudomonas syringae*	1
Magnolia x 'Butterflies'	Bacterial leaf spot	*Pseudomonas syringae*	1
Magnolia x loebneri 'Leonard Messel'	Bacterial blight	*Pseudomonas syringae*	1
Magnolia x soulangiana 'Susan'	Bacterial blight	*Pseudomonas syringae*	3
Magnolia x soulangiana 'Susan'	Powdery mildew	*Erysiphe magnifica (=Microsphaera magnifica)***	1
Mahonia aquifolium	Bacterial leaf spot	*Pseudomonas* sp.	1
Mahonia aquifolium 'Compacta'	Bacterial leaf spot	*Pseudomonas* sp.	1
Mahonia aquifolium 'Compacta'	Rust	*Cumminsiella mirabilissima*	1
Mahonia nervosa	Black root rot	*Thielaviopsis basicola*	1
Matteuccia struthiopteris	Web blight/ stem canker	*Rhizoctonia solani*	1
Myrica californica	Bacterial leaf spot	*Pseudomonas* sp.	1
Myrica gale	Bacterial leaf spot	*Pseudomonas* sp.	1
Onoclea sensibilis	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Osmanthus heterophyllus 'Goshiki'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	2
Oxalis oregana	Black root rot	*Thielaviopsis basicola*	1
Oxalis oregana	Root rot	*Pythium* sp. / *Phytophthora* sp.	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Pachysandra terminalis	Volutella blight	*Volutella pachysandrae*	2
Pachysandra terminalis 'Green Sheen'	Volutella blight	*Volutella pachysandrae*	2
Pachystima canbyi	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Paeonia lactiflora	Ascochyta leaf spot	*Ascochyta paeoniae*	1
Paeonia lactiflora	Cladosporium leaf-blotch and stem rot	*Dichocladosporium chlorocephalum (=Cladosporium chlorocephalum, C. paeoniae)*	3
Paeonia lactiflora 'Edulis Superba', 'Karl Rosenfeld', 'Shirley Temple'	Botrytis bud blight/ leaf spot/ stem canker	*Botrytis cinerea*	3
Paeonia lactiflora 'Edulis Superba', 'Laura Dessert'	Cladosporium leaf-blotch and stem rot	*Dichocladosporium chlorocephalum (=Cladosporium chlorocephalum, C. paeoniae)*	2
Parthenocissus quinquefolia	Bacterial leaf spot	*Pseudomonas* sp.	1
Parthenocissus quinquefolia	Downy mildew	*Peronospora* sp.	1
Parthenocissus tricuspidata 'Veitchii'	Downy mildew	*Peronospora* sp.	1
Penstemon davidisonii	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Penstemon serrulatus	Root rot	*Pythium* sp. / *Phytophthora* sp. and *Rhizoctonia solani*	1
Philadelphus coronarius 'Aureus'	Bacterial leaf spot	*Pseudomonas* sp.	2
Photinia x fraseri	Entomosporium leaf spot	*Diplocarpon mespili*	2
Photinia x fraseri 'Pink Marble'	Entomosporium leaf spot	*Diplocarpon mespili*	1
Physocarpus capitatus	Ascochyta leaf spot	*Ascochyta* sp.	2
Physocarpus opulifolius 'Center Glow', 'Diablo'	Powdery mildew	*Podosphaera aphanis*	2
Picea abies	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Picea abies pumila	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Picea glauca conica	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	2
Picea glauca conica 'December'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Picea glauca 'Densata'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Picea glauca pendula	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Picea mariana 'Golden', `Nana`	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Picea pungens 'Baby Blue', `Select Blue`	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	2
Pieris japonica 'Carnaval'	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Pieris japonica 'Mountain Fire'	Bacterial leaf spot	*Pseudomonas* sp.	1
Pieris japonica 'Mountain Fire'	Leaf spot	*Botrytis cinerea*	1
Pieris japonica 'Mountain Fire'	Ringspots on leaves	Unidentified virus	1
Pinus cembra	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Pinus contorta latifolia	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Pinus contorta 'Taylors Sunburst'	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Pinus flexilis	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Pinus mugo 'New Glow', `Pumilo`, 'Slowmound'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	3
Pinus nigra 'Gaelle Bregeon'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Pinus sp.	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Pinus strobiformis	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Pinus thunbergii 'Yatsubusa'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Polystichum sp.	Web blight	*Rhizoctonia solani*	1
Polystichum munitum	Root rot/ dieback	*Pythium* sp.	2
Populus balsamifera 'Paskapoo'	Septoria leaf spot	*Septoria populicola*	1
Populus balsamifera 'Paskapoo'	Leaf spot	*Phomopsis* sp.	1
Populus tremuloides	Bacterial blight/ shoot tip dieback	*Pseudomonas* sp.	2
Populus tremuloides	Leaf rust	*Melampsora* sp.	1
Populus tremuloides	Venturia blight	*Venturia tremulae*	1
Populus trichocarpa	Leaf rust	*Melampsora* sp.	1
Populus trichocarpa	Marsonnina blight	*Marsonnina populi*	1
Populus x acuminata	Rust	*Melampsora* sp.	1
Potentilla fruiticosa 'Abbotswood', 'Goldfinger'	Blossom blight	*Botrytis cinerea*	2
Potentilla fruticosa 'Abbotswood'	Black root rot	*Thielaviopsis basicola*	3
Potentilla fruticosa 'Abbotswood'	Root rot	*Pythium* sp. / *Phytophthora* sp.	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Primula hortensis	Bacterial soft rot	*Erwinia carotovora*	1
Prunus cerasus 'Carmine Jewel'	Bacterial leaf spot	*Pseudomonas syringae*	1
Prunus cistena	Bacterial leaf spot	*Pseudomonas syringae*	1
Prunus incisa 'Little Twist'	Bacterial leaf spot	*Pseudomonas syringae*	1
Prunus maackii 'Goldspar'	Bacterial leaf spot	*Pseudomonas syringae*	1
Prunus sp.	Bacterial leaf spot	*Pseudomonas syringae*	2
Prunus triloba 'Multiplex'	Bacterial leaf spot	*Pseudomonas syringae*	1
Prunus triloba 'Multiplex'	Cherry leaf spot	*Blumeriella jaapii*	1
Prunus virginiana	Bacterial leaf spot	*Pseudomonas syringae*	3
Prunus x 'Evans'	Bacterial leaf spot	*Pseudomonas syringae*	1
Prunus x 'Evans'	Cherry leaf spot	*Blumeriella jaapii*	1
Prunus x kerrasis 'Cupid', 'Juliet', 'Romeo', 'Valentine'	Bacterial leaf spot	*Pseudomonas syringae*	1
Prunus x kerrasis 'Romeo'	Cherry leaf spot	*Blumeriella jaapii*	1
Pseudotsuga menziesii	Botrytis tip blight	*Botrytis cinerea*	1
Pseudotsuga menziesii	Root rot/ dieback	*Phytophthora* sp.	1
Quercus garryana	Powdery mildew	Erysiphales	1
Rhodo impeditum	Root rot	*Phytophthora* sp.	2
Rhododendron (Azalea) 'Golden Lights'	Leaf blight	*Botrytis cinerea*	1
Rhododendron (Azalea) 'Golden Lights', 'Mandarin Lights', 'White Lights'	Powdery mildew	*Erysiphe azaleae (=Microsphaera azaleae)*	2
Rhododendron (Azalea) 'Hino Crimson', 'Purple Triumph', 'Mother's Day'	Root rot	*Phytophthora* sp.	3
Rhododendron (Azalea) 'Purple Triumph'	Leaf spot	*Ascochyta* sp./ *Phoma* sp.	1
Rhododendron x 'Mikkeli', 'Peter Tigerstedt', 'Pohjola's Daughter', 'Catawbiense Album'	Powdery mildew	*Erysiphe azaleae (=Microsphaera azaleae)*	4
Rhododendron x 'Peter Tigerstedt', 'Rose Walloper',	Leaf spot/ anthracnose	*Colletotrichum* sp.	1
Rhododendron x 'Ramapo'	Root rot/ dieback	*Phytophthora* sp.	1
Ribes alpinum	Anthracnose	*Drepanopeziza ribis*	1
Ribes bracteosum	Rust	*Cronartium ribicola*	1
Rosa gymnocarpa	Powdery mildew	*Podosphaera pannosa (=Sphaerotheca pannosa)*	1
Rosa nutkana	Black spot	*Diplocarpon rosae*	1
Rosa nutkana	Powdery mildew	*Podosphaera pannosa (=Sphaerotheca pannosa)*	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Rosa nutkana	Rust	*Phragmidium mucronatum*	1
Rosa woodsii	Black spot	*Diplocarpon rosae*	1
Rosa woodsii	Downy mildew	*Peronospora sparsa*	1
Rosa x 'Adelaide Hoodless', 'Morden Sunrise', 'Scarlet Meidiland', 'White Meidiland', 'Winnipeg Parks'	Downy mildew	*Peronospora sparsa*	5
Rosa x 'Adelaide Hoodless', 'Morden Sunrise', 'Scarlet Meidiland', 'White Meidiland', 'Winnipeg Parks'	Black spot	*Diplocarpon rosae*	5
Rosa x hybrida	Black spot	*Diplocarpon rosae*	4
Rosa x hybrida	Blossom blight	*Botrytis cinerea*	1
Rosmarinus officinalis	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	1
Rosmarinus officinalis 'Barbeque Sky', 'Blue Spire', 'Speedy', 'Upright Blue'	Powdery mildew	Erysiphales	5
Rosmarinus officinalis 'Gold Dust', 'Speedy', 'Wilma's Gold'	Yellowing/ black root rot	*Thielaviopsis basicola*	3
Rosmarinus officinalis 'Wilma's Gold'	Bacterial blight	*Pseudomonas syringae*	2
Rosmarinus officinalis 'Wilma's Gold'	Root rot	*Pythium* sp. / *Phytophthora* sp.	2
Rubus idaeus	Yellow rust	*Phragmidium rubi-idaei*	1
Rubus idaeus 'Heritage'	Botrytis blight	*Botrytis cinerea*	1
Rubus idaeus 'Heritage'	Grey mould	*Botrytis cinerea*	1
Rubus spectabilis	Powdery mildew	*Podosphaera aphanis*	1
Rubus spectabilis	Bacterial leaf spot	*Pseudomonas* sp.	1
Rudbeckia fulgida 'Goldsturm'	Leaf spot	*Phoma*/*Ascochyta* sp.	1
Rudbeckia hirta 'Autumn Colors'	Bacterial leaf spot	*Pseudomonas* sp.	1
Salix lasiandra	Rust	*Melampsora* sp.	1
Sambucus racemosa	Powdery mildew	Erysiphales	1
Sambucus racemosa	Bacterial leaf spot	*Pseudomonas* sp.	1
Sambucus racemosa 'Sutherland Gold'	Foliar nematodes	*Aphelenchoides* sp.	1
Sedum 'Bartram Anderson'	Root rot	*Pythium* sp.	1
Sedum telephium 'Matrona'	Powdery mildew	Erysiphales	1
Sempervirum tectorum 'Sunset'	Botrytis blossom blight	*Botrytis cinerea*	1
Sequoiadendron giganteum	Root rot/ shoot dieback	*Phytophthora* sp.	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Skimmia japonica 'Chameleon'	Leaf and petiole rot	*Pythium* sp.	1
Skimmia japonica 'Chameleon'	Sooty mould	*Meria* sp.	1
Spiraea japonica Anthony Waterer'; 'Dart's Red'; ''Little Princess'; 'Neon Flash', 'Snowmound'	Bacterial leaf spot	*Pseudomonas syringae*	4
Spiraea japonica 'Firelight', 'Goldmound', 'Magic Carpet'	Powdery mildew	*Podosphaera* sp.	2
Spiraea sp.	Powdery mildew	*Podosphaera* sp.	2
Spiraea sp.	Bacterial leaf spot	*Pseudomonas syringae*	1
Spiraea x bumalda 'Crispa'	Powdery mildew	*Podosphaera* sp.	1
Spiraea x bumalda 'Crispa'	Bacterial leaf spot/ blight	*Pseudomonas syringae*	2
Strelitzia reginae 'Orange Bird of Paradise'	Root and crown rot	*Fusarium* sp. and bacterial soft rot	1
Styrax japonica 'Fragant Fountain'	Bacterial leaf spot	*Pseudomonas* sp.	1
Symphoricarpos albus	Powdery mildew	*Erysiphe symphoricarpi (=Microsphaera symphoricarpi)*	4
Syringa meyeri 'Palibin'	Bacterial leaf spot/ canker	*Pseudomonas syringae* pv. *syringae*	1
Syringa reticulata 'Ivory Silk'	Bacterial leaf spot	*Pseudomonas syringae* pv. *syringae*	1
Syringa vulgaris	Powdery mildew	*Erysiphe syringae* (=*Microsphaera syringae)*	1
Syringa vulgaris	Stem canker	*Nectria cinnabarina*	1
Syringa vulgaris 'Dappled Dawn', 'Krasavitsa Moskvy' (Beauty of Moscow)' 'Montaigne', 'Prairie Petite', 'President Grevy', 'Sensation'	Bacterial leaf spot/ blight/ canker	*Pseudomonas syringae* pv. *syringae*	8
Syringa vulgaris 'Krasavitsa Moskvy' (Beauty of Moscow), 'Montaigne'	Cercospora leaf spot	*Pseudocercospora lilacis***	2
Syringa vulgaris 'President Grevy'	Powdery mildew	*Erysiphe syringae* (=*Microsphaera syringae)*	1
Syringa vulgaris 'President Grevy'	Ascochyta leaf spot	*Ascochyta syringae*	1
Syringa x 'Bailbelle'	Bacterial leaf spot	*Pseudomonas syringae* pv. *syringae*	1
Taxus brevifolia	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Taxus cuspidata 'Emerald Spreader'	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Taxus cuspidata 'Nana Aurescens'	Root rot	*Pythium* sp. / *Phytophthora* sp.	1

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Taxus media	Yellowing/ root rot	*Pythium* sp. / *Phytophthora* sp.	1
Thamnocalamus crassinodus	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Thuja occidentalis 'Brandon', 'Danica', 'DeGroot's Spire', 'Little Giant', 'Holmstruppi', 'Nigra', 'Smaragd', 'Skybound', 'Wareana', Woodwardii	Kabatina twig blight	*Kabatina thujae*	10
Thuja occidentalis 'Brandon', 'Emerald Green'	Tip blight	*Pestalotiopsis* sp.	2
Thuja occidentalis 'Brandon'; 'Danica', 'Daniellow', 'DeGroot's Spire', 'Emerald Green', 'Golden Tuffet', 'Jantar', 'Technito', 'Teddy', 'Smaragd'	Root rot/ dieback	*Phytophthora* sp.	12
Thuja occidentalis 'Emerald Green', 'Brandon', 'Wareana'	Phomopsis blight	*Phomopsis* sp.	2
Thuja occidentalis 'Skybound'	Root and stem rot	*Pythium* sp. / *Phytophthora* sp.	1
Thuja plicata	Root rot/ dieback	*Phytophthora* sp.	1
Thuja plicata 4'Ever (Goldy)	Keithia blight	*Didymascella thujina*	1
Typha minima	Phomopsis blight	*Phomopsis* sp.	1
Vaccinium corymbosum 'Chippewa'	Mummyberry/ shoot strikes	*Monilinia vaccinii-corymbosi*	1
Vaccinium corymbosum 'Chippewa'	Root rot	*Pythium* sp. / *Phytophthora* sp.	1
Vaccinium corymbosum 'Chippewa', 'Duke', 'North Blue'	Leaf spot/ botrytis blight	*Botrytis cinerea*	1
Vaccinium ovatum 'Thunderbird'	Bacterial leaf spot	*Pseudomonas syringae*	1
Vaccinium spp.	Bacterial leaf spot	*Pseudomonas syringae*	4
Vaccinium spp.	Root rot / dieback	*Pythium* sp. / *Phytophthora* sp.	1
Vaccinium x 'Northland'	Bacterial blight	*Pseudomonas syringae*	3
Vaccinium x 'Northland'	Leaf spot/ botrytis blight	*Botrytis cinerea*	1
Veronica spicata 'Christy Speedwell', 'Royal Candles'	Root rot/ dieback	*Pythium* sp. / *Phytophthora* sp.	4
Viburnum carlcephalum	Bacterial leaf spot	*Pseudomonas syringae*	3
Viburnum davidii	Leaf spot	*Phomopsis* sp.	1
Viburnum opulus 'Nanum', 'Sterile'	Bacterial leaf spot	*Pseudomonas syringae*	3
Viburnum opulus 'Nanum', 'Sterile'	Cercospora leaf spot	*Cercospora* sp.	2
Viburnum plicatum 'Summer Snowflake'	Cercospora leaf spot	*Cercospora* sp.	1
Viburnum trilobum 'Alfredo', 'Bailey's Compact'	Bacterial leaf spot	*Pseudomonas syringae*	2

CROP	SYMPTOM/DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Viburnum trilobum 'Bailey's Compact'	Leaf spot	*Ramularia* sp.	1
	Root and crown rot	*Pythium* sp. / *Phytophthora* sp.	2
Vinca minor	Bacterial leaf spot	*Pseudomonas* sp.	1
Vinca minor	Leaf spot/ stem blight	*Phoma exigua* var. *exigua*	1
Vitis vinifera 'Prairie Star'	Powdery mildew	*Uncinula necator*	2
Weigela florida 'Minuet'	Leaf spot	*Ascochyta/Phoma* sp.	1
Wisteria sinensis	Bacterial leaf spot	*Pseudomonas* sp.	1
Yucca filamentosa	Leaf spot	*Cercospora* sp.	2
Yucca filamentosa 'Bright Edge'	Leaf spot	*Cercospora* sp.	1
Yucca filamentosa 'Color Guard'	Root and crown rot	*Pythium* sp. and bacterial soft rot	2
Yucca glauca	Root and crown rot	*Pythium* sp. and bacterial soft rot	2
Total			623

* *S. bicornis* confirmed by sequencing of rDNA ITS region;
**new report for British Columbia

CROPS: Commercial crops – Diagnostic Laboratory Report
LOCATION: Saskatchewan

NAMES AND AGENCIES:
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TITLE: DISEASES DIAGNOSED ON CROP SAMPLES SUBMITTED IN 2012 TO THE SASKATCHEWAN MINISTRY OF AGRICULTURE CROP PROTECTION LABORATORY

ABSTRACT: In 2012 Saskatchewan's Crop Protection Laboratory received 513 disease/disorder samples comprised of special crops, cereals, oilseeds, shade trees, vegetables, forages, fruit and ornamental plants. Diseases/disorders were caused by fungi, bacteria, viruses, phytoplasmas, herbicide injury and the environment. Fifty-one percent of these samples were Dutch elm disease or dothiorella wilt of elm. Fusarium head blight was common in cereals.

METHODS: The Saskatchewan Ministry of Agriculture's Crop Protection Laboratory (CPL) provides diagnostic services to the agricultural industry on all crop health problems. Services include disease, insect and weed identification, as well as testing of weed seeds for herbicide resistance. The CPL 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 CPL by personnel from the Saskatchewan Ministry of Agriculture, the Saskatchewan Ministry of Environment, and by individual growers, crop insurance adjustors, agribusiness representatives and market/home gardeners. Samples are also received from clients in Alberta and Manitoba. Diagnosis of fungal diseases is performed primarily through assessment of plant symptoms, microscopic examination, and isolation of fungi on artificial media. When additional confirmation is needed, disease samples are sent to research laboratories for identification of associated pathogens by other means, such as polymerase chain reaction (PCR). Viral and bacterial diagnoses are mostly based on visible symptoms but ELISA testing was used to identify wheat streak mosaic virus (WSMV) in 2012.

RESULTS: A total of 513 disease/disorder samples were submitted to the CPL from April 1 to November 8, 2012. Out of this, 51% (260 samples) were elm samples submitted for DED testing. Categories and percentages of samples received (excluding DED samples) were: special crops (22%), cereals (40%), oilseeds (20%), shade trees (other than elm) (7%), vegetables (2%), forages (3%) ornamentals (3%), and fruit (2%). Samples that were submitted but diagnosed with insect damage are not included in this report. Summaries of diseases and causal agents diagnosed on crop samples submitted to the CPL in 2012 are presented in Tables 1-7 by crop category.

Table 1: Summary of diseases diagnosed on **fruit crops** submitted to the Saskatchewan Crop Protection Laboratory in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Sour cherry	Brown rot	*Monilinia fructicola*	1
	Shot-hole	*Wilsonomyces carpophilus*	1
	Bacterial canker	*Pseudomonas syringae* pv. *morsprunorum*	1
Saskatoon berry	Entomosporium leaf spot	*Entomosporium mespili*	1

Table 2: Summary of diseases diagnosed on **cereal crops** submitted to the Saskatchewan Crop Protection Laboratory in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Barley	Fusarium head blight	*Fusarium* spp.	6
	Herbicide injury		2
	Nutrient deficiency		1
	Environmental injury	Excess moisture	1
	Environmental injury	Hot and dry weather	1
Durum wheat	Fusarium head blight	*Fusarium* spp.	11
	Seedling blight/root rot	*Bipolaris sorokiniana*	2
	Leaf spot	*Septoria tritici*	1
	Loose smut	*Ustilago tritici*	1
	Stripe rust	*Puccinia striiformis*	1
	Physiological leaf spot		2
Oat	Nutrient deficiency		1
	Environmental injury	Heat stress, wind damage	3
Wheat	Fusarium head blight	*Fusarium* spp.	13
	Tan spot	*Pyrenophora tritici-repentis*	2
	Leaf rust	*Puccinia triticina*	2
	Septoria leaf blotch	*Septoria* sp.	1
	Seedling blight	*Bipolaris sorokiniana*	1
	Common root rot	*Cochlobolus sativus*	2
	Ring spot	*Drechslera campanulata*	1
	Bacterial leaf blight	*Pseudomonas* sp.	1
	Environmental injury	Excess moisture/ wind damage	8
	Herbicide injury		3
	Nutrient deficiency		3
	Physiological leaf spot		1
Corn	Ear rot	*Stenocarpella maydis*	1

Table 3: Summary of diseases diagnosed on **vegetable crops** submitted to the Saskatchewan Crop Protection Laboratory in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Potato	Common scab	*Streptomyces scabies*	1
	Verticillium wilt	*Verticillium albo-atrum*	1
	Rhizoctonia canker / black scurf	*Rhizoctonia solani*	1

Table 4: Summary of diseases diagnosed on **forage legume and grass crops** submitted to the Saskatchewan Crop Protection Laboratory in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Alfalfa	Common leaf spot	*Pseudopeziza medicaginis*	1
	Spring black stem	*Phoma medicaginis*	1
Turf	Leaf rust	*Puccinia* sp.	1
Timothy	Root rot	*Fusarium* sp.	1
	Purple eye spot	*Cladosporium phlei*	
	Leaf blotch	*Dreschslera phlei*	1
Bromegrass	Stripe smut	*Ustilago striiformis*	1
	Leaf spot	*Pseudoseptoria bromi*	1
Slender wheatgrass	Head smut	*Pyrenophora bromi*	1
Ryegrass	Environmental injury		1

Table 5: Summary of diseases diagnosed on **special crops** submitted to the Saskatchewan Crop Protection Laboratory in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Canaryseed	Herbicide injury		1
Lentil	Root rot	*Fusarium* spp.	3
	Anthracnose	*Colletotrichum truncatum*	3
	Herbicide injury	Group 2 and 4 herbicides	6
	Environmental injury	Excess moisture/poor root development	3
Pea	Herbicide injury		4
	Ascochyta leaf and pod spot	*Ascochyta pisi*	3
	Root rot*	Root rot complex	8
	Septoria leaf blotch	*Septoria pisi*	3
	Mycosphaerella blight	*Mycosphaerella pinodes*	3
	Bacterial blight	*Pseudomonas syringae* pv. *pisi*	4
	Environmental injury	Excess moisture/poor root development	3
Soybean	Brown spot	*Septoria glycines*	1
Faba Bean	Ascochyta blight	*Ascochyta fabae*	1
	Chocolate spot	*Botrytis fabae*	1

*See paper by Banniza et al. in this issue of Canadian Plant Disease Survey

Table 6: Summary of diseases diagnosed on **oilseed crops** submitted to the Saskatchewan Crop Protection Laboratory in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Canola	Black spot	*Alternaria brassicae*	5
	Black-leg	*Leptosphaeria* sp.	4
	Root rot	*Rhizoctonia* or *Fusarium* spp.	7
	Grey stem and white	*Pseudocercosporella*	1
	spot	*capsellae*	3
	White mould	*Sclerotinia sclerotiorum*	3
	Aster yellows	*Candidatus* Phytoplasma asteris	2
	Herbicide injury		13
	Nutrient deficiency	Sulfur	1
	Environmental injury		1
Flax	Herbicide injury		1
	Environmental injury	Moisture stress	4
	Pasmo	*Septoria linicola*	2
	Powdery mildew	*Oidium lini*	1
Sunflower	Chemical injury		1

Table 7: Summary of diseases diagnosed on **woody ornamental trees** submitted to the Saskatchewan Crop Protection Laboratory in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Aspen (*Populus* spp.)	Herbicide damage		2
	Environmental injury		1
Elm (*Ulmus* spp.)	Dutch Elm Disease	*Ophiostoma novae-ulmi*	101*
	Dothiorella Wilt	*Dothiorella ulmi*	16*
Maple (*Acer* sp.)	Environmental injury		1
Hawthorn (*Crataegus* sp.)	Hawthorn rust	*Gymnosporangium* spp.	1
	Herbicide damage		1
	Leaf spot	*Diplocarpon mespili*	2
Larch (*Larix* sp.)	Needle cast	*Hypodermella laricis*	1

* The remaining 143 American elm submissions were negative for known pathogens of elm

CROP: Diagnostic Laboratory Report
LOCATION: Manitoba

NAME AND AGENCY:
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TITLE: 2012 MANITOBA CROP DIAGNOSTIC CENTRE LABORATORY SUBMISSIONS

ABSTRACT: Diseases and disorders of plants analysed by the Manitoba Crop Diagnostic Centre were recorded for the year 2012. Samples received by the laboratory covered most crops grown in Manitoba and also included ornamentals. For 2012 the largest number of samples were cereals with root rot diseases and environmental injuries at higher numbers than usually observed.

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 visual examination of symptoms, microscopy, 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, 2012.

Table 1. Summary of diseases diagnosed on **herbaceous ornamentals** submitted to the MAFRI Crop Diagnostic Centre in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Gladiolus	Corm rot	*Fusarium oxysporum*	1
Lily of the Valley	Leaf spot	*Ascochyta* sp.	1
Monkshood	Root rot	*Pythium* sp.	1
Morning glory	Leaf spot	*Alternaria* sp.	1

Table 2. Summary of diseases diagnosed on **greenhouse crops** submitted to the MAFRI Crop Diagnostic Centre in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Flax, perennial	Rust	*Melampsora lini*	1
Hemp, medicinal	Wilt	*Fusarium oxysporum*	1
Pepper	Damping off	*Pythium* sp.	1
Poinsettia	Scab	*Sphaceloma poinsettiae*	1
Tomato	Leaf mould	*Fulvia fulva*	1
	Environmental injury		1

Table 3. Summary of diseases diagnosed on **cereal crops** submitted to the MAFRI Crop Diagnostic Centre in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Wheat	Aster yellows	*Candidatus* Phytoplasma asteris	1
	Bacterial blight	*Pseudomonas syringae*	7
	Barley yellow dwarf	Barley Yellow Dwarf Virus	6
	Black head moulds	*Epicoccum* sp., *Alternaria* sp.	14
	Common root rot	*Cochliobolus sativus*	7
	Fusarium head blight	*Fusarium* spp.	9
	Leaf rust	*Puccinia triticina*	1
	Powdery mildew	*Blumeria graminis*	16
	Root rot	*Fusarium* spp.	45
	Root rot	*Fusarium* spp., *Rhizoctonia solani*	9
	Septoria leaf spot	*Septoria* spp.	10
	Tan spot	*Pyrenophora tritici-repentis*	17
	Wheat streak mosaic	Wheat Streak Mosaic Virus	10
	Physiological disorders	undetermined	1
	Physiological leaf spot	chloride deficiency	6
	Environmental injury		78*
	Herbicide injury		28
	Nutrient deficiency		5
Barley	Aster Yellows	*Candidatus* Phytoplasma asteris	2
	Barley yellow dwarf	Barley Yellow Dwarf Virus	12
	Black head moulds	*Epicoccum* sp., *Alternaria* sp.	1
	Common root rot	*Cochliobolus sativus*	1
	Net blotch	*Drechslera teres*	4
	Root rot	*Fusarium* spp., *Rhizoctonia solani*	3
	Spot blotch	*Bipolaris sorokiniana*	5
	Wheat streak mosaic	Wheat Streak Mosaic Virus	1
	Herbicide injury		9
	Environmental injury		15*
	Nutrient deficiency		1
Oat	Barley yellow dwarf	Barley Yellow Dwarf Virus	7
	Bacterial blight	*Pseudomonas syringae*	4
	Fusarium head blight	*Fusarium* spp.	2
	Leaf spot	*Stagonospora avenae*	3
	Pyrenophora leaf blotch	*Pyrenophora avenae*	1
	Root rot	*Fusarium* spp., *Rhizoctonia solani*	7
	Physiological disorder	undetermined	1
	Environmental injury		8*
	Herbicide injury		2
Rye	Fusarium head blight	*Fusarium* spp.	1
Triticale	Barley yellow dwarf	Barley Yellow Dwarf Virus	1

*High numbers of environmental injuries were due primarily to hot dry conditions in mid to late season which resulted in a variety of symptoms such as plant stunting, leaf tip burn, and head sterility or poor head fill.

Table 4. Summary of diseases diagnosed on **vegetable crops** submitted to the MAFRI Crop Diagnostic Centre in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Asparagus	Crown rot	*Fusarium oxysporum*	1
Bean, snap	Environmental stress		2
	Herbicide injury		1
Beet, red	Scab	*Streptomyces scabies*	1
Cabbage	Downy mildew	*Peronospora parasitica*	1
	Fusarium yellows	*Fusarium oxysporum*	1
Carrot	Aster yellows	Aster yellows phytoplasma	1
	Root rot	*Fusarium* spp.	2
	White mould rot	*Sclerotinia sclerotiorum*	1
Celery	Aster yellows	*Candidatus* Phytoplasma asteris	1
Corn, sweet	Stalk rot	*Fusarium graminearum*	1
Cucumber	Alternaria leaf blight	*Alternaria cucumerina*	1
Garlic	Fusarium basal plate rot	*Fusarium oxysporum*	4
Leek	Root rot	*Fusarium oxysporum*	1
Lettuce	Aster yellows	*Candidatus* Phytoplasma asteris	1
Onion	Fusarium basal plate rot	*Fusarium oxysporum*	4
	Neck rot	*Botrytis allii*	2
	Root rot	*Pythium* sp.	1
	Environmental injury		1
	Herbicide injury		1
Pea	Root rot	*Fusarium solani*	1
Pumpkin	Powdery mildew	*Sphaerotheca* sp.	1
	Leaf spot	*Alternaria* sp.	1
	Root rot	*Fusarium* sp.	1
Squash	Leaf spot	*Alternaria* sp.	1
Tomato	Black dot	*Colletotrichum coccodes*	1
	Early blight	*Alternaria solani*	2
	Fruit discoloration	Alfalfa mosaic virus	1
	Late blight	*Phytophthora infestans*	2
	Leaf spot	*Stemphylium* sp.	2
	Root rot	*Pythium* sp.	1
	Septoria leaf spot	*Septoria lycopersici*	1
	Physiological disorder		1
	Herbicide injury		1

Table 5. Summary of diseases diagnosed on **shelterbelt trees** and **woody ornamentals** submitted to the MAFRI Crop Diagnostic Centre in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Ash (*Fraxinus* sp.)	Anthracnose	*Gloeosporium aridum*	1
	Canker	unidentified	1
	Leaf spot	*Cylindrosporium* sp.	1
	Verticillium wilt	*Verticillium dahliae*	2
	Environmental injury		1
	Herbicide injury		3
Basswood	Canker	*Nectria* sp.	1
	Environmental injury		3
Cedar (*Thuja* sp.)	Needle blight	*Kabatina* sp.	1
Chokecherry, Amur (*Prunus maackii*)	Twig blight	*Pestalotia* sp.	1
Chokecherry, Schubert (*Prunus virginiana*)	Black knot	*Apiosporina morbosa*	1
Cotoneaster	Canker	*Botryosphaeria* sp.	1
	Fireblight	*Erwinia amylovora*	1
Crabapple	Canker	*Diplodia seriata*	1
	Frogeye leafspot	*Diplodia seriata*	1
	Scab	*Venturia inaequalis*	1
Elm, American (*Ulmus americana*)	Anthracnose	*Gloeosporium* sp.	1
	Canker	*Botryodiplodia* sp.	1
	Canker	*Botryosphaeria* sp.	3
	Dothiorella wilt	*Dothiorella* sp.	3
	Dutch elm disease	*Ophiostoma ulmi*	65
	Verticillium wilt	*Verticillium* spp.	2
	Herbicide injury		1
Lilac	Bacterial blight	*Pseudomonas syringae*	1
	Wilt	*Verticillium dahliae*	1
Maple, Manitoba (*Acer negundo.*)	Canker	*Sphaeropsis* sp.	1
	Environmental injury		1
	Herbicide injury		3
	Nutrient deficiency		1
Mayday tree (*Prunus padus commutata*)	Black knot	*Apiosporina morbosa*	1
Mountain ash (*Sorbus* sp.)	Fireblight	*Erwinia amylovora*	1
Oak (*Quercus macrocarpa)*	Anthracnose	*Discula* sp.	2
	Leaf blister	*Taphrina caerulescens*	3
	Verticillium wilt	*Verticillium albo-atrum*	1
	Environmental injury		1

Table 5 (contd.)

Poplar (*Populus* spp.)	Leaf spot	*Discosporium* sp.	1
	Leaf spot	*Marssonina* sp.	2
	Leaf spot	*Septoria* sp.	1
	Root rot	*Cylindrocarpon* sp.	1
	Iron chlorosis	nutrient deficiency	1
Rose	Rust	*Phragmidium* sp.	1
Spruce (*Picea* spp.)	Cytospora canker	*Leucostoma kunzei*	2
	Needle blight	*Lirula* sp.	4
	Rhizosphaera needlecast	*Rhizosphaera kalkhoffii*	1
	Stigmina needle blight	*Stigmina lautii*	17
	Tip blight	*Phomopsis* sp.	1
	Physiological disorders		3
	Environmental injury		25
	Nutrient deficiency		2
Willow	Canker	*Cystospora* sp.	1
	Willow scab and black canker	*Venturia saliciperda*, *Glomerella miyabeana*	1
	Root rot	*Cylindrocarpon* sp.	1
	Environmental injury		1
	Herbicide injury		2

Table 6. Summary of diseases diagnosed on **oilseed crops** submitted to the MAFRI Crop Diagnostic Centre in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Canola	Aster yellows	Aster yellows phytoplasma	6
	Blackleg	*Leptosphaeria maculans*	27
	Black spot	*Alternaria brassicae*	3
	Downy mildew	*Peronospora parasitica*	10
	Root rot	*Fusarium* spp., *Pythium* sp.	5
	Root rot	*Rhizoctonia solani*	5
	Stem rot	*Sclerotinia sclerotiorum*	3
	Withertop	Calcium deficiency	1
	Environmental injury		7
	Herbicide injury		20
	Nutrient deficiency		3
Flax	Anthracnose	*Colletotrichum* sp.	1
	Aster yellows	*Candidatus* Phytoplasma asteris	11
	Fusarium wilt	*Fusarium oxysporum*	10
	Pasmo	*Septoria linicola*	3
	Root rot	*Fusarium oxysporum*, *Rhizoctonia solani*	4
	Environmental injury		4
	Herbicide injury		12
Sunflower	Black stem	*Phoma macdonaldii*	1
	Downy mildew	*Plasmopara halstedii*	2
	Leaf spot	*Alternaria* sp.	1
	Root rot	*Fusarium* sp.	2
	Herbicide injury		4

Table 7. Summary of diseases diagnosed on **fruit crops** submitted to the MAFRI Crop Diagnostic Centre in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Apple	Frogeye leafspot	*Diplodia seriata*	4
	Fireblight	*Erwinia amylovora*	1
	Scab	*Venturia inaequalis*	1
	Twig canker	*Nectria cinnabarina*	1
	Herbicide injury		1
Cherry, dwarf sour (*Prunus cerasus*)	Leaf spot	*Seimatosporium* sp.	1
Currant	Fruit drop	Physiological disorder	1
Gooseberry	Cluster cup rust	*Puccinia caricina*	1
Grape	Black rot	*Phyllosticta ampelicida*	1
Raspberry	Anthracnose	*Elsinoë veneta*	2
	Bacterial blight	*Pseudomonas syringae*	2
	Fireblight	*Erwinia amylovora*	1
	Iron chlorosis	nutrient deficiency	1
Saskatoon berry	Environmental injury		1
Strawberry	Anthracnose	*Colletotrichum dematium*	1
	Root rot	*Rhizoctonia solani*	3
	Environmental injury		1
	Nutrient deficiency		1

Table 8. Summary of diseases diagnosed on **forage legume crops** submitted to the MAFRI Crop Diagnostic Centre in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Alfalfa	Brown root rot	*Phoma sclerotioides*	1
	Root rot	*Cylindrocarpon* sp.	1
	Stem rot	*Sclerotinia trifoliorum*	1
	Nutrient deficiency	potassium deficiency	1
Birdsfoot trefoil	Flower blight	*Colletotrichum* sp.	1

Table 9. Summary of diseases diagnosed on **grasses** submitted to the MAFRI Crop Diagnostic Centre in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Perennial rye grass	Herbicide injury		2
Turf grass	Fairy ring	*Marasmius* sp.	1

Table 10. Summary of diseases diagnosed on **special field crops** submitted to the MAFRI Crop Diagnostic Centre in 2012.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Borage	Root rot	*Fusarium* sp., *Pythium* sp.	1
Canaryseed	Leaf rust	*Puccinia* sp.	1
	Environmental injury		1
	Herbicide injury		4
Corn	Goss's wilt	*Clavibacter michiganensis* subsp. *nebraskensis*	3
	Holcus spot	*Pseudomonas syringae*	1
	Root rot	*Fusarium graminearum, F. equiseti, F. oxysporum*	1
	Yellow leaf blight	*Phyllosticta maydis*	1
	Environmental injury		3
	Nutrient deficiency		4
Faba Bean	Root rot	*Fusarium* spp., *Rhizoctonia solani*	1
Field bean	Common blight	*Xanthomonas axonopodis* pv. *phaseoli*	1
	Root rot	*Fusarium* spp.	3
	Environmental injury		5
	Herbicide injury		1
	Nutrient deficiency		1
Field pea	Anthracnose	*Colletotrichum pisi*	1
	Ascochyta leaf spot	*Ascochyta* sp.	3
	Root rot	*Fusarium* spp.	4
	Root rot	*Pythium* sp.	1
	Herbicide injury		1
Quinoa	Root rot	*Fusarium oxysporum*	3
	Stem lesion	*Phoma* sp.	1
Soybean	Anthracnose	*Colletotrichum* sp.	4
	Bacterial blight	*Pseudomonas* sp.	5
	Brown spot	*Septoria glycines*	14
	Downy mildew	*Peronospora manshurica*	8
	Root rot	*Fusarium* spp., *Pythium* spp., *Rhizoctonia solani*	17
	Root rot	*Phytophthora sojae*	5
	Seed discoloration	Soybean mosaic virus	1
	Stem blight	*Phomopsis longicolla*	1
	Stem rot	*Sclerotinia sclerotiorum*	1
	Environmental injury		9
	Herbicide injury		11

Table 11. Summary of diseases diagnosed on **potato crops** submitted to the MAFRI Crop Diagnostic Centre in 2012.

SYMPTOM/ DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Bacterial soft rot	*Pectobacterium carotovorum* subsp. *carotovorum*	1
Blackleg	*Pectobacterium carotovorum* subsp. *atrosepticum*	4
Black dot, on leaves	*Colletotrichum coccodes*	1
Black dot, on stems	*Colletotrichum coccodes*	4
Black dot, on tuber	*Colletotrichum coccodes*	1
Brown spot	*Alternaria alternata*	4
Early blight, foliar	*Alternaria solani*	13
Early blight, tuber	*Alternaria solani*	2
Fusarium dry rot	*Fusarium graminearum*	1
Fusarium dry rot	*Fusarium oxysporum*	1
Fusarium dry rot	*Fusarium sambucinum*	4
Fusarium dry rot	*Fusarium solani*	1
Fusarium wilt	*Fusarium avenaceum*	1
Grey mould	*Botrytis cinerea*	1
Late blight, foliar	*Phytophthora infestans*	8
Late blight, tuber	*Phytophthora infestans*	1
Leaf spot	*Colletotrichum coccodes*	1
Rhizoctonia stem and stolon canker	*Rhizoctonia solani*	2
Pink eye	unknown	2
Pink rot	*Phytophthora erythroseptica*	1
Scab, common	*Streptomyces* spp.	1
Scab, powdery	*Spongospora subterranea*	5
Silver scurf	*Helminthosporium solani*	1
Tuber rot	*Fusarium graminearum, Fusarium avenaceum, Mucor* sp.	2
Verticillium wilt	*Verticillium dahliae*	4
Physiological disorders		2
Herbicide injury		3
Environmental injury		3

CROPS: Commercial Crops - Diagnostic Laboratory Report
LOCATION: Ontario

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TITLE: DISEASES DIAGNOSED ON PLANTS SUBMITTED TO THE PEST DIAGNOSTIC CLINIC AT THE UNIVERSITY OF GUELPH IN 2011

ABSTRACT: Diseases and their causal agents diagnosed on part of the plant samples received by the Pest Diagnostic Clinic of the University of Guelph in 2011 are summarized in this report. Samples included greenhouse vegetables, annual and perennial ornamental plants, field crops, berry crops, tree fruit, turfgrass and trees.

METHODS: The Pest Diagnostic Clinic of the University of Guelph provides plant pest diagnostic services to growers, agri-businesses, provincial and federal governments and homeowners across Canada. Services include disease diagnosis, plant parasitic nematode identification and enumeration, pathogen detection from soil and water, and insect and plant identification. The following data reflect part of the samples received by the laboratory for disease diagnosis in 2011. Diagnoses were accomplished using microscopic examination, culturing on artificial media, biochemical identification of bacteria using BIOLOG®, enzyme-linked immunosorbent assay (ELISA), polymerase chain reaction(PCR)-based techniques including DNA multiscan, PCR and RT-PCR, and DNA sequencing.

RESULTS AND COMMENTS: Summaries of diseases and their causal agents diagnosed on part of the samples received by the laboratory are presented in Tables 1- 6 below. For various reasons, the frequency of the sample types submitted to the laboratory does not reflect the prevalence of the diseases of various crops. Problems caused by plant parasitic nematodes, insects, and abiotic factors are not listed.

Table 1. Summary of plant diseases diagnosed on **vegetable** samples (including **greenhouse vegetables**) submitted to the University of Guelph Pest Diagnostic Clinic in 2011.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Broccoli (*Brassica oleracea*)	Black spot	*Alternaria brassicicola*	1
	Black rot	*Xanthomonas campestris*	1
Cantaloupe (*Cucumis melo*)	*Plectosphaerella cucumerina*	*Plectosphaerella cucumerina*	1
Carrot (*Daucus carota*)	Cottony rot	*Sclerotinia sclerotiorum*	1
	Sour rot	*Geotrichum candidum*	1
	Bacterial soft rot	*Pectobacterium carotovorum*	1
	Cercospora leaf blight	*Cercospora* sp.	1
	Fusarium rot	*Fusarium* sp.	1
	Dry rot	*Fusarium* sp.	4
	Alternaria leaf blight	*Alternaria dauci*	3

Table 1, contd.

Cauliflower (*Brassica oleracea*)	Bacterial leaf spot	*Pseudomonas syringae*	1
Cucumber (*Cucumis sativus*)	Gummy stem blight	*Didymella bryoniae*	2
	Cucumber Green Mottle Mosaic Virus	Cucumber Green Mottle Mosaic Virus (CGMMV)	6
	Belly rot	*Rhizoctonia solani*	1
	Pythium root rot	*Pythium aphanidermatum*	2
	Melon Necrotic Spot Virus	Melon Necrotic Spot Virus (MNSV)	2
Eggplant (*Solanum melongena*)	Basal stem and crown rot	*Sclerotinia sclerotiorum*	1
Garlic (*Allium sativum*)	Pythium root rot	*Pythium ultimum*	1
	Leaf blight	*Alternaria* sp.	1
	Leaf blight	*Stemphylium* sp.	1
	Basal plate rot	*Fusarium oxysporum*	4
Gourd (*Cucurbita pepo*)	Anthracnose	*Colletotrichum* sp.	1
Green onion (*Allium fistulosum*)	Purple blotch	*Alternaria porri*	1
Lettuce (*Lactuca sativa*)	Bacterial soft rot	*Pseudomonas marginalis*	3
	Pythium crown and root rot	*Pythium dissotocum*	6
	Bacterial leaf spot and head rot	*Xanthomonas campestris*	3
	Bacterial rot	*Pseudomonas cichorii*	1
	Rhizoctonia leaf spot	*Rhizoctonia* sp.	1
	Leaf spot	*Cercospora* sp.	1
Onion (*Allium cepa*)	Leaf streak and bulb rot	*Pseudomonas viridiflava*	1
	Bacterial soft rot	*Pseudomonas marginalis*	1
	Basal plate rot	*Fusarium oxysporum*	9
	Anthracnose	*Colletotrichum* sp.	1
	Slippery skin	*Burkholderia gladioli*	1
Pea (*Pisum sativum*)	Pythium root rot	*Pythium* sp.	1
	Alternaria leaf spot	*Alternaria* sp.	1
	Anthracnose	*Colletotrichum* sp.	1
Pepper (*Capsicum annuum*)	Tomato Spotted Wilt Virus	Tomato Spotted Wilt Virus (TSWV)	1
	Bacterial soft rot	*Pectobacterium carotovorum*	3
	Fusarium stem rot	*Fusarium oxysporum*	3
	Stem rot	*Phytophthora capsici*	1
	Fusarium wilt	*Fusarium oxysporum*	1
	Bacterial soft rot	*Pseudomonas marginalis*	1
	Alternaria rot	*Alternaria* sp.	1

Table 1, contd.

Pepper (*Capsicum annuum*)	Phytophthora blight	*Phytophthora capsici*	2
	Bacterial leaf spot	*Pseudomonas syringae*	1
Potato (*Solanum tuberosum*)	Pythium crown and root rot	*Pythium dissotocum*	3
	Dry rot	*Fusarium solani*	1
	Pink rot	*Phytophthora cryptogea*	2
Pumpkin (*Cucurbita pepo*)	Bacterial leaf spot	*Xanthomonas campestris*	1
	Gummy stem blight	*Didymella bryoniae*	1
	Pythium crown and root rot	*Pythium dissotocum*	1
	Black rot	*Phoma cucurbitacearum*	1
Rutabaga (*Brassica napus*)	Crown rot	*Fusarium* sp.	1
Spinach (*Spinacia oleracea*)	Cladosporium leaf spot	*Cladosporium variabile*	1
	Pythium root rot	*Pythium aphanidermatum*	3
Sugar beet (*Beta vulgaris*)	Leaf spot	*Cercospora* sp.	1
	Root rot	*Fusarium* sp.	1
Sweet potato (*Ipomoea batatas*)	Dry rot	*Fusarium* sp.	1
Tilia (*Tilia* sp.)	Leaf spot	*Cercospora* sp.	1
Tomato (*Lycopersicon esculentum*)	Bacterial soft rot	*Pectobacterium carotovorum*	2
	Pythium crown and root rot	*Pythium* sp.	1
	Root and crown rot	*Fusarium oxysporum*	4
	Pepino Mosaic Virus	Pepino Mosaic Virus (PepMV)	5
	Bacterial canker	*Clavibacter michiganensis* ssp. *michiganensis*	7
	Fusarium wilt	*Fusarium oxysporum*	1
	Verticillium wilt	*Verticillium dahliae*	4
	Bacterial spot	*Xanthomonas campestris*	7
	Pith necrosis	*Pseudomonas marginalis*	1
	Hairy root	*Agrobacterium* sp.	1
	Early blight	*Alternaria solani*	1
	Anthracnose	*Colletotrichum coccodes*	1
	Black mould	*Alternaria* sp.	2
	Late blight	*Phytophthora infestans*	1
Watermelon (*Citrullus lanatus*)	Pythium root rot	*Pythium ultimum*	1
	Fusarium wilt	*Fusarium oxysporum*	1
Winter melon (*Benincasa hispida*)	Black mould	*Alternaria sp.*	1

Table 2. Summary of plant diseases diagnosed on **fruit** samples submitted to the University of Guelph Pest Diagnostic Clinic in 2011.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
American cranberry (*Vaccinium macrocarpus*)	Leaf spot	*Pyrenobotrys compacta*	2
Apple (*Malus* sp.)	Blister spot	*Pseudomonas syringae*	2
	Stem canker	*Botryosphaeria* sp.	1
	Phomopsis canker	*Phomopsis* sp.	5
	Fireblight	*Erwinia amylovora*	1
	Anthracnose	*Colletotrichum acutatum*	2
	Root and crown rot	*Phytophthora cactorum*	1
Blueberry (*Vaccinium* sp.)	Phomopsis canker	*Phomopsis* sp.	5
Cranberry (*Vaccinium* sp.)	Twig dieback	*Pestalotiopsis* sp.	1
Highbush blueberry (*Vaccinium corymbosum*)	Blueberry Shock Virus	Blueberry Shock Virus (BlShV)	2
Peach *(Prunus persica*)	Bacterial spot	*Xanthomonas campestris*	3
Red raspberry (*Rubus idaeus*)	Raspberry Bushy Dwarf Virus	Raspberry Bushy Dwarf Virus (RBDV)	3
Serviceberry (Amelanchier sp.)	Gymnosporangium rust	*Gymnosporangium nelsonii*	1
Strawberry (*Fragaria* sp.)	Botryosphaeria canker	*Botryosphaeria* sp.	1
	Leaf spot	*Mycosphaerella fragariae*	1
	Botrytis blight	*Botrytis* sp.	1
	Leather rot	*Phytophthora cactorum*	1
	Rhizoctonia root rot	*Rhizoctonia solani*	3
	Gnomonia crown and root rot	*Gnomonia* sp.	1
	Root rot	*Phytophthora cactorum*	2
	Root rot	*Phytophthora* sp.	1
	Strawberry mottle virus	Strawberry mottle virus (SMoV)	1
	Verticillium wilt	*Verticillium dahliae*	1
	Anthracnose	*Colletotrichum acutatum*	2

Table 3. Summary of plant diseases diagnosed on **herbaceous ornamental** plants submitted to the University of Guelph Pest Diagnostic Clinic in 2011.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Angel's Trumpet (*Brugmansia* sp.)	Tobacco Mosaic Virus	Tobacco Mosaic Virus (TMV)	1
Begonia (*Begonia* sp.)	Bacterial leaf spot	*Xanthomonas campestris*	2
	Root rot	*Fusarium* sp.	1
Blackeyed susan (*Rudbeckia fulgida*)	Downy mildew	*Plasmopara* sp.	2
Bluegrass (*Poa* sp.)	Anthracnose	*Colletotrichum graminicola*	1
Christmas cactus (*Schlumbergera truncata*)	Stem rot	*Fusarium* sp.	1
Chrysanthemum (*Chrysanthemum* sp.)	Chrysanthemum Stunt Viroid	Chrysanthemum Stunt Viroid (CSVd)	3
	Impatiens Necrotic Spot Virus	Impatiens Necrotic Spot Virus (INSV)	2
Cineraria (*Pericallis* sp.)	Impatiens Necrotic Spot Virus	Impatiens Necrotic Spot Virus (INSV)	1
Coreopsis (*Coreopsis* sp.)	Fusarium rot	*Fusarium* spp.	1
Dahlia (*Dahlia* sp.)	Pythium crown and root rot	*Pythium dissotocum*	1
	Pythium root rot	*Pythium* sp.	1
	Root and crown rot	*Fusarium oxysporum*	1
English ivy (*Hedera helix*)	Leaf spot	*Xanthomonas campestris*	1
Epimedium (*Epimedium* sp.)	Anthracnose	*Colletotrichum* sp.	1
Euphorbia (*Euphorbia* sp.)	Phytophthora root rot	*Phytophthora nicotianae*	1
Freesia (*Freesia* sp.)	Root and crown rot	*Fusarium oxysporum*	1
Fuchsia (*Fuchsia* sp.)	Botrytis blight	*Botrytis* sp.	1
Zonal geranium (*Pelargonium* sp.	Gray mold	*Botrytis* sp.	6
Grass species (*Gramineae*)	Anthracnose	*Microdochium bolleyi*	1
Hosta (*Hosta* sp.)	Root rot	*Fusarium* sp.	1
Impatiens (*Impatiens wallerana*)	Alternaria leaf spot	*Alternaria* sp.	1
	Rhizoctonia root rot	*Rhizoctonia solani*	1
Kalanchoe (*Kalanchoe* sp.)	Root and crown rot	*Fusarium oxysporum*	3
	Phytophthora root rot	*Phytophthora nicotianae*	1
	Impatiens Necrotic Spot Virus	Impatiens Necrotic Spot Virus (INSV)	2
	Pythium crown and root rot	*Pythium dissotocum*	1
Kentucky bluegrass (*Poa pratensis*)	Anthracnose foliar blight	*Colletotrichum graminicola*	1
Large periwinkle (*Vinca major*)	Bacterial leaf spot	*Acidovorax konjaci*	1
Lenten rose (*Helleborus* sp.)	Root and crown rot	*Phytophthora cactorum*	1

Table 3, contd.

Leucanthemum (*Leucanthemum* sp.)	Pythium crown and root rot	*Pythium dissotocum*	1
Lisianthus (*Eustoma russellianu*m)	Fusarium wilt	*Fusarium oxysporum*	1
	Rhizoctonia stem rot	*Rhizoctonia* sp.	2
Lucky bamboo (*Dracaena sanderiana*)	Anthracnose	*Colletotrichum dracaenophilum*	2
	Stem rot	*Fusarium* sp.	1
Million bells (*Calibrachoa* sp.)	Stem rot	*Botrytis* sp.	1
	Root rot	*Phytophthora* sp.	1
	Black root rot	*Thielaviopsis basicola*	1
Petunia (*Petunia* sp.)	Tobacco Mosaic Virus	Tobacco Mosaic Virus (TMV)	1
	Tomato Mosaic Virus	Tomato Mosaic Virus (ToMV)	1
Garden phlox (*Phlox paniculata*)	Septoria leaf spot	*Septoria* sp.	1
Phlox (*Phlox* sp.)	Downy mildew	*Peronospora* sp.	1
Poinsettia (*Euphorbia pulcherrima*)	Alternaria leaf spot	*Alternaria* sp.	1
	Poinsettia Mosaic Virus	Poinsettia Mosaic Virus (PnMV)	1
	Stem canker	*Botrytis* sp.	1
Purple coneflower (*Echinacea purpurea*)	Anthracnose	*Colletotrichum* sp.	1
Russelia (*Russelia* sp.)	Pythium crown and root rot	*Pythium* sp.	1
Sage (*Salvia* sp.)	Anthracnose	*Colletotrichum* sp.	1
Sedum (*Sedum* sp.)	Pythium root and crown rot	*Pythium irregulare*	1
Shasta daisy (*Leucanthemum* sp.)	Crown gall	*Agrobacterium* sp.	1
Tulip (*Tulipa gesneriana*)	Blue mold	*Penicillium* sp.	1
Verbena (*Verbena* sp.)	Impatiens Necrotic Spot Virus	Impatiens Necrotic Spot Virus (INSV)	1

Table 4. Summary of plant diseases diagnosed on **woody ornamentals** submitted to the University of Guelph Pest Diagnostic Clinic in 2011.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Azalea (*Rhododendron* sp.)	Glomerella canker and dieback	*Colletotrichum gloeosporioides*	1
Cedar (*Thuja* sp.)	Stem rot	*Fusarium* sp.	1
	Tip blight	*Pestalotiopsis funerea*	2
Colorado blue spruce (*Picea pungens*)	Late leaf rust	*Pucciniastrum americanum*	1
Cypress (*Cupressus* sp.)	Pestalotiopsis twig blight	*Pestalotiopsis* sp.	1
Deerberry (*Vaccinium stamineum*)	Tar spot	*Rhytisma* sp.	1
Dogwood (*Cornus* sp.)	Septoria leaf spot	*Septoria* sp.	1
Elm (*Ulmus* sp.)	Phyllosticta leaf spot	*Phyllosticta* sp.	3
English oak (*Quercus robur*)	Oak leaf spot	*Tubakia dryina*	1
Euonymus (*Euonymus* sp.)	Bacterial leaf spot	*Pseudomonas syringae*	1
Fir (*Abies* sp.)	Swiss needlecast	*Phaeocryptopus gaeumannii*	1
Golden-chain tree (*Laburnum* sp.)	Alternaria leaf spot	*Alternaria* sp.	1
Hawthorn (*Crataegus* sp.)	Entomosporium leaf spot	*Entomosporium mespili*	1
Hazelnut (*Corylus* sp.)	Root and crown rot	*Fusarium* sp.	1
Honey locust(*Gleditsia triacanthos*)	Dothiorella canker	*Dothiorella* sp.	1
	Nectria canker	*Nectria cinnabarina*	1
Hydrangea (*Hydrangea* sp.)	Slime mold	Myxomycetes	1
	Bacterial leaf spot	*Pseudomonas viridilivida*	1
Japanese maple (*Acer palmatum)*	Anthracnose	*Kabatiella apocrypta*	2
	Phyllosticta leaf blight	*Phyllosticta* sp.	1
Maple (*Acer* sp.)	Powdery mildew	*Uncinula* sp.	1
Pagoda dogwood (*Cornus alternifolia*)	Golden canker	*Cryptodiaporthe corni*	1
Red elderberry (*Sambucus racemosa*)	Septoria leaf spot	*Septoria* sp.	1
Red oak (*Quercus rubra*)	Pestalotia leaf spot	*Pestalotia* sp.	1
	Oak leaf spot	*Tubakia dryina*	1
Rocky mountain juniper (*Juniperus scopulorum*)	Botryosphaeria canker	*Botryosphaeria* sp.	1
Rose (*Rosa* sp.)	Powdery mildew	*Oidium* sp.	1
Russelia (*Russelia* sp.)	Pythium crown and root rot	*Pythium* sp.	1
Shagbark hickory (*Carya ovata*)	Downy leaf spot	*Microstroma juglandis*	1
Siberian elm (*Ulmus pumila*)	Leaf blister	*Taphrina ulmi*	1
Spruce (*Picea* sp.)	Rhizospheara needlecast	*Rhizosphaera kalkhoffi*	1
Winterberry (*Gaultheria* sp.)	Botrytis stem blight	*Botrytis cinerea*	1

Table 5. Summary of plant diseases diagnosed on **field crops** submitted to the University of Guelph Pest Diagnostic Clinic in 2011.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Barley (*Hordeum vulgare*)	Rust	*Puccinia* sp.	1
Bean (*Phaseolus vulgaris*)	Fusarium root rot	*Fusarium solani*	1
	Alternaria leaf spot	*Alternaria* sp.	1
	Pythium crown and root rot	*Pythium* spp.	1
	Anthracnose	*Colletotrichum lindemuthianum*	1
	Anthracnose	*Colletotrichum* sp.	1
	Common bacterial blight	*Xanthomonas campestris*	1
Canola (*Brassica napus*)	Root rot	*Fusarium* sp.	1
Corn (*Zea mays*)	Fusarium stalk rot	*Fusarium moniliforme*	2
	Black mould	*Alternaria* sp.	1
	Phaeosphaeria sp.	*Phaeosphaeria* sp.	1
	Stalk rot	Fusarium sp.	1
Soybean (*Glycine max*)	Root rot	*Fusarium* sp.	7
	Anthracnose	*Colletotrichum* sp.	3
Wheat (*Triticum* sp.)	Septoria leaf spot	*Septoria* sp.	6

Table 6. Summary of plant diseases diagnosed on **herbs and special crops** submitted to the University of Guelph Pest Diagnostic Clinic in 2011.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Basil (*Ocimum basilicum*)	Downy mildew	*Peronospora belbahrii*	2
Dill (*Anethum graveolens*)	Leaf blight	*Itersonilia perplexans*	1
Fenugreek (*Trigonella foenum-graecum*)	Alternaria leaf spot	*Alternaria* sp.	1
Ginseng (*Panax* sp.)	Root rot	*Fusarium* sp.	1
Hop (*Humulus lupulus*)	Bacterial blight	*Pseudomonas syringae*	1
	Downy mildew	*Pseudoperonospora humuli*	2
	Alternaria leaf spot	*Alternaria* sp.	1
Lavender (*Lavandula* sp.)	Bacterial leaf spot	*Pseudomonas viridilivida*	1
	Pythium root rot	*Pythium sylvaticum*	1
Quinoa (*Chenopodium quinoa*)	Phomopsis canker	*Phomopsis* sp.	1
Sage (*Salvia* sp.)	Anthracnose	*Colletotrichum* sp.	1
Sugar beet (*Beta vulgaris*)	Leaf spot	*Cercospora* sp.	1
	Root rot	*Fusarium* sp.	1
Sweet potato (*Ipomoea batatas*)	Dry rot	*Fusarium* sp.	1

CROPS: Commercial Crops **-** Diagnostic Laboratory Report
LOCATION: Ontario

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TITLE: DISEASES DIAGNOSED ON PLANT SAMPLES SUBMITTED TO THE PEST DIAGNOSTIC CLINIC, UNIVERSITY OF GUELPH IN 2012

ABSTRACT: Diseases and their causal agents diagnosed on plant samples received by the Pest Diagnostic Clinic, University of Guelph in 2012 are summarized in this report. Samples included greenhouse vegetables, annual and perennial ornamental plants, field crops, berry crops, tree fruit, turfgrass and trees. Soybean Vein Necrosis Virus was confirmed in Ontario for the first time.

METHODS: The Pest Diagnostic Clinic of the University of Guelph provides plant pest diagnostic services to growers, agri-businesses, provincial and federal governments and homeowners across Canada. Services include disease diagnosis, plant parasitic nematode identification and enumeration, pathogen detection from soil and water, and insect and plant identification. The following data are for samples received by the laboratory for disease diagnosis in 2012. Diagnoses were accomplished using microscopic examination, culturing on artificial media, biochemical identification of bacteria using BIOLOG®, enzyme-linked immunosorbent assay (ELISA), and polymerase chain reaction (PCR)-based techniques including DNA multiscan, PCR and RT-PCR, and DNA sequencing.

RESULTS AND COMMENTS: In 2012, from January 1 to December 31, the Pest Diagnostic Clinic received samples representing plants in over 95 genera for disease diagnosis. Results are presented in Tables 1 - 6 below. For various reasons, frequency of samples submitted to the laboratory does not reflect the prevalence of diseases of various crops. Problems caused by plant parasitic nematodes, insects, and abiotic factors are not listed. Most of the diseases identified in 2012 are commonly diagnosed with the exception of soybean vein necrosis virus, which was confirmed in Ontario for the first time.

Table 1. Summary of plant diseases diagnosed on **vegetable** samples (including **greenhouse vegetables**) submitted to the University of Guelph Pest Diagnostic Clinic in 2012.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Broccoli (*Brassica oleracea*)	Black rot	*Xanthomonas campestris*	1
Cantaloupe (*Cucumis melo*)	Black root rot	*Thielaviopsis basicola*	1
	Fusarium wilt	*Fusarium oxysporum*	1
	Pythium root rot	*Pythium* sp.	1
Carrot (*Daucus carota*)	Dry rot	*Fusarium* sp.	1
	Fusarium crown and root rot	*Fusarium* sp.	1
	Grey mold	*Botrytis cinerea*	1
	Pythium root rot	*Pythium* sp.	2

Table 1, contd.

Cauliflower (*Brassica oleracea*)	Bacterial leaf spot	*Pseudomonas syringae*	1
	Black spot	*Alternaria brassicae*	1
	Cladosporium rot	*Cladosporium* sp.	1
	Fusarium crown and root rot	*Fusarium* sp.	1
	Head rot	*Pseudomonas fluorescens*	1
	Pythium crown and root rot	*Pythium ultimum*	1
	Pythium root rot	*Pythium* sp.	1
	Rhizoctonia root rot	*Rhizoctonia solani*	1
Celery (*Apium graveolens*)	Celery leaf curl	*Colletotrichum acutatum*	2
	Fusarium crown and root rot	*Fusarium sp.*	1
	Phytoplasma	*Candidatus* Phytoplasma sp.	1
	Pythium root rot	*Pythium ultimum*	2
Chinese cabbage (*Brassica rapa pekinensis*)	Black rot	*Xanthomonas campestris*	1
Cilantro (*Coriandrum sativum*)	Pythium root rot	*Pythium* sp.	1
	Root rot	*Fusarium* sp.	1
Cucumber (*Cucumis sativus*)	Alternaria rot	*Alternaria* sp.	1
	Bacterial wilt	*Erwinia tracheiphila*	2
	Beet Pseudo-yellows Virus	Beet Pseudo-yellows Virus (BPYV)	1
	Cucumber Green Mottle Mosaic Virus	Cucumber Green Mottle Mosaic Virus (CGMMV)	2
	Leaf spot	*Fusarium solani*	1
	Powdery mildew	Oidium sp.	1
	Pythium crown and root rot	*Pythium aphanidermatum*	2
	Pythium crown and root rot	*Pythium dissotocum*	1
	Pythium root rot	*Pythium ultimum*	1
	Rhizoctonia root rot	*Rhizoctonia solani*	1
	Root and crown rot	*Fusarium oxysporum*	1
	Fusarium stem rot	*Fusarium oxysporum*	1
Diakon radish (*Raphanus sativus*)	Black mold	*Alternaria sp.*	1
Eggplant (*Solanum melongena*)	White mold	*Sclerotinia sclerotiorum*	1
Garlic (*Allium sativum*)	Basal plate rot	*Fusarium oxysporum*	2
	Botrytis rot	*Botrytis* sp.	1
	Botrytis neck rot	*Botrytis* sp.	2

Table 1, contd.

Garlic (*Allium sativum*)	Embellisia skin blotch	*Embellisia allii*	2
	Fusarium rot	*Fusarium* sp.	11
	Penicillium decay	*Penicillium* sp.	1
	Pythium root rot	*Pythium ultimum*	1
	Rhizoctonia root and crown rot	*Rhizoctonia solani*	3
Green onion (*Allium fistulosum*)	Fusarium rot	*Fusarium oxysporum*	1
Lettuce (*Lactuca sativa*)	Pythium root rot	*Pythium* sp.	1
	Root rot	*Fusarium* sp.	1
Onion (*Allium cepa*)	Aster yellows	*Candidatus* Phytoplasma sp.	1
	Bacterial soft rot	*Pectobacterium carotovorum subsp. carotovorum*	1
	Basal plate rot	*Fusarium oxysporum*	4
	Black mold	*Aspergillus niger*	1
	Fusarium plate rot	*Fusarium* sp.	1
	Iris Yellow Spot Virus	Iris Yellow Spot Virus (IYSV)	1
	Leaf blight	*Stemphylium* sp.	26
	Phytoplasma	*Candidatus* Phytoplasma sp.	1
	Purple blotch	*Alternaria porri*	3
	Slippery skin	*Burkholderia gladioli* pv. *alliicola*	2
	Sour skin	*Burkholderia* sp.	2
Pepper (*Capsicum annuum*)	Alternaria leaf spot	Alternaria sp.	1
	Bacterial soft rot	*Pectobacterium carotovorum*	2
	Cucumber Mosaic Virus	Cucumber Mosaic Virus (CMV)	1
	Damping-off	*Pythium aphanidermatum*	1
	Pythium root rot	*Pythium aphanidermatum*	2
	Fusarium rot	*Fusarium* spp.	3
	Phytophthora blight	*Phytophthora capsici*	2
	Pythium crown and root rot	*Pythium* sp.	2
	Pythium root rot	Pythium dissotocum	1
	Root and crown rot	*Fusarium oxysporum*	3
	Root and crown rot	*Fusarium solani*	1
	Root and crown rot	*Phytophthora* sp.	1
	Tomato Spotted Wilt Virus	Tomato Spotted Wilt Virus (TSWV)	2
Potato (*Solanum tuberosum*)	Bacterial soft rot	*Pseudomonas marginalis*	1

Table 1, contd.

Potato (*Solanum tuberosum*)	Black dot	*Colletotrichum coccodes*	1
	Black leg	*Erwinia carotovora* subsp. *atroseptica*	1
	Black scurf	*Rhizoctonia solani*	2
	Dry rot	*Fusarium* sp.	2
	Early blight	*Alternaria solani*	1
	Leak	*Pythium aphanidermatum*	1
	Pink rot	*Phytophthora cryptogea*	1
	Wilt	*Fusarium* sp.	2
Pumpkin (*Cucurbita pepo*)	Bacterial blight	*Pseudomonas viridiflava*	1
Radish (*Raphanus sativus*)	Bacterial leaf spot	*Xanthomonas campestris*	1
Rutabaga (*Brassica napus*)	Rhizoctonia rot	*Rhizoctonia solani*	1
Sugar beet (*Beta vulgaris*)	Leaf spot	*Alternaria* sp.	1
	Anthracnose	*Colletotrichum* sp.	1
	Stemphylium leaf spot	*Stemphylium* sp.	1
Sweet potato (*Ipomoea batatas*)	Sweet Potato Feathery Mottle Virus	Sweet Potato Feathery Mottle Virus (SPFMV)	1
Tomato (*Lycopersicon esculentum*)	Anthracnose	*Colletotrichum* sp.	3
	Bacterial canker	*Clavibacter michiganensis* subsp. *michiganensis*	14
	Bacterial leaf spot	*Xanthomonas campestris*	4
	Bacterial stem rot	*Pectobacterium carotovorum*	1
	Black mold	*Alternaria alternata*	2
	Buckeye Rot	*Phytophthora capsici*	2
	Corky root rot	*Pyrenochaeta lycopersici*	1
	Fusarium root rot	*Fusarium oxysporum*	2
	Fusarium wilt	*Fusarium oxysporum*	1
	Pepino Mosaic Virus	Pepino Mosaic Virus (PepMV)	1
	Phytophthora crown and root rot	*Phytophthora capsici*	1
	Phytophthora root rot	*Phytophthora drechsleri*	1
	Powdery mildew	*Oidium* sp.	2
	Pythium crown and root rot	*Pythium aphanidermatum*	3
	Pythium crown and root rot	*Pythium dissotocum*	4
	Pythium crown and root rot	*Pythium irregulare*	1
	Pythium root rot	*Pythium* sp.	7
	Pythium root rot	*Pythium ultimum*	1
	Rhizoctonia root rot	*Rhizoctonia solani*	1
	Rhizopus canker	*Rhizopus sp.*	1

Table 1, contd.

Tomato (*Lycopersicon esculentum*)	Root and crown rot	*Fusarium oxysporum*	2
	Root and crown rot	*Fusarium solani*	1
	Root and crown rot	*Fusarium* sp.	14
	Stem rot	*Phytophthora capsici*	2
	Tomato Spotted Wilt Virus (TSWV)	Tomato Spotted Wilt Virus (TSWV)	1
	Verticillium wilt	*Verticillium* sp.	3

Table 2. Summary of plant diseases diagnosed on **fruit** samples submitted to the University of Guelph Pest Diagnostic Clinic in 2012.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Apple (*Malus domestica*)	Alternaria blotch	*Alternaria* sp.	13
	Bitter rot	*Colletotrichum acutatum*	8
	Black rot	*Botryosphaeria obtusa*	2
	Calyx-end rot	*Sclerotinia sclerotiorum*	1
	Diplodia canker	*Botryosphaeria* sp.	1
	Fireblight	*Erwinia amylovora*	3
	Fusarium crown and root rot	*Fusarium* spp.	2
	Pythium root rot	*Pythium sylvaticum*	1
	Root and crown rot	*Rhizoctonia solani*	2
Blueberry (*Vaccinium* sp.)	Canker and dieback	*Neofusicoccum parvum*	1
	Fusarium crown and root rot	*Fusarium* sp.	1
	Phoma stem canker and dieback	*Phoma* sp.	1
	Pythium root rot	*Pythium* sp.	1
	Twig dieback	*Pestalotiopsis* sp.	1
Cranberry (*Vaccinium* sp.)	Pestalotia leaf spot	*Pestalotia* sp.	2
Nectarine (*Prunus persica* var. *nucipersica*)	Peach leaf curl	*Taphrina deformans*	1
Peach *(Prunus persica*)	Bacterial spot	*Xanthomonas campestris*	2
Pear (*Pyrus communis*)	Rust	*Gymnosporangium* sp.	1
Pear (*Pyrus communis*)	Scab	*Venturia pirina*	1
Red raspberry (*Rubus idaeus*)	Leaf spot	*Cercospora* sp.	1
	Potyvirus	Potyvirus	3
	Pythium root rot	*Pythium* sp.	1
	Rhizoctonia root rot	*Rhizoctonia solani*	1
	Tomato Ringspot Virus	Tomato Ringspot Virus (ToRSV)	1

Table 2, contd.

Strawberry (*Fragaria* sp.)	Gnomonia crown rot	*Gnomonia* sp.	3
	Phytophthora root rot	*Phytophthora drechsleri*	1
	Pythium root rot	*Pythium* sp.	8
	Red stele	*Phytophthora fragariae*	1
	Rhizoctonia root and crown rot	*Rhizoctonia solani*	12
	Root and crown rot	*Phytophthora cactorum*	2
	Root and crown rot	*Fusarium oxysporum*	2
	Root and crown rot	*Fusarium* sp.	2
	Root and crown rot	*Phytophthora* sp.	1
	Strawberry Pallidosis Virus	Strawberry Pallidosis Virus (SPaV)	1
	Verticillium wilt	*Verticillium dahliae*	3
Sweet cherry (*Prunus avium*)	Bacterial canker	*Pseudomonas syringae*	1

Table 3. Summary of plant diseases diagnosed on **herbaceous ornamental** plants submitted to the University of Guelph Pest Diagnostic Clinic in 2012.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Bacopa (*Bacopa* sp.)	Botrytis stem blight	*Botrytis cinerea*	1
Bentgrass (*Agrostis* sp.)	Anthracnose basal rot	*Colletotrichum graminicola*	3
	Blight	*Fusarium* sp.	2
Begonia (*Begonia* sp.)	Pythium root rot	*Pythium* sp.	2
Calathea (*Calathea* sp.)	Fusarium rot	*Fusarium oxysporum*	1
	Phytophthora root rot	*Phytophthora nicotianae*	1
Calla lily (*Zantedeschia* sp.)	Pythium root rot	Pythium sp.	2
Cana lily (*Cana* sp.)	Potyvirus	Potyvirus	2
Chrysanthemum (*Chrysanthemum* sp.)	Fusarium wilt	*Fusarium oxysporum*	1
	Phytophthora root rot	*Phytophthora drechsleri*	1
	Pythium root rot	*Pythium aphanidermatum*	2
	Pythium root rot	*Pythium dissotocum*	1
Coleus (*Solenostemon* sp.)	Pythium root rot	Pythium sp.	1
Cyclamen (*Cyclamen* sp.)	Fusarium wilt	*Fusarium oxysporum*	1
Dahlia (*Dahlia* sp.)	Pythium root rot	*Pythium* sp.	1
Dandelion (*Taraxacum officinale*)	Rhizoctonia root rot	*Rhizoctonia solani*	1

Table 3, contd

Dendrobium orchid (*Dendrobium* sp.)	Phyllosticta leaf spot	*Phyllosticta* sp.	1
Dieffenbachia (*Dieffenbachia* sp.)	Leaf spot	*Myrothecium* sp.	1
	Root and crown rot	*Phytophthora nicotianae*	1
	Bipolaris leaf spot	*Bipolaris* sp.	1
Echinacea (*Echinacea* sp.)	Aster yellows	*Candidatus* Phytoplasma sp.	2
Garden phlox (*Phlox paniculata*)	Black root rot	*Thielaviopsis basicola*	1
Gardenia (*Gardenia* sp.)	Root and crown rot	*Phytophthora nicotianae*	1
Gazania (*Gazania* sp.)	Powdery mildew	*Oidium* sp.	1
Gentiana (*Gentiana* sp.)	Stem rot	*Fusarium solani*	1
Geranium (*Pelargonium* sp.)	Crown rot	*Botrytis cinerea*	2
Geranium (*Pelargonium* sp.)	Pythium root and crown rot	*Pythium irregulare*	1
Gerbera (*Gerbera* sp.)	Pythium root rot	*Pythium* sp.	2
Goldenseal (*Hydrastis canadensis*)	Rhizoctonia root and crown rot	*Rhizoctonia solani*	1
	Root and stem rot	*Fusarium* sp.	1
Grass species (Gramineae)	Anthracnose basal rot	*Colletotrichum graminicola*	1
	Pythium root rot	*Pythium* sp.	1
Hydrangea (*Hydrangea* sp.)	Blight	*Phytophthora* sp.	1
	Leaf spot	*Myrothecium roridum*	1
Impatiens (*Impatiens wallerana*)	Pythium rot	*Pythium* sp.	1
	Rhizoctonia crown rot	*Rhizoctonia solani*	1
Kalanchoe (*Kalanchoe* sp.)	Fusarium root rot	*Fusarium oxysporum*	1
	Pythium crown and root rot	*Pythium dissotocum*	1
	Root and crown rot	*Fusarium* sp.	1
	Root and crown rot	*Phytophthora nicotianae*	1
Large periwinkle (*Vinca major*)	Bacterial leaf spot	*Acidovorax konjaci*	1
Lavender (*Lavandula* sp.)	Pythium crown and root rot	Pythium sp.	1
	Root and crown rot	*Fusarium* sp.	1
Lenten rose (*Helleborus* sp.)	Pythium root rot	*Pythium* sp.	1
	Root rot	*Fusarium* sp.	1
Lily (*Lilium* sp.)	Pythium root rot	*Pythium* sp.	2
	Root and crown rot	*Fusarium sp.*	3

Table 3, contd

Mandevilla (*Mandevilla* sp.)	Fusarium stem rot	*Fusarium oxysporum*	2
Monarda (*Monarda* sp.)	Bacterial blight	*Pseudomonas cichorii*	1
Money Tree (*Pachira aquatica*)	Botryodiplodia canker	*Botryodiplodia* sp.	3
Moth orchid (*Phalaenopsis* sp.)	Root rot	*Fusarium solani*	1
Orchid (*Bifrenaria harrisoniae* sp.)	Root and crown rot	*Fusarium* sp.	1
Orchid (*Masdevallia* sp.)	Root and crown rot	*Fusarium* sp.	1
Orchid (*Neolauchea* sp.)	Root and crown rot	*Fusarium* sp.	1
Orchid (*Odontoglossum* sp.)	Phyllosticta leaf spot	*Phyllosticta* sp.	1
	Root and crown rot	*Fusarium* sp.	1
Pachysandra (*Pachysandra* sp.)	Volutella blight	*Volutella pachysandrae*	1
Phlox (*Phlox subulata*)	Anthracnose	*Colletotrichum* sp.	1
	Downy mildew	*Peronospora* sp.	4
	Grey mold	*Botrytis cinerea*	3
Poinsettia (*Euphorbia pulcherrima*)	Fusarium crown and root rot	*Fusarium* spp.	1
Rose (*Rosa* sp.)	Downy mildew	*Peronospora* sp.	1
	Fusarium rot	*Fusarium* spp.	1
	Pythium root rot	*Pythium* sp.	1
	Rhizoctonia root rot	*Rhizoctonia solani*	1
	Root and crown rot	*Fusarium* spp.	1
	Root rot	*Phytophthora* sp.	1
	Stem canker	*Botrytis* sp.	1
Russelia (*Russelia* sp.)	Pythium crown and root rot	*Pythium* sp.	1
Sedum (*Sedum* sp.)	Leaf spot	*Colletotrichum* sp.	1
	Stem rot	*Colletotrichum* sp.	1
Tulip (*Tulipa gesneriana*)	Blue mold	*Penicillium* sp.	1
	Bulb rot	*Penicillium* sp.	1
	Fusarium root rot	*Fusarium culmorum*	2
	Pythium root rot	*Pythium* sp.	2
	Root rot	*Fusarium* sp.	3
Zinnia (*Zinnia* sp.)	Botrytis leaf blight	*Botrytis cinerea*	1

Table 4. Summary of plant diseases diagnosed on **woody ornamentals** submitted to the University of Guelph Pest Diagnostic Clinic in 2012.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
American elm (*Ulmus americana*)	Cytospora canker	*Cytospora* sp.	1
Austrian pine (*Pinus nigra*)	Brown spot needle blight	*Mycosphaerella* sp.	1
Balsam fir (*Abies balsamea*)	Sphaeropsis shoot blight	*Sphaeropsis* sp.	1
Beech (*Fagus* sp.)	Botryosphaeria canker	*Botryosphaeria* sp.	1
	Phomopsis canker	*Phomopsis* sp.	1
	Twig dieback	*Pestalotiopsis* sp.	1
Boxwood (*Buxus* sp.)	Leaf blight	*Phoma* sp.	3
	Macrophoma leaf spot	*Macrophoma* sp.	3
	Phyllosticta leaf spot	*Phyllosticta* sp.	1
	Root rot	*Phytophthora* sp.	1
	Volutella stem canker and leaf blight	*Volutella buxi*	137
Eastern white cedar (*Thuja occidentalis*)	Shoot blight	*Pestalotiopsis* sp.	1
Eastern white pine (*Pinus strobus*)	Foliage Blight	*Pestalotia* sp.	1
	Pythium root rot	*Pythium ultimum*	1
	Root rot	*Cylindrocarpon* sp.	1
	Root rot	*Fusarium solani*	1
	Shoot blight	*Pestalotiopsis* sp.	2
European beech (*Fagus sylvatica*)	Botryosphaeria canker	*Botryosphaeria* sp.	1
Forsythia (*Forsythia* sp.)	Bacterial blight	*Pseudomonas viridiflava*	1
Japanese Maple (*Acer palmatum*)	Phoma stem canker and dieback	*Phoma* sp.	1
Juniper (*Juniperus* sp.)	Twig dieback	*Pestalotiopsis* sp.	2
Larch (*Larix* sp.)	Phomopsis blight	*Phomopsis* sp.	1
Lilac (*Syringa* sp)	Bacterial blight	*Pseudomonas syringae*	1
	Phomopsis twig blight	*Phomopsis* sp.	1
Linden (*Tilia* sp.)	Phomopsis canker	*Phomopsis* sp.	1
Lodgepole pine (*Pinus contorta*)	Black root rot	*Thielaviopsis basicola*	1
	Pythium root rot	*Pythium* sp.	1
	Root rot	*Fusarium solani*	1
Maple (*Acer* sp.)	Anthracnose	*Colletotrichum* sp.	1
	Powdery mildew	*Oidium* sp.	1
Microbiota (*Microbiota* sp.)	Shoot blight	*Pestalotiopsis* sp.	1
	Fusarium sp.	*Fusarium* sp.	1

Table 4, contd.

Mulberry (*Morus* sp.)	Canker	*Fusarium* sp.	1
Prunus (*Prunus* sp.)	Dieback	*Botryosphaeria obtusa*	1
Red osier dogwood (*Cornus stolonifera*)	Bacterial leaf spot	*Pseudomonas syringae*	1
Rhododendron (*Rhododendron* sp.)	Botrytis leaf blight	*Botrytis cinerea*	1
	Leaf spot	*Pestalotiopsis* sp.	1
Sequoiadendron (*Sequoiadendron giganteum*)	Fusarium rot	*Fusarium* spp.	1
	Pythium rot	*Pythium* sp.	1
	Rhizoctonia rot	*Rhizoctonia solani*	1
Serbian spruce (*Picea omorika*)	Sphaeropsis tip blight	*Sphaeropsis sapinea*	1
Tuliptree (*Liriodendron* sp.)	Powdery mildew	*Oidium* sp.	1
Willow (*Salix* sp.)	Fusarium rot	*Fusarium* spp.	1

Table 5. Summary of plant diseases diagnosed on **field crops** submitted to the University of Guelph Pest Diagnostic Clinic in 2012.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Bean (*Phaseolus vulgaris*)	Potyvirus	Potyvirus	1
Clover (*Trifolium* sp.)	Anthracnose	*Colletotrichum* sp.	1
	Pseudopeziza leaf spot	*Pseudopeziza* sp.	3
	Rust	*Uromyces* sp.	2
	Sooty blotch	*Cymadothea trifolii*	1
	Rust	*Puccinia* sp.	3
Corn (*Zea mays*)	Fusarium rot	*Fusarium oxysporum*	2
	Holcus spot	*Pseudomonas syringae* pv. *syringae*	1
	Pythium root rot	*Pythium* sp.	6
	Stalk Rot	*Fusarium* sp.	1
Soybean (*Glycine max*)	Charcoal rot	*Macrophomina phaseolina*	2
	Fusarium crown and root rot	*Fusarium* spp.	9
	Pythium crown and root rot	*Pythium* spp.	5
	Rhizoctonia rot	*Rhizoctonia solani*	1
	Soybean Vein Necrosis Virus	Soybean Vein Necrosis Virus (SVNV)	2
	Stem Blight	*Phomopsis* sp.	1
	Sudden Death Syndrome	*Fusarium solani* f. sp. *glycines*	1

Table 6. Summary of plant diseases diagnosed on **herbs and special crops** submitted to the University of Guelph Pest Diagnostic Clinic in 2012.

CROP NAME	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Ginseng (*Panax* sp.)	Root rot	*Cylindrocarpon destructans*	1
Hazelnut (*Corylus* sp.)	Black root rot	*Thielaviopsis basicola*	1
Rosemary (*Rosmarinus officinalis*)	Black root rot	*Thielaviopsis basicola*	1
Sage (*Salvia* sp.)	Black root rot	*Thielaviopsis basicola*	1
Wolfberry (*Lycium* sp.)	Anthracnose	*Colletotrichum acutatum*	2

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

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TITLE: DISEASES DIAGNOSED ON VEGETABLE CROPS SUBMITTED TO THE MUCK CROPS RESEARCH STATION DIAGNOSTIC LABORATORY IN 2012

ABSTRACT: As part of the integrated pest management program of the Muck Crops Research Station, diagnostic service is provided to vegetable growers around the Holland/Bradford Marsh, Ontario. In 2012, 238 samples were submitted to the laboratory for identification and possible control recommendations. Samples included infectious diseases, physiological disorders, weeds, insects and insect damage.

METHODS: As part of the integrated pest management (IPM) program, the plant disease diagnostic laboratory of the Muck Crops Research Station (MCRS), provides diagnosis and control recommendations for diseases of vegetable crops to growers in the Bradford/Holland Marsh, and surrounding area of Ontario. The objectives are to scout growers' fields, provide growers with disease and insect forecasting information and 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 visual examination of symptoms, microscopic observations and culturing on growth media.

RESULTS AND COMMENTS: Weather conditions in the 2012 growing season were conducive for the development of many pathogens including bacteria, *Pythium* spp., *Sclerotinia* spp*. and Rhizoctonia* spp*.* A high incidence of heat canker was observed on carrot due to a heat wave and shortage of rain in June. Excessive soil moisture from above average rainfall in July created ideal conditions for soil-borne pathogens, particularly *Pythium* spp*.* and *Rhizoctonia* spp. on carrot. From 8 January to 15 November, 2012, the diagnostic laboratory of the MCRS received 238 samples for diagnosis. Of these, 58% (138) were infectious diseases and 27% (65) physiological disorders. The samples were associated with the following crops: onion (33.3%), carrot (21.7%), celery (17.9%), lettuce (5.8%), and other vegetables (22.3%). A total of 27 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 2012 is presented in Table 1.

Table 1: Summary of plant diseases diagnosed on crops submitted to the Muck Crops Research Station Diagnostic Laboratory in 2012.

CROP	DISEASE	CAUSAL AGENT	NUMBER OFSAMPLES
Beet	Alternaria leaf spot	*Alternaria brassicae*	1
Broccoli	Nutrient deficiency	P deficiency	1
Cabbage	Black rot	Ca deficiency	1
Carrot	Aster yellows	*Candidatus* Phytoplasma asteris	8
	Crown rot	*Rhizoctonia solani*	3
	Cavity spot	*Pythium* spp.	1
	Grey mould	*Botrytis cinerea*	1
	Sclerotinia rot	*Sclerotinia sclerotiorum*	2

Table 1 (contd.)

Carrot	Leaf blight	*Alternaria dauci* and *Cercospora carotae*	3
	Growth crack (split)	Fluctuating moisture level	3
	Pythium root dieback	*Pythium spp.*	3
	Crater rot	*Rhizoctonia carotae*	3
	Soft rot	*Erwinia carotovora*	3
	Crown gall	*Agrobacterium tumefaciens*	1
	Fusarium rot	*Fusarium* spp.	1
	Chemical injury	Herbicide damage	3
	Forking	Growth point damage	2
	Heat canker	High temperatures	7
	Bruising	Physiological disorder	1
Celery	Aster yellows	*Candidatus* Phytoplasma asteris	6
	Bacterial leaf blight	*Pseudomonas cichorii*	3
	Bacterial leaf spot	*Pseudomonas syringae* pv.*apii*	4
	Bacterial rot	*Erwinia carotovora*	7
	Early blight	*Cercospora apii*	1
	Nutrient deficiency	B deficiency	3
	Nutrient deficiency	Mg deficiency	2
	Physiological disorder	Heat stress	2
	Blackheart	Ca deficiency	2
	Chemical injury	Herbicide damage	6
Collard	Soft rot	*Erwinia* spp.	1
	Alternaria leaf spot	*Alternaria* spp.	1
	Hollow stem	Environmental injury	1
Coriander	Alternaria leaf spot	*Alternaria* spp.	1
Eggplant	Physiological disorder	Frost damage	1
Garlic	Rust	*Puccinia allii*	1
	Purple blotch	*Alternaria porri*	1
	Bulb and stem nematode	*Ditylenchus dipsaci*	1
	Basal rot	*Fusarium oxysporum* f. sp. *cepae*	1
Green onion	Physiological disorder	Pelting rain injury	1
Kale	Downy mildew	*Hyaloperonospora parasitica*	1
	Alternaria leaf spot	*Alternaria brassicae*	1
Leek	Pink root	*Phoma terrestris*	1
	Aster yellows	Phytoplasma	1
	Chemical injury	Herbicide damage	1
Lettuce	Lettuce drop	*Sclerotinia sclerotiorum* and *S. minor*	2
	Grey mould	*Botrytis cinerea*	3
	Bacterial leaf spot	*Xanthomonas campestris* pv. *vitians*	3
	Downy mildew	*Bremia lactucae*	1
	Powdery mildew	*Erysiphe cichoracearum*	1
	Anthracnose	*Microdochium panattonianum*	1
	Tipburn	Heat stress/Ca deficiency	1
Long bean	Grey mould	*Botrytis cinerea*	1
Napa cabbage	Alternaria leaf spot	*Alternaria brassicae*	1
Onion	Stemphylium leaf blight	*Stemphylium vesicarium*	12
	Purple blotch	*Alternaria porri*	18
	Pink root	*Phoma terrestris*	5
	Botrytis leaf blight	*Botrytis squamosa*	3
	Soft rot	*Erwinia carotovora*	2
	Smut	*Urocystis cepulae*	2
	Anthracnose	*Colletotrichum* sp.	1

Table 1 (contd.)

Onion	White rot	*Sclerotium cepivorum*	4
	Sour skin	*Pseudomonas cepacia*	1
	Blue mould	*Penicillium* sp.	2
	Slippery skin	*Burkholderia gladioli* pv. *alliicola*	1
	Tipburn	Heat stress	9
	Chemical injury	Herbicide damage	6
	Environmental injury	Pelting rain injury	3
Pak choi	Downy mildew	*Hyaloperonospora parasitica*	1
	Alternaria black spot	*Alternaria brassicae*	1
	Tipburn	Ca deficiency	1
Parsley	Alternaria leaf spot	*Alternaria petroselini*	2
	Aster yellows	Phytoplasma	1
	Early blight	*Cercospora apii*	1
	Tipburn	Heat stress	1
Radish	Downy mildew	*Hyaloperonospora parasitica*	1
	Tipburn	Ca deficiency	1
Shangai pak choi	Environmental injury	Pelting rain injury	1
Spinach	Nutrient deficiency	Zn or Mg deficiency	2
	Chemical injury	Herbicide damage	1
	Nutrient deficiency	Mn deficiency	1
	Tipburn	Heat stress/Ca deficiency	1
Squash	Scab	*Cladosporium cucumerinum*	1
	Powdery mildew	*Sphaerotheca fuliginea*	1
	Alternaria leaf blight	*Alternaria cucumerina*	1
Swiss chard	Cercospora leaf spot	*Cercospora beticola*	1
Turnip	Alternaria leaf blight	*Alternaria brassicae*	1
DISEASED SAMPLES			**138**
ABIOTIC AND OTHER DISORDERS			**65**
TOTAL SUBMISSIONS			**203**

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 REÇUS AU LABORATOIRE DE DIAGNOSTIC EN PHYTOPROTECTION DU MAPAQ EN 2012

RÉSUMÉ : 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 des cultures commerciales au Québec. Du 1er janvier au 15 décembre 2012, 1374 maladies ont été identifiées dont, 798 attribuables aux champignons, 182 aux bactéries, 56 aux virus, 37 aux nématodes et 29 aux phytoplasmes. Les plantes maraîchères portaient 41% des maladies identifiées; les petits fruits 29%. Le PVY détecté chez la pomme de terre et la tomate ainsi que des phytoplasmes dans le concombre sont quelques maladies nouvellement identifiées à notre laboratoire.

ABSTRACT: The plant protection diagnostics laboratory of the Quebec Ministry of Agriculture and Food provides an identification service for diseases of commercial crops in Quebec. Between January 1 and December 15, 2012 1374 diseases were identified, the majority due to fungi or bacteria. Field vegetable and small fruit diseases were the most common types. Two diseases newly identified at this laboratory were phytoplasmas in cucumber and PVY in potato and tomato.

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 parasitaires et non parasitaires pour les cultures commerciales produites au Québec. Les données rapportées présentent les maladies identifiées sur les échantillons de plantes provenant des conseillers agricoles des secteurs publics et privés, de la Financière agricole du Québec, de l'Institut québécois du développement de l'horticulture ornementale (IQDHO) et par ceux de l'industrie. Tous les échantillons font l'objet d'un examen visuel préalable suivi d'un examen à la loupe binoculaire. Selon les symptômes, un ou plusieurs tests diagnostiques sont réalisés dans le but de détecter ou d'identifier l'agent pathogène. Tous les tests de diagnostic utilisés au laboratoire sont largement cités dans la littérature scientifique; 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 principalement 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 sur les cultures commerciales. Au tableau 1, les maladies des plantes maraîchères de plein champ regroupent aussi les transplants provenant des serres et des pépinières. Les maladies des légumes entreposées listées au tableau 2 incluent les 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 ou vivaces.

Les totaux des maladies ne correspondent pas au nombre d'échantillons réellement traités 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 microorganismes spécifiques. 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, l'excès ou le manque d'irrigation et les blessures mécaniques. 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, les vents forts et la grêle brisant les feuilles.

Du 1er janvier au 15 décembre 2012, 1374 maladies ont été identifiées. Parmi ces maladies, 1104 (80%) sont d'origine parasitaire soit une proportion comparable à celle de 2010. Cette proportion demeure supérieure à la moyenne de 72% des trois dernières années. Parmi le total des maladies parasitaires, 798 sont attribuables aux champignons, 182 aux bactéries, 56 aux virus, 37 aux nématodes et 29 aux phytoplasmes.

Les plantes maraîchères de toutes provenances portaient 41% des maladies identifiées; les petits fruits 29%. PepMV est le virus le plus fréquent (tomate, *Solanum* sp.) parmi les19 types de virus qui ont été détectés. La maladie la plus fréquemment identifiée est la pourriture noire des racines du fraisier. L'importance des *Ditylenchus* a été mise en évidence lors d'une enquête réalisée dans les productions d'ail. Une enquête comparable sur la situation des maladies du cerisier nain a aussi démontré l'importance de la criblure des feuilles. Le feu bactérien et la tavelure du pommier, pour leur part, ont fait l'objet d'une surveillance accrue dans le cadre de la *Loi sur la Protection sanitaire des Cultures du Québec*.

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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 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Ail	*Botrytis* sp.	Pourriture du col	3
	Cladosporium sp.	Brûlure hétérosporienne	2
	Ditylenchus dipsaci	Enflure	18
	Embellisia allii	Tache et pourriture du bulbe	4
	Fusarium moniliforme / F. oxysporum	Fusariose du plateau	19
	Penicillium sp.	Tache des bulbes	1
	Carences minérales		7
	Insolation		4
	Autres stress climatiques et culturaux		1
Asperge	*Fusarium oxysporum / F. moniliforme*	Pourriture fusarienne	3
	Stemphylium sp.	Tache stemphylienne	2
Aubergine	*Pythium* sp.	Pourridié pythien	3
	Pseudomonas viridiflava	Tache foliaire	1
Betterave/poirée	*Pythium* sp.	Fonte de semis	1
	Rhizoctonia solani	Rhizoctone	2
Brocoli	*Alternaria brassicicola*	Tache noire	1
	Rhizoctonia solani	Rhizoctone	1
	Stress climatiques		3
	Stress culturaux		3
Carotte/panais	*Fusarium* spp.	Chancre et pourriture de racines	5
	Oidium sp.	Blanc	1
	Pectobacterium chrysanthemi	Pourriture molle bactérienne	1
	Phytoplasmes	Malformation racinaire et foliaire	1
	Pythium sp.	Pourridié pythien	2
	Rhizoctonia solani	Rhizoctone	1
	Streptomyces sp.	Gale bactérienne	1
	Thielaviopsis basicola	Pourriture noire des racines	1
	Xanthomonas campestris	Tache bactérienne	1
	Excès d'eau		1
Chou/Chou de Bruxelles/Radis	*Alternaria brassicicola*	Tache noire	2
	Plasmodiophora brassicae	Hernie	1
	Pseudomonas syringae	Moucheture bactérienne	1
	Rhizoctonia solani	Rhizoctone	1
	Septoria sp.	Tache septorienne	1
	Xanthomonas campestris pv. *campestris*	Nervation noire	2
	Grêle		1
	Moucheture noire		2
	Œdème		1

Tableau 1. Sommaire des maladies diagnostiquées parmi les **cultures maraîchères** de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Chou chinois	*Xanthomonas campestris* pv. *campestris*	Nervation noire	1
	Carence de bore		1
Chou-fleur	*Pseudomonas marginalis*	Tache foliaire	1
	Pythium ultimum	Pourridié pythien	1
	Rhizoctonia solani	Rhizoctone	1
	Déséquilibre minéral		2
Citrouille	*Alternaria* spp.	Tache alternarienne	2
	Colletotrichum sp.	Anthracnose	2
	Erwinia tracheiphila	Flétrissement bactérien	3
	Fusarium oxysporum	Fusariose vasculaire	21
	Oidium sp.	Blanc	1
	Papulaspora sp.	Anomalie de coloration de graines	1
	Phoma cucurbitacearum	Pourriture noire	2
	Phytophthora capsici	Pourridié phytophthoréen	10
	Pseudomonas syringae	Tache angulaire	2
	Pythium sp.	Pourridié pythien	12
	Pythium ultimum	Pourriture des fruits	8
Concombre	*Alternaria alternata*	Tache foliaire	1
	Erwinia tracheiphila	Flétrissement bactérien	6
	Fusarium oxysporum	Fusariose vasculaire	1
	Geotrichum candidum	Pourriture des fruits	1
	Pseudomonas syringae	Tache angulaire	2
	Pythium ultimum	Pourriture du fruit	1
	Rhizoctonia solani	Pourriture du fruit	1
Courge/courgette	*Cladosporium cucumerinum*	Gale	1
	Erwinia tracheiphila	Flétrissement bactérien	2
	Colletotrichum sp.	Anthracnose	1
	Fusarium sp.	Pourriture des fruits	1
	Geotrichum candidum	Pourriture des fruits	1
	Pectobacterium carotovorum	Pourriture molle bactérienne	1
	Phoma cucurbitacearum	Pourriture noire	1
	Phytophthora capsici	Pourriture des fruits	1
	Pseudomonas syringae	Tache angulaire	1
	Septoria cucurbitacearum	Tache septorienne	2
	SqMV	Mosaïque	2
	Dérèglement génétique		1
	Excès de chaleur		1
Endive	Phytoplasmes	Anomalie de coloration foliaire	1

Tableau 1. Sommaire des maladies diagnostiquées parmi les **cultures maraîchères** de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Épinard	*Fusarium oxysporum*	Pourriture des racines et collets	1
	Phytophthora sp.	Pourridié phytophthoréen	1
	Pythium sp.	Pourridié pythien	2
Haricot/Pois	*Aphanomyces* sp.	Faible développement	4
	CMV	Mosaïque	2
	Fusarium sp.	Dépérissement	8
	Pseudomonas syringae	Graisse bactérienne	2
	Phoma sp.	Tache ascochytique	2
	Pythium sp.	Pourriture pythienne des	5
	Rhizoctonia solani	racines	5
	Thielaviopsis basicola	Rhizoctone	1
	Froid	Pourriture noire des racines	2
	Phytotoxicité herbicides		1
Laitue (frisée, pommée, romaine)	*Alternaria dauci*	Alternariose	1
	Fusarium oxysporum	Pourriture fusarienne des racines	1
	Pseudomonas syringae	Tache luisante	1
	Sclerotinia sclerotiorum	Sclérotiniose	1
	Xanthomonas campestris	Tache bactérienne	2
	Pythium sp.	Pourridié pythien	1
Maïs sucré	*Fusarium oxysporum / F. verticillioides*	Pourriture fusarienne des racines	2
	Pythium ultimum	Pourridié pythien	2
	Phytotoxicité par herbicides		2
Melon/Pastèque	CMV	Anomalie de coloration foliaire	1
	Erwinia tracheiphila	Flétrissement bactérien	2
	Fusarium oxysporum	Fusariose vasculaire	3
	Pseudomonas syringae	Tache angulaire	1
	Excès de chaleur		1
Oignon/ Échalotte/ Poireau	*Colletotrichum circinans*	Anthracnose	1
	Burkholderia cepaciae	Pourriture bactérienne	1
	Burkholderia gladioli	Pourriture brune bactérienne	1
	Fusarium solani / F. oxysporum / Fusarium spp.	Pourriture de bulbes, de racines et de feuilles	3
	Penicillium sp. / *Geotrichum candidum* / levures	Pourriture des bulbes	1
	Pantoea agglomerans	Brûlure apicale des feuilles	1
	Pectobacterium carotovorum	Pourriture molle bactérienne	1
	Pseudomonas syringae	Pourriture molle de feuilles	1
	Carence de bore		1
	Fente de croissance		1
	Phytotoxicité par un pesticide		1
Panais	*Botrytis cinerea*	Moisissure grise	1
	Itersonilia perplexans	Chancre	1

Tableau 1. Sommaire des maladies diagnostiquées parmi les **cultures maraîchères** de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Patate sucrée (Ipomée)	*Geotrichum candidum*	Pourriture caoutchouc	1
	Pythium sp.	Pourridié pythien	1
	Phytotoxicité par un pesticide		1
Poivron	*Alternaria alternata*	Pourriture de fruits	3
	Botrytis cinerea	Moisissure grise	2
	Fusarium oxysporum	Pourriture des racines et du collet	1
	Pectobacterium carotovorum	Pourriture molle bactérienne	1
	Phytophthora capsici	Pourriture de fruits et de racines	2
	Pseudomonas syringae	Moucheture bactérienne	2
	Pseudomonas marginalis	Brûlure foliaire	1
	Pythium sylvaticum / P. ultimum	Pourridié pythien	2
	Grêle		1
	Insolation		1
	Transpiration excessive		1
Pomme de terre	*Alternaria solani*	Alternariose	3
	Colletotrichum coccodes	Dartrose	13
	Fusarium oxysporum / Fusarium sp.	Pourriture fusarienne	7
	Geotrichum candidum	Pourriture caoutchouc	2
	Helminthosporium solani	Tache argentée	1
	Pectobacterium carotovorum	Pourriture molle bactérienne	8
	Pectobacterium chrysanthemi	Pourriture molle bactérienne	1
	Phytoplasmes		1
	Phytophthora erythroseptica	Pourriture rose	2
	Phytophthora infestans	Mildiou	2
	Pseudomonas marginalis, P. viridiflava	Pourriture molle bactérienne	2
	PMTV	Anomalie de coloration du tubercule	2
	PVY	Malformation des tubercules	3
	Pyrenochaeta terrestris	Anomalie de coloration du tubercule	2
	Pythium sp.	Pourriture aqueuse	2
	Rhizoctonia solani	Rhizoctonie	4
	Streptomyces sp.	Gale commune	1
	Verticillium dahliae	Verticilliose	8
	Cœur creux		1
	Excès de chaleur		5
	Fente de croissance		2
	Peau d'éléphant		2
	Phytotoxicité par des herbicides		2
	Sol inadéquat		1
	Virescence		2
	Autres stress climatiques et culturaux		16

Tableau 1. Sommaire des maladies diagnostiquées parmi les **cultures maraîchères** de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Tomate	*Clavibacter michiganensis* ssp. *michiganensis*	Chancre bactérien	3
	Geotrichum candidum	Pourriture laiteuse	1
	Oidium sp.	Blanc	1
	Phytophthora capsici	Pourridié phytophthoréen	1
	Pseudomonas syringae	Moucheture bactérienne	1
	Rhizoctonia solani	Rhizoctone	1
	Verticillium dahliae	Verticilliose	1
	Excès de chaleur		1
	Pourriture apicale		1
Total			**405**

Tableau 2. Sommaire des maladies diagnostiquées parmi les **légumes d'entrepôt** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Ail	*Botrytis* spp.	Pourriture du bulbe	1
	Fusarium oxysporum / F. moniliforme	Pourriture du bulbe	3
	Penicillium sp.	Tache sur bulbe	1
Carotte	*Fusarium solani*	Chancre sur racine	3
	Pythium sp.	Maladie de la tache	1
	Thielaviopsis basicola	Pourriture noire des racines	1
Chou	*Alternaria brassicicola*	Tache noire	1
	Sclerotium rolfsii	Pourriture des feuilles	1
Oignon	*Penicillium* sp.	Tache pourriture du bulbe	1
Panais	*Botrytis cinerea*	Moisissure grise	1
	Itersonilia perplexans	Chancre à Itersonilia	1
Pomme de terre	*Alternaria solani*	Alternariose	2
	Colletotrichum coccodes	Dartrose	3
	Fusarium spp.	Pourriture fusarienne	2
	Geotrichum candidum	Pourriture caoutchouc	2
	Helminthosporium solani	Tache argentée	1
	Pectobacterium carotovorum	Pourriture molle bactérienne	2
	Phytophthora infestans	Mildiou	1
	PMTV	Anomalie de coloration dans le tubercule	1
	Pyrenochaeta terrestris	Tache rose sur tubercule	1
	Pythium sp.	Pourriture aqueuse	1
	Rhizoctonia solani	Rhizoctonie	1
	Verticillium dahliae	Verticilliose	1
	Gel en entrepôt		2
Total			**35**

Tableau 3. Sommaire des maladies diagnostiquées parmi les **plantes maraîchères de serres** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Aubergine	*Colletotrichum* sp.	Anthracnose	1
	Fusarium oxysporum	Fusariose	1
	Meloidogyne sp.	Nodosité des racines	1
	Pyrenochaeta sp.	Dépérissement	1
	Pythium sp.	Pourridié pythien	2
	Salinité élevée du substrat		1
Concombre	*Erwinia tracheiphila*	Flétrissement bactérien	1
	Fusarium oxysporum	Pourriture des racines	1
	Phytoplasmes	Tache foliaire	1
	Podosphaera sp.	Blanc	1
	Pythium aphanidermatum	Pourridié pythien	2
	Rhizoctonia solani	Rhizoctone	1
	Sphaerotheca sp.	Blanc	1
	pH du sol élevé		1
	Salinité élevée du sol		2
	Transpiration excessive		1
Laitue	*Alternaria dauci*	Alternariose	1
	Pseudomonas sp.	Pourriture molle bactérienne	1
Physalis (Cerise de terre)	*Entyloma australe*	Charbon foliaire	1
	Fusarium sp.	Pourriture du collet	1
	Pseudomonas viridiflava	Tache foliaire	1
Poivron	*Botrytis cinerea*	Moisissure grise	2
Tomate	*Alternaria alternata*	Alternariose	1
	Botrytis cinerea	Moisissure grise	4
	Clavibacter michiganensis ssp. *michiganensis*	Chancre bactérien	13
	Colletotrichum sp.	Anthracnose sur racines	1
	Fusarium oxysporum	Pourridié fusarien	13
	Fusarium solani	Chancre de collet et de tige	8
	Leveillula taurica	Blanc	2
	Meloidogyne sp.	Nodosité des racines	1
	Oidium neolycopersici	Blanc	3
	PepMV	Mosaïque foliaire	8
	Phoma sp.	Chancre au collet	1
	Phytophthora infestans	Mildiou	1
	Plectosporium sp.	Chancre sec	2
	Pseudomonas syringae	Moucheture bactérienne	1
	PVY	Mosaïque foliaire	6
	Pythium irregulare / *Pythium* sp.	Pourridié pythien	16
	Verticillium dahliae	Verticilliose	2
	Asphyxie racinaire		2
	Blessure mécanique		2
	Déséquilibres minéraux		6
	Désordre physiologique		1

Tableau 3. Sommaire des maladies diagnostiquées parmi les **plantes maraîchères de serres** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Tomate (suite)	Intumescence		1
	Phytotoxicités par des pesticides variés		1
	Salinité du sol élevée		3
	Transpiration excessive du feuillage		1
Total			**126**

Tableau 4. Sommaire des maladies diagnostiquées parmi les **petits fruits** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Amélanchier	*Entomosporium mespili*	Entomosporiose	1
	Gymnosporangium clavariiforme	Rouille-tumeur clavariforme	6
	Pseudomonas syringae	Brûlure de feuilles et de tiges	1
Argousier	*Phomopsis* sp.	Brûlure phomopsienne	11
	Pseudomonas syringae	Brûlure des rameaux	1
Bleuetier en corymbe	*Alternaria alternata*	Tache alternarienne	1
	Aureobasidium sp.	Brûlure de rameaux	1
	Colletotrichum sp.	Anthracnose	4
	Fusicoccum putrefaciens	Chancre	5
	Gibbera vaccinicola (Protoventura)	Gale te tige	1
	Marssonina sp.	Tache foliaire	1
	Monilinia sp.	Pourriture sclérotique	1
	Phomopsis sp.	Brûlure phomopsienne	1
	Phytoplasmes	Malformation, nanisme	7
	Pseudomonas marginalis / P. syringae	Tache foliaire	2
	Pucciniastrum geoppertianum	Rouille balai de sorcières	2
	Septoria sp.	Tache septorienne	1
	ToRSV	Tache et malformation foliaire	4
	Gel hivernal		1
	Phytotoxicité herbicides		3
	pH inadéquat		6
	Autres stress culturaux		11
Bleuetier nain	*Botrytis cinerea*	Moisissure grise	1
	Oidium sp.	Blanc	1
	Seimatosporium sp.	Brûlure de tiges	1
	Septoria sp.	Tache septorienne	7
	Valdensia heterodoxa	Tache valdensienne	3
	Déséquilibres minéraux		2
	pH inadéquat		4
Canneberge	*Fusicoccum putrefaciens*	Pourriture godronienne	2
	Phomopsis vaccinii	Brûlure phomopsienne	1
	Phyllosticta sp.	Pourriture du fruit	3
	Physalospora vaccini	Pourriture tachetée	1
	Protoventuria myrtilli	Tache foliaire	2
	Rhizoctonia solani	Rhizoctone	1
	Insolation		2
Cassissier/ groseillier	Phytoplasmes	Malformation des feuilles	2
	Gel hivernal		1
	Gel printanier		2

Tableau 4. Sommaire des maladies diagnostiquées parmi les **petits fruits** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Fraisier	*Botrytis cinerea*	Moisissure grise	2
	Meloidogyne sp.	Nodosité des racines	6
	Phytophthora cactorum	Pourriture du fruit et du collet	4
	Phytophthora fragariae	Stèle rouge	9
	Phytophthora spp.	Brûlure foliaire, dépérissement	12
	Phytoplasmes	Balai de sorcières	2
	Pratylenchus sp.	Lésions des racines	8
	Pythium/*Rhizoctonia*/*Cylindrocarpon*/ *Fusarium*	Pourriture noire des racines	99
	Sphaerotheca macularis (Oïdium)	Blanc	1
	Verticillium dahliae	Verticilliose	8
	Zythia fragariae	Brûlure foliaire	9
	Asphyxie racinaire		2
	Blessure mécanique		1
	Déséquilibre minéral		6
	Gel hivernal		13
	Gel printanier		1
	Insolation		1
	Phytotoxicité herbicide		5
	pH / salinité / sol inadéquats		3
	Autres stress climatiques et culturaux		3
Framboisier rouge/noir	*Erwinia amylovora*	Feu bactérien	1
	Oidium sp.	Blanc	1
	Phytophthora spp.	Pourridié phytophthoréen	3
	Phytoplasmes	Anomalie de coloration foliaire	1
	Pseudomonas syringae	Brûlure bactérienne	1
	Pythium/*Rhizoctonia*/*Cylindrocarpon*/ *Fusarium*	Pourriture noire des racines	7
	Rhizobium radiobacter	Tumeur du collet	3
	Septoria rubi	Tache septorienne	3
	Sphaceloma necator	Anthracnose	1
	ToRSV		1
	Déséquilibre minéral		4
	Gel hivernal		1
	Phytotoxicité par des herbicides		4
	Salinité élevée du sol		2
	Autres stress climatiques et culturaux		3
Sureau	*Cercospora* sp.	Tache cercosporéenne	1
	Phytoplasmes	Anomalie de coloration foliaire	2
	PVX		1
	Xiphinema sp.	Nanisme	1
	Ozone	Nanisme	1

Tableau 4. Sommaire des maladies diagnostiquées parmi les **petits fruits** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Vigne	*Alternaria* sp. / *Cladosporium* sp.	Pourriture de la râfle et des baies	4
	Botrytis cinerea	Tache foliaire, avortement	5
	Phoma sp.	Pourriture des baies; brûlure des feuilles	2
	Phytoplasmes	Malformation, anomalie de coloration	7
	Rhizobium radiobacter	Tumeur du collet	1
	Sphaceloma ampelinum	Anthracnose	1
	Phytotoxicité par des pesticides		8
	Grêle		1
	Gel hivernal		4
	Carences minérales		3
	Insolation		5
	Ozone		2
	Autres stress climatiques et culturaux		5
Total			**395**

Tableau 5. Sommaire des maladies diagnostiquées parmi les **céréales** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Avoine	BYDV	Feuille rouge	1
	Ustilago avenae	Charbon nu	1
	Carence de Mn	Tache grise	1
Blé	BYDV	Jaunisse nanisante	1
Orge	*Bipolaris sorokiniana*	Tache helminthosporienne	4
	BYDV	Jaunisse nanisante	1
	Fusarium oxysporum	Piétin fusarien	2
	Pseudomonas syringae	Tache foliaire	1
	Pythium sp.	Piétin brun	3
	Ustilago hordei	Charbon vêtu	2
	Carence minérale		2
Seigle	*Alternaria / Cladosporium / Epicoccum*	Moisissure noire	1
Total			20

Tableau 6. Sommaire des maladies diagnostiquées parmi les **cultures industrielles** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Canola	*Alternaria alternata / A. brassicae*	Anomalie de coloration des graines	2
	Stress climatiques et culturaux		3
Houblon	*Podosphaera* sp.	Blanc	1
	Pseudoperonospora sp.	Mildiou	1
Maïs grain / Maïs ensilage	*Cladosporium* sp.	Moisissure noire	2
	Fusarium spp.	Piétin fusarien / pourriture de l'épi	6
	Pythium sp.	Pourridié pythien	1
	Phytotoxicité herbicides		2
Soya	*Alternaria alternata*	Alternariose	3
	Colletotrichum sp.	Anthracnose	1
	Corynespora cassiicola	Pourriture des racines	1
	Fusarium spp.	Pourriture du collet et des racines	3
	Phomopsis sp. (*Diaporthe*)	Brûlure phomopsienne	3
	Phytophthora sp.	Pourridié phytophthoréen	3
	Pseudomonas syringae	Tache foliaire	2
	Pythium spp.	Pourridié pythien	4
	Rhizoctonia solani	Rhizoctone commun	6
	Septoria glycines	Tache septorienne	1
	Xanthomonas campestris		1
	Carence de K		1
	Phytotoxicité herbicides		4
	Semence inadéquate		1
Tournesol	*Sclerotinia sclerotiorum*	Sclérotiniose	1
Total			**55**

Tableau 7. Sommaire des maladies diagnostiquées parmi les **plantes fourragères** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Fléole	*Fusarium poae*	Fusariose de l'épi	1
Luzerne	*Colletotrichum trifolii*	Anthracnose	3
	Carence de B		1
	Ozone		1
Total			**6**

Tableau 8. Sommaire des maladies diagnostiquées parmi les **arbres et arbustes fruitiers** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Cerisier	*Blumeriella jaapii (Phloeosporella padi)*	Tache foliaire, criblure	35
	Botrytis cinerea	Moisissure grise	1
	Cercospora sp.	Tache cercosporéenne	1
	Septoria sp.	Tache septorienne	2
	Phomopsis sp.	Chancre phomopsien	1
	Podosphaera sp.	Blanc	1
	Pseudomonas syringae	Brûlure foliaire, dépérissement	15
	Monilia sp.	Brûlure foliaire, dépérissement	14
	Carence minérale		2
	Stress culturaux		4
Poirier	*Erwinia amylovora*	Brûlure bactérienne	1
	Phomopsis sp.	Chancre phomopsien	1
	Phytotoxicité par les pesticides		1
Pommier	*Colletotrichum* sp.	Anthracnose	1
	Erwinia amylovora	Feu bactérien	45
	Phytophthora cactorum	Pourriture du collet	3
	Phytoplasmes	Jaunissement de la marge des feuilles	1
	Pseudomonas syringae	Chancre bactérien	12
	Sphaeropsis malorum	Pourriture noire	1
	Spilocaea pomi	Tavelure	47
	Carence minérale		3
	Gel hivernal		2
	Phytotoxicité par les pesticides		2
	Tache amère		2
	Stress culturaux		2
Prunier	*Erwinia amylovora*	Feu bactérien	1
	Phyllosticta sp.	Phyllostictose	1
	Septoria sp.	Tache septorienne	1
Total			**203**

Tableau 9. Sommaire des maladies diagnostiquées parmi les **graminées à gazon** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Agrostide	*Colletotrichum graminicola*	Anthracnose	1
	Curvularia sp.	Tache foliaire	2
	Fusarium sp.	Brûlure fusarienne des feuilles	2
	Gaeumannomyces graminis	Tache foliaire	1
	Leptosphaerulina sp.	Piétin échaudage	1
	Microdochium nivale	Moisissure nivéale rosée	1
	Myrothecium sp.	Anomalie de coloration racinaire	1
	Pythium torulosum / Pythium sp.	Piétin brun	4
	Rhizoctonia sp.	Rhizoctone brun	1
Poa annua / P. pratensis	*Colletotrichum graminicola*	Anthracnose	2
	Leptosphaeria sp.	Tache nécrotique	1
	Magnaporthe sp.	Anomalie de coloration racinaire	1
	Myrothecium sp.	Brûlure de plantules	1
	Pythium torulosum	Piétin brun	1
	Rhizoctonia sp.	Tache ocellée	1
	Uromyces sp.	Rouille	1
Total			**23**

Tableau 10. Sommaire des maladies diagnostiquées parmi les **arbres** et **arbustes ornementaux** reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Abies balsamea / A. fraseri	*Cylindrocarpon destructans / Fusarium* sp.	Pourriture des racines	1
	Gel hivernal		1
Buxus sempervirens	*Volutella* sp.	Tache/ abscission foliaire	1
Caragana sp.	Phytoplasmes	Tache / anomalie de coloration	1
Daphne sp.	*Pseudomonas marginalis*	Pourriture du collet/ dépérissement	1
Juglans sp.	*Discula* sp.	Anthracnose	1
Gleditsia triacanthos	Manque d'eau		1
Magnolia	*Pseudomonas fluorescens*	Pourriture du collet et des racines	1
	Toxicité minérale		2
Malus sp.	*Botrytis cinerea*	Moisissure grise	1
	Erwinia amylovora	Feu bactérien	1
Parthenocissus quinquefolia	*Phyllosticta ampelicida*	Tache foliaire	1
Picea abies	*Phomopsis* sp.	Brûlure phomopsienne	1
Picea pungens	*Rhizosphaera* sp.	Rouge	1
Pinus mugo / Pinus nigra / Pinus sp.	*Pestalotiopsis funerea*	Brûlure des aiguilles	2
	Sphaeropsis sapinea	Brûlure des rameaux	1
Quercus robur	*Oidium* sp.	Blanc	2
Sorbus sp.	*Erwinia amylovora*	Brûlure bactérienne	1
Thuja occidentalis	*Pestalotiopsis funerea*	Brûlure des aiguilles	1
	Phytophthora cinnamomi	Pourridié phytophthoréen	1
	pH trop élevé		1
	Phytotoxicité par un pesticide		1
	Toxicité à l'urée		1
Ulmus americana	*Ophiostoma ulmi*	Maladie hollandaise de l'orme	1
	Pseudomonas syringae	Tache foliaire	1
Total			**28**

Tableau 11. Sommaire des maladies diagnostiquées parmi les **plantes ornementales d'extérieur** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Althaea officinale	Phytoplasmes	Anomalie de coloration foliaire	1
Clematis sp.	*Septoria clematidis*	Tache septorienne	1
Echinacea purpurea	*Aphelenchoides* sp.	Tache foliaire	1
	Botrytis cinerea	Moisissure grise	2
	Fusarium oxysporum	Fusariose vasculaire	1
	Phytotoxicité par un pesticide		1
Hydrastis canadensis	*Fusarium* sp.	Pourridié fusarien	1
	Pseudomonas viridiflava	Brûlure foliaire	1
Lavendula sp.	*Phytophthora* sp.	Pourridié phytophthoréen	1
Molene sp.	*Phoma* sp.	Tache foliaire	1
Racomitrium sp.	*Fusarium* sp.	Brûlure du feuillage	1
Sedum sp.	*Rhizoctonia solani*	Rhizoctone	1
Total			**13**

Tableau 12. Sommaire des maladies diagnostiquées parmi les **plantes aromatiques et les fines herbes** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Basilic	*Peronospora belbahrii*	Mildiou	3
	Pythium sp.	Pourridié pythien	1
Coriandre	*Pseudomonas cichorii*	Tache foliaire	1
Persil	*Pseudomonas syringae*	Tache foliaire	1
	Septoria sp.	Tache septorienne	1
Total			**7**

Tableau 13 Sommaire des maladies diagnostiquées parmi les **plantes ornementales de serres** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Acanthus sp.	Transpiration excessive du feuillage		1
Ajuga sp.	*Phoma* sp.	Pourriture du collet	1
	Pythium sp.	Pourridié pythien	1
Angelonia sp.	*Botryris cinerea*	Moisissure grise	1
Astilbe sp.	*Rhizoctonia solani*	Rhizoctone	1
Bacopa sp.	*Botrytis cinerea*	Moisissure grise	1
	pH élevé		1
Begonia sp.	INSV	Tache et brûlure foliaire	1
Brunnera macrophylla	*Aphelenchoides* sp.	Tache foliaire	1
	Phytophthora sp.	Pourridié phytophthoréen	1
	Pseudomonas syringae	Tache foliaire	1
Buddleia davidii	*Peronospora* sp.	Mildiou	1
Coleus sp.	pH acide du sol		1
Dahlia sp.	*Cercospora* sp.	Tache cercosporéenne	1
Dianthus sp.	CarMV	Tache et brûlure foliaire	1
	Fusarium oxysporum	Fusariose	1
	Pythium irregulare	Pourridié pythien	1
	Phytotoxicité par un pesticide		1
Dracaena indivisa	*Colletotrichum* sp.	Anthracnose	1
Echinacea purpurea	*Aphelenchoides* sp.	Tache foliaire	1
	Pseudomonas marginalis	Pourriture du collet	1
	Pythium sp.	Pourridié pythien	1
	Septoria sp.	Tache septorienne	1
	Verticillium sp.	Verticilliose	1
Ensete ventricosum	Phytoplasmes	Nanisme/ malformation	1
Gerbera sp.	*Fusarium solani*	Pourridié fusarien	1
Helictotrichon sp.	*Puccinia* sp.	Rouille	1
Heuchera micrantha	*Phytophthora* sp.	Pourridié phytophthoréen	1
Hosta sp.	TRV	Anomalie de coloration foliaire	1

Tableau 13 Sommaire des maladies diagnostiquées parmi les **plantes ornementales de serres** reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2012.

CULTURE	AGENT PATHOGÈNE / CAUSE	MALADIE / SYMPTÔME	NOMBRE
Hoya incarna	INSV	Tache foliaire	1
Lisianthus sp.	*Thielaviopsis basicola*	Pourriture noire des racines	1
Lysimachia sp.	*Pythium* sp.	Pourridié pythien	1
Pachystachys sp.	INSV	Anomalie de coloration foliaire	1
Pelargonium X hortorum	*Botrytis cinerea*	Moisissure grise	1
	BBWV	Tache foliaire	1
	TSWV	Tache foliaire	1
	TRSV		1
Phlox paniculata	*Peronospora phlogina*	Mildiou	1
Schlumbergera sp.	*Fusarium* sp.	Pourridié fusarien	1
	Pythium sp.	Pourridié pythien	1
Solanum sp.	AMV		1
	INSV		3
	PepMV		2
	PVX		1
	TNV		2
	TBRV		1
	TRV		1
Teucrium scorodonia	*Pythium irregulare*	Pourridié pythien	1
Tricyrtis	Potyvirus	Tache foliaire, mosaïque	1
	TNV	Brûlure foliaire, mosaïque	1
	TRV	Tache foliaire, brûlure, mosaïque	1
Trollius europaeus	Carence de B		1
Veronica sp.	*Peronospora* sp.	Mildiou	1
Washingtonia robusta	*Fusarium* sp.	Pourridié fusarien	1
Total			**58**
GRAND TOTAL			**1374**

Cereals/ Céréales

CROP / CULTURE : Barley
LOCATION / RÉGION: Central Alberta

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TITLE / TITRE: 2012 BARLEY DISEASE SURVEY IN CENTRAL ALBERTA

ABSTRACT: Foliar diseases of barley, either scald, netted net blotch, spotted net blotch or spot blotch were less severe in central Alberta in 2012 than in previous years, despite favourable growing conditions. Aster yellows was commonly seen, levels of common root rot remained light, and no stripe rust was observed.

INTRODUCTION AND METHODS: A survey to document diseases of barley was conducted in 20 fields in central Alberta from July 31 - August 15, 2012. 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 at least 25 m in from the field edge, with visual assessment made of 10 penultimate leaves at each of 5 locations that were at least 25 m apart. Leaf diseases were rated for percent leaf area affected (PLAD) by scald, netted net blotch or 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=severe. Other diseases, if present, were rated as a percent of the plants affected. Subsequently, a representative tissue sub-sample of diseased plant parts collected at each location was cultured in the laboratory for pathogen isolation and identification.

RESULTS AND COMMENTS: Survey results are presented in Table 1. Growing conditions in central Alberta were wet and relatively warm in May, June, and July, while August was hot and dry. Disease development was relatively moderate throughout the region.

Scald (*Rhynchosporium secalis*) severity ranged from 0.1 to 10 % in 16 fields, with crops in all remaining fields free of scald. Netted net blotch (*Pyrenophora teres* f. *teres*) was observed in all surveyed fields; severity ranged from 0.1% to 10% in 18 fields, while one crop was rated at 17%, and another at 41%. Other leaf spots, diagnosed as spotted net blotch (*P. teres* f. *maculata*) or spot blotch (*Cochliobolus sativus*), were found in 100% of the fields surveyed. Their severity ranged from 2% to 28%. *Alternaria* spp. were also isolated from sub-samples of the leaf tissues.

Aster Yellows was commonly found throughout the region in 2012.

Common root rot (*Cochliobolus sativus* and *Fusarium* spp.) occurred in all the surveyed fields at similar levels to those reported in 2011 (Rauhala and Turkington 2012).

Stripe rust (*Puccinia striiformis)* was not observed in any of the commercial barley fields surveyed.

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Table 1. Disease incidence and severity in 20 commercial barley fields in central Alberta, 2012.

Disease (severity rating scale)	% Crops Affected	Average Severity	Range of Severity
Scald (PLAD*)	75	2	0 – 6
Netted net blotch (PLAD)	100	4	0 – 41
Other leaf spots (PLAD)	100	8	1 – 28
Total Leaf Area Diseased (PLAD)	100	13	1 – 48
Common root rot (0-4)	100	1.9	1 – 4

*Percentage 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 2012

ABSTRACT: In 2012, Fusarium head blight (FHB) incidence and severity were assessed in 49 barley crops in Saskatchewan. FHB occurred in 96% of the surveyed barley crops and the provincial mean FHB severity was 3.1%.

INTRODUCTION AND METHODS: Fusarium head blight (FHB) incidence and severity in Saskatchewan in 2012 were assessed in 49 barley crops (43 two-row; 6 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 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 barley crop surveyed: FHB severity (%) = [% of spikes affected x mean proportion (%) of kernels infected] / 100. Mean FHB severity values were calculated for each soil 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 *Fusarium* species on infected kernels.

RESULTS AND COMMENTS: Approximately 1.1 million hectares (2.6 million ac) of barley were seeded in Saskatchewan in 2012 (Saskatchewan Ministry of Agriculture 2012). Excess precipitation early in the growing season created many challenges for farmers in 2012. Crops were stressed from excess moisture and disease pressure. 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 the province reported varying quality and yields from region to region. The average yield for barley was 2.4 tonnes per hectare (43.9 bu/acre) in 2012, lower than the 10-year average of 2.7 tonnes per hectare (50.3 bu/acre) (Saskatchewan Ministry of Agriculture 2012).

In 2012, FHB occurred in 96% of the barley crops surveyed, 95% of two-row and 100% of six-row samples (Table 1). The provincial mean FHB severities for two-row barley (3.0%) and six-row barley (3.7%) were higher than in 2011 (2.8% and 2.2%, respectively) (Dokken-Bouchard et al. 2012). Severity of FHB for two- and six-row barley was highest in soil zone 3. Seven of the two-row barley and two of the six-row barley crops showed severities higher than 5%. The sample with the highest FHB severity (6.9%) was from a two-row barley crop in soil zone 2.

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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Dokken-Bouchard, F.L., Miller, S.G., Northover, P.R., Weitzel, C.N., Shiplack, J.J., and Fernandez, M.R. 2012. Fusarium head blight in barley in Saskatchewan in 2011. Can. Plant Dis. Surv. 91: 65-66. (www.phytopath.ca/cpds.shtml)

Saskatchewan Ministry of Agriculture. 2012. Statistics Canada's November Estimate of 2012 Crop Production. (www.agriculture.gov.sk.ca/Estimate_Crop_Production)

Table 1. Prevalence and severity of fusarium head blight (FHB) in barley crops grouped by soil zone in Saskatchewan, 2012.

Soil Zones	Two-Row Barley		Six-Row Barley	
	Prevalence[1] (No. of crops infected)	**Mean FHB Severity[2] (range)**	**Prevalence (No. of crops infected)**	**Mean FHB Severity[2] (range)**
Zone 1 Brown	100% (7)	1.5% (0.1 – 2.7%)	–	–
Zone 2 Dark Brown	100% (20)	3.0% (0.2 –14.3%)	–	–
Zone 3 Black/Grey	88% (16)	3.6% (0 – 11.2%)	100% (6)	3.7% (1.2 – 6.9%)
Overall Total/Mean	95% (43)	3.0%	100% (6)	3.7%

[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 IN MANITOBA – 2012

ABSTRACT: Twenty-seven barley crops in southern Manitoba were monitored for fusarium head blight (FHB) to assess disease severity and identify the causal *Fusarium* species. Severity was light with a FHB-Index of 0.8%, similar to 2011, but considerably lower than the 10-year average of 1.9%. *Fusarium poae* was the dominant species in developing kernels; other species in diminishing order were *F. graminearum*, *F. avenaceum* and *F. sporotrichioides*.

INTRODUCTION AND METHODS: Barley crops in Manitoba were monitored for the presence of fusarium head blight (FHB) from July 18 to 25 when at the early- to soft dough (ZGS 79-86) stages of growth. Twenty-seven fields (19 two-row, 8 six-row) were selected at random along the survey routes, depending on crop frequency. The area sampled was bounded by Highways #26, 16 and 45 to the north, #14 and 3 to the south, #12 to the east and #83 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 scores. The mean spike proportion infected (SPI) was 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 onto potato dextrose agar in Petri plates (10 kernels per plate) to quantify and identify the species of *Fusarium* spp. in kernels, based on morphology as described in standard taxonomic keys.

RESULTS AND COMMENTS: The growing conditions in Manitoba in 2012 were difficult to characterize due to considerable variability in levels of precipitation among the five major agricultural regions and reporting sites within these. Soil moistures and temperatures were conducive to early seeding (late April to mid-May) and the emergence of earlier-seeded crops was rated as good to excellent. Cooler conditions prevailed in the latter half of May, but warm weather returned in mid-June and June, July and August were generally very warm, with 2012 being the hottest summer on record at many locations. Precipitation was spotty throughout June and July with some areas receiving adequate levels while others remained dry. Crop development was more rapid than normal, and had a somewhat negative impact on seed set and grain filling. Frost in many areas on May 30 caused minor injury to particular crops, and several fast-moving systems accompanied by strong winds or hail resulted in temporary crop lodging. August was generally dry leading to favourable harvest conditions for the early-matured crops. Similar conditions continued throughout September. Accumulation of growing degree days (April 1 to August 26) was above normal in most regions, while total precipitation was somewhat below normal in the eastern and central regions, but above normal in the Interlake, southwest and northwest. Overall, cereal crop yields and quality were described as ‘good’.

Barley was grown on about 204,000 ha (505,000 acres) in 2012, more than double the area in 2011, but below the mean level for 2001 - 2011. Eight cultivars made up 75% of the total: ‘Conlon’ (23%), ‘Newdale’ (11%), ‘Champion’ (8%), ‘AC Metcalfe’ (8%), ‘Celebration’ (8%), ‘Tradition’ (8%), ‘CDC Copeland’ (5%) and ‘Stellar-ND’ (4%) (MASC 2012).

Putative symptoms of FHB were observed in 26 of the 27 crops surveyed. Mean incidence of FHB in two-rowed crops was 4.4% (range 0 - 14%), while the spike proportion infected (SPI) averaged 10.7% (range 0 - 30%); in six-rowed crops incidence was 7.1% (range 0 - 23%) and the SPI 10.8% (range 3 - 20%). The resulting mean Fusarium head blight index (FHB-I) [%incidence X %SPI / 100] for 2-row barley was 0.7% (range 0 – 3%), and that for 6-row barley 1.1% (range 1 – 5%). The mean FHB-I for all barley was

0.8%. This level would have resulted in minimal yield loss from FHB in barley in 2012. The mean FHB-I in 2012 was similar to that reported for 2011 (Tekauz et al. 2012) but considerably lower than the 10-year average (2001-2010) of 1.9% (Tekauz and Gilbert 2011). The higher (slightly so again in 2012) FHB severity in six-row vs. two-row barley is typically expected, but not always realized, as evidenced in both 2010 and 2009 (Tekauz et al. 2011, 2010). While conditions early in the season appeared favourable for development of inoculum, the low levels of FHB in Manitoba in 2011 likely resulted in reduced carry-over of *Fusarium* in overwintered straw and stubble. Subsequent dry and hot conditions in many locales would have further reduced the likelihood of floral infection and manifestation of FHB symptoms.

Fusarium colonies developed from kernels of 26 of the 27 fields surveyed, at a mean level of 34.4%. The individual *Fusarium* species identified on kernels are listed in Table 1. As found in 2011 (Tekauz 2012), *F. poae* predominated in 2012; it was detected in most fields and made up 62% of the total *Fusarium* flora. This was in contrast to 2010 and 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* each were detected in 15% of fields at low levels.

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Table 1. *Fusarium* spp. isolated from FHB-affected barley kernels in Manitoba in 2012.

***Fusarium* spp.**	**Percent of fields**	**Percent of kernels**
F. avenaceum	15	3.5
F. equiseti	7	0.9
F. graminearum	78	31.4
F. poae	93	62.2
F. sporotrichioides	15	2.6

CROP / CULTURE: Barley
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: LEAF SPOT DISEASES OF MANITOBA BARLEY CROPS IN 2012

ABSTRACT: Twenty-seven barley crops in southern Manitoba were monitored to assess leaf spot severity and identify the causal fungi. Spotting was evident in most crops at low levels, as has been typical for many years. Slight damage was observed and minimal or no losses were expected. *Cochliobolus sativus* (causal agent of spot blotch) and *Pyrenophora teres* (net blotch) were isolated in similar proportions from lesions sampled.

INTRODUCTION AND METHODS: In 2012, leaf spot diseases of barley in Manitoba were assessed by monitoring 27 commercial fields (19 two-row, 8 six-row) from July 18 to 25, when most crops were at the early- or soft dough growth stages (ZGS 82-86). Fields were sampled at regular intervals along the survey routes, depending on availability. The area sampled was bounded by Highways #26, 16 and 45 to the north, #14 and 3 to the south, #12 to the east and #83 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 or nil (no visible symptoms); trace (<1% leaf area affected); very slight (1-5%); slight (6-15%); moderate (16-40%); and severe (41-100%). Infected leaves with typical symptoms were collected at each site, dried, and stored in paper envelopes. Subsequently, 10 surface-sterilized pieces of putatively infected leaf tissue were placed on filter paper in moist chambers for 3-5 days to promote sporulation and confirm the pathogen and disease(s) present.

RESULTS AND COMMENTS: The growing conditions in Manitoba in 2012 were difficult to characterize due to considerable variability in precipitation among the five major agricultural regions and reporting sites within these. Soil moistures and temperatures were conducive to early seeding (late April to mid-May) and the emergence of earlier-seeded crops was rated as good to excellent. Cooler conditions prevailed in the latter half of May, but warm weather returned in mid-June and June, July and August were generally very warm, with 2012 being the hottest summer on record at many locations. Precipitation was spotty throughout June and July with some areas receiving adequate levels while others remained dry. Crop development was more rapid than normal, and had a somewhat negative impact on seed set and grain filling. Frost in many areas on May 30 caused minor injury to particular crops, and several fast-moving systems accompanied by strong winds or hail resulted in temporary crop lodging. August was generally dry leading to favourable harvest conditions for the early-matured crops. Similar conditions continued throughout September. Accumulation of growing degree days (April 1 to August 26) was above normal in most regions, while total precipitation was somewhat below normal in the eastern and central regions, but above normal in the Interlake, southwest and northwest. Overall, cereal crop yields and quality were described as ‘good’.

Barley was grown on about 204,000 ha (505,000 acres) in 2012, more than double the area in 2011, but below the mean level for 2001 - 2011. Eight cultivars made up 75% of this total: ‘Conlon’ (23%), ‘Newdale’ (11%), ‘Champion’ (8%), ‘AC Metcalfe’ (8%), ‘Celebration’ (8%), ‘Tradition’ (8%), ‘CDC Copeland’ (5%) and ‘Stellar-ND’ (4%) (MASC 2012).

Leaf spots were observed in the upper and/or lower leaf canopies of most barley crops surveyed. Disease levels in the upper canopy were zero, trace, very slight or slight in 85% of fields and moderate in 15%. Respective severity categories in the lower canopy were estimated as 52% and 37%, with 8% rated as severe, and 4% as senescent. These severity levels are typical of those found in recent years. The generally low disease levels were likely the product of spotty early- and mid-season precipitation, the use of foliar fungicides, and a reduced inoculum carry-over as a result of low disease levels in 2011 (Tekauz et al. 2012). Overall, yield losses attributable to leaf spots were nil to very slight.

Cochliobolus sativus (spot blotch) and *Pyrenophora teres* (net blotch) were the principal pathogens, and caused most (and similar amounts) of the damage observed (Table 1); this is typical for barley leaf spots in Manitoba (Tekauz et al. 2012). *Septoria passerinii* (speckled leaf blotch) was a minor component of the leaf spot complex, as is also typical, and was detected in only two fields. The three fields with the most severe leaf spotting included two six-row crops in the northwest from which all 10 foliar tissue pieces yielded both *C. sativus* and *P. teres*, and a two-row crop near Stony Mountain in the southern Interlake with all tissue pieces yielding *P. teres*.

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Table 1. Incidence and isolation frequency of leaf spot pathogens of barley in Manitoba in 2012.

Pathogen	**Incidence (% of fields)**	**Frequency (% of isolations)***
Cochliobolus sativus	78	53
Pyrenophora teres	56	46
Septoria passerinii	7	1

*indicative of the relative foliar damage caused

CROP / CULTURE: Barley
LOCATION / RÉGION: Central and Eastern Ontario

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TITLE / TITRE: DISEASES OF BARLEY IN CENTRAL AND EASTERN ONTARIO IN 2012

ABSTRACT: Twenty-one barley crops in Ontario were surveyed for diseases when plants were at the soft dough stage of growth. Of 14 diseases observed, net blotch and spot blotch were the most common. Slight fusarium head blight was seen, with *Fusarium poae* identified as the predominant species involved.

INTRODUCTION AND METHODS: A survey of barley diseases was conducted by sampling 21 crops in central and eastern Ontario, where most of the spring barley is grown, in the third week of July in 2012 when plants were at the soft dough stage. 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 as trace, slight, moderate, and severe infection levels, respectively. Severity for covered smut, ergot, leaf stripe, loose smut, and take-all was based on 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 kernels were identified by microscopic examination using standard taxonomic keys.

RESULTS AND COMMENTS: The surveyed crops consisted of 2 two-row and 19 six-row barley fields. A total of 14 diseases or disease complexes was observed (Table 1). Net blotch (*Pyrenophora teres*) and spot blotch (*Cochliobolus sativus*) were the most common and observed in 20 and 18 fields, respectively. The mean severity for each disease was 3.2; severe infection with net blotch or spot blotch were found in only two fields and one field, respectively. Yield reductions due to the two diseases were estimated to have averaged <5% in affected fields. Leaf rust (*Puccinia hordei*) and stem rust (*Puccinia graminis* f. sp. *tritici* or f. sp. *secalis*) were observed in 15 and 10 fields at average severities of 2.6 and 4.4, respectively. A severe level of leaf rust was observed in three fields while severe stem rust was detected in four fields. Yield reductions from these rusts were likely >5% in affected fields. Other foliar diseases observed included barley yellow dwarf (BYD), the septoria complex [including speckled leaf blotch (*Septoria tritici*) and leaf blotch (*Stagonospora nodorum*)], powdery mildew (*Erysiphe graminis*) and scald (*Rhynchosporium secalis*). Their respective mean severities were estimated to be 1.6, 1.4, 1.5 and 1.3 and the diseases were observed in 14, 13, 4 and 4 fields, respectively. These trace to slight levels of infection suggesting that none of the diseases caused significant damage to crops.

Covered smut (*Ustilago hordei*), ergot (*Claviceps purpurea*), and leaf stripe (*Pyrenophora graminea*) were observed in 9, 16, and 12 fields at incidence levels of 1.2, 1.0, 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 13 and 18 fields at mean incidences of 1.0 and 2.4%, respectively. This is the third consecutive year that take-all was commonly observed in barley crops in Ontario (Xue and Chen 2012).

Fusarium head blight was observed in 19 of the 21 crops (Table 1). The FHB index ranged from 0.01 to 0.25% with a mean of 0.04%. Severe levels of FHB were not found. The disease would not have resulted in a significant loss in barley grain yield or quality in 2012. Five *Fusarium* species were isolated from putatively infected kernels (Table 2). *Fusarium poae* predominated and occurred in all fields and on 19.2% of discoloured kernels. *Fusarium avenaceum, F. equiseti, F. graminearum*, and *F. sporotrichioides* were less common, occurring in 35-50% of fields and 1.3-1.9% of kernels.

Overall, the incidence and severity of foliar diseases in barley in 2012 was similar to that in 2011 (Xue and Chen 2012). Net blotch and spot blotch continued to be the most prevalent diseases. Take-all became more common, causing an estimated average yield reduction of 2.4% in 2012; however, severity was lower than that in 2011 (4.5%) or 2010 (3.8%). FHB was common but less severe in 2012 than in 2011 (Xue and Chen 2012). Relatively high temperatures and infrequent rainfall from June to August in 2012 were unfavorable for disease development and likely responsible for the low level of FHB observed.

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Table1: Prevalence and severity of barley diseases in central and eastern Ontario in 2012.

DISEASE	NO. CROPS AFFECTED (n=21)	DISEASE SEVERITY IN AFFECTED CROPS*	
		MEAN	RANGE
Barley yellow dwarf	14	1.6	1.0-3.0
Leaf rust	15	2.6	1.0-7.0
Net blotch	20	3.2	1.0-6.0
Powdery mildew	4	1.5	1.0-2.0
Scald	4	1.3	1.0-2.0
Septoria complex	13	1.4	1.0-3.0
Spot blotch	18	3.2	1.0-7.0
Stem rust	10	4.4	1.0-7.0
Covered smut (%)	9	1.2	0.5-2.0
Ergot (%)	16	1.0	0.5-2.0
Leaf stripe (%)	12	1.1	0.5-2.0
Loose smut (%)	13	1.0	0.5-3.0
Take-all (%)	18	2.4	0.5-5.0
Fusarium head blight**	19		
Incidence (%)		1.5	1.0-5.0
Severity (%)		2.1	1.0-5.0
Index (%)		0.04	0.01-0.25

*Foliar disease severity was rated on a scale of 0 (no disease) to 9 (severely diseased); covered smut, ergot, leaf stripe, loose smut, and take-all severity 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 2012.

***Fusarium* spp.**	**% AFFECTED FIELDS**	**% KERNELS**
Total *Fusarium*	100	25.6
F. avenaceum	35	1.6
F. equiseti	50	1.9
F. graminearum	50	1.6
F. poae	100	19.2
F. sporotrichioides	40	1.3

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

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TITLE /TITRE: SEED-BORNE FUSARIUM ON CEREALS IN SASKATCHEWAN IN 2012

ABSTRACT: A summary of almost 2,000 test results from three seed testing laboratories showed that levels of seed infection with *Fusarium graminearum* and other *Fusarium* species in harvested grain were abnormally high and comparable to levels in 2010. Well-above average growing-season precipitation and high humidity in much of the province were no doubt responsible.

INTRODUCTION AND METHODS: The results of agar plate tests for *Fusarium* spp. on cereal seed samples from Saskatchewan provided by three companies were summarized. The tests were conducted between early September and mid-late December, 2012 and it was assumed that the majority of samples in this period came from the 2012 crop. The tests were conducted either to determine the frequency of all species of *Fusarium* present (total *Fusarium*) or simply the frequency of *F. graminearum.* Data for *F. graminearum* and for total *Fusarium* were tabulated for each Saskatchewan crop district [CD] (6). The mean percent seed infection levels with *F. graminearum* and with total *Fusarium* were calculated. In addition, the percentages of *F. graminearum*–free samples in each CD were calculated. Almost no samples tested were free of all *Fusarium* spp. so data on % *Fusarium*-free samples were not tabulated. *Fusarium* species other than *F. graminearum* commonly found were *F. avenaceum*, *F. poae*, *F. sporotrichioides* and occasionally *F. culmorum.*

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 above average moisture levels in May and June throughout the arable area of the province. This was followed by dry weather in the south west and extreme south-central regions but continued frequent precipitation and high humidity in the north, central and south east regions. Warm dry weather everywhere in September led to fairly timely completion of the harvest.

Yields were average and crop quality was good except in cereals in the north, central and south east areas where rainfall and humidity had persisted until the end of August (6). Symptoms of fusarium head blight (FHB) were conspicuous in late summer on wheat and barley in central and eastern CDs (1, 2). Later, there were a number of reports of farmers unable to market grain because of high levels of fusarium-damaged kernels. No data are available on the proportion of Saskatchewan cereal crops that were sprayed with fungicides to control FHB. However, the senior author observed wheat crops in both CD 2B and 6B that received regular foliar fungicide applications from June through early August, but still had high levels of FHB.

The data compiled on seed infection (Table 1) showed that 2012 was the third consecutive year of high infection with *Fusarium* spp. (4, 5) and in some respects the worst year since recording began in Saskatchewan in 2005 (3). The mean provincial level of infection with *F. graminearum* (5.6%) was higher than in 2010 or 2011 and the mean percent samples free of *F. graminearum* (18%) was lower. However, the mean provincial level of infection with total *Fusarium* spp. (11.2%) was not as high as the 19%

recorded in 2010 (4). The seed infection data compiled for 2012 (Table 1) are based on 1,981 samples, double the number reported in 2011 (5) and quadruple that reported in 2010 (4) for similar time periods. These increases partly reflect ongoing concern about FHB among Saskatchewan growers but now also reflect a potential shortage of healthy seed to plant in 2013.

Mean provincial levels of infection do not reflect the large variation among crop districts (Table 1) (4, 5) and in turn CD means do not reflect the large variation among samples tested, including variation among cereal species. However, there are three important observations that may be made from the data for 2010-2012. First, the only areas where *F. graminearum* infection of cereal grains remains absent or very rare are CDs 3BS and 4, and this conclusion is based on only very few samples. Second, there are substantial differences in *Fusarium* species composition between eastern and western Saskatchewan. Though high levels of total *Fusarium* have been recorded in both the east and the west, the proportions of *F. graminearum* in the totals are generally higher in CDs 1, 2, 5 and 8A (east) than in CDs 7 and 9 (west). Moreover, in 2012 *F. graminearum* constituted a larger component than before of total *Fusarium* in CD 6 (central). Third, when mean total *Fusarium* levels in a CD are in the 10-20% range, the population includes many samples with 30-50% infection. Some of these heavily infected samples came from registered seed growers and the test results could have a devastating effect on the growers' business.

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Table 1. Number of cereal seed samples tested from September to mid- December 2012 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	53	4.7	19%	6.8
1B	40	2.2	15%	4.5
2A	112	8.9	13%	13.1
2B	247	4.2	16%	7.2
3AN	23	3.1	22%	7.3
3AS	138	2.1	36%	4.3
3BN	71	2.2	20%	5.8
3BS	8	0	100%	0.4
4A	-	-	-	-
4B	4	0	100%	0.8
5A	54	4.1	7%	8.1
5B	106	4.9	11%	11.9
6A	228	5.6	13%	9.7
6B	302	5.3	15%	12.5
7A	122	1.5	34%	8.5
7B	68	1.8	21%	10.2
8A	104	13.2	4%	18.6
8B	138	17.1	4%	26.6
9A	97	5.5	21%	18.3
9B	66	1.0	33%	21.5
TOTAL	1981*	5.6	18%	11.2

*Number of samples tested for total *Fusarium* from all crop districts was 1845.

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

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TITLE / TITRE: STEM RUSTS OF CEREALS IN WESTERN CANADA IN 2012

ABSTRACT: We surveyed 235 oat and 185 wheat fields for stem rust to assess severity of infection and determine the virulence spectrum in each pathogen population. Severity was low mostly due to low inoculum pressure from the USA. As in the past 10 years, race QFCSC continues to predominate in wheat and barley. In oat, much greater variability in race structure continues, with dominant race (TJS, TGN, and TJN) prevalence likely influenced by the ability to attack the *Pg-a* resistance used in the southern USA.

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 2012. Infected stem tissue samples were collected from the sites surveyed. Urediniospores were obtained from these collections and evaluated for virulence specialization on sets of host differential lines (Fetch 2009).

RESULTS AND COMMENTS: Wet conditions in April and May delayed planting of cereal crops, particularly in the western prairie region. Mean temperature was near normal (-1 to +1°C) from April to June, but was +2 to +4°C above normal in July. Precipitation was above average across the central and western prairies from April to June, with 85-150% of normal in the rust area and 150-200% in central Saskatchewan. However, it was dry (40-85%) in the southern prairies in July and August. Environmental conditions for stem rust infection were not favourable across the prairies in July or August. Additionally, fungicide use was widespread in 2012 due to high grain prices. Thus, incidence and severity on susceptible lines in trap nurseries and in commercial oat and barley fields were at trace levels across western Canada. Stem rust infection in the USA was very light in 2012 due to drought, thus little inoculum migrated from the USA.

All spring wheat cultivars recommended for production in western Canada have excellent resistance to stem rust, and no stem rust infection was observed in commercial wheat fields. Stem rust was detected at trace levels on susceptible wheat lines in trap nurseries, on cultivated barley, and on wild barley (*Hordeum jubatum*) in 2012. Race determination demonstrated that 85% of the samples of *P*. *graminis* f. sp. *tritici* in 2012 were race QFCSC, which has been dominant since 2004.

Stem rust in cultivated and wild oat was at trace levels in western Canada in 2012. All oat cultivars except 'Stainless' are susceptible to stem rust races TJJ and TJS (Fetch and Jin 2007). Race TJS was dominant in 2012 (50% of total samples), followed by TGN (26%), TJJ (12%), and TJN (4%). Races TJS and TJJ (NA67), which attack most oat cultivars in western Canada, rose greatly in frequency from the 16% and 5% levels, respectively, found in 2011 (Fetch et al. 2012). The rise in race TJS, and prevalence of races TGN and TJN, is likely due to use of the *Pg-a* resistance in southern USA oat cultivars.

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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 2012

ABSTRACT: Dry conditions in many Ontario and Québec corn fields led to reduced foliar disease development. However, northern leaf blight and common rust remained widespread in both Ontario and Québec. Late season ear and stalk diseases and ear rot and stalk rots in seed corn were sometimes severe in the seed corn production area. Mite populations were high due to the drought. Stewart's wilt and Goss's wilt were not found. European corn borer, corn rootworm and grasshoppers were less problematic in both provinces. Red-purple virus-like plant discolorations late in the season resulted in significant yield losses.

INTRODUCTION AND METHODS: Due to the unusually dry conditions and high temperatures in Ontario and Québec in 2012, the survey was conducted from August 29 to September 14, one week earlier than normal. As in previous years (1, 2, 3, 4), the emphasis was to determine the distribution and severity of corn diseases and insects pests including northern leaf blight (*Exserohilum turcicum*), anthracnose leaf blight (*Colletotrichum graminicol*a), 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. graminicol*a), Stewart's wilt (*Pantoea stewartii = Erwinia stewartii*), Goss's wilt (*Clavibacter michiganensis* subsp. *nebraskensis*), European corn borer (*Ostrinia nubilalis*), corn rootworm (*Diabrotica longicornis* and *D. virgifera*), and corn flea beetle (*Chaetocnema pulicaria*). In addition, fields were scouted for newer pests to Canada. A total of 173 fields in Ontario and 67 fields in Québec were surveyed and at each location the incidence of each disease or pest, and the severity of those that predominated, were recorded.

RESULTS AND COMMENTS:
Fungal leaf diseases: Northern leaf blight (NLB) was found in 149 fields in Ontario and 37 in Québec (Table 1). Although NLB incidence was lower in 2012 than in 2011, it was the most common foliar disease observed. There were 32 fields with intermediate to high severities in Ontario, including seven seed corn fields. In six commercial fields, one each located in the counties of Chatham-Kent, Elgin, Lambton, Middlesex, Perth, and Ottawa-Carleton, ON, at least 4 ha were observed to have very severe NLB damage. Additionally, in a corn field of more than 100 ha between Elgin and Norfolk County, ON severe NLB infection at the time of the survey -was estimated to result in yield losses near 10%. In Québec, a similar situation occurred in four fields, including one Réseaux Grandes Cultures du Québec (RGCQ) trial and three commercial fields having intermediate to high NLB severities. In a field in Bécancour, QC, more than 24 ha of plants were dead due to severe NLB.

In 10 Ontario Corn Committee (OCC) trials, some hybrids were found to be moderately susceptible to NLB; whereas at the Tilbury, Kerwood, Ilderton, Thorndale, and Waterloo OCC trials, some hybrids showed moderate to high susceptibility to NLB. As found in previous years, resistant and susceptible NLB lesion types were both frequently observed on the same leaf which indicating s the presence of different pathogenic races. Although drought reduced the overall NLB incidence in 2012, the fields or areas most affected by the disease had some similarities, i.e. they: 1) were surrounded by trees or wood-lots; 2) not far from a river or lake; 3) had a recent history of NLB incidence; and 4) had higher levels of corn residues. In addition, the most affected portions occurred in low lying areas of a field, as these provide more favourable conditions for infection.

Anthracnose leaf blight (ALB) was found in 118 fields in Ontario and 53 in Québec (Table 1). Although ALB was widely distributed, its importance was reduced in 2012. In the six seed corn fields and OCC trials in southern Ontario with moderate ALB infection, the presence of other foliar diseases such as NLB, common rust, eyespot, or grey leaf spot contributed additional damage.

Typical symptoms of grey leaf spot (GLS) were found in 100 fields in 13 counties of Ontario (Table 1). As occurred with most foliar diseases, GLS severity was lower in 2012 compared to 2011. At the Ridgetown, Wabash, Blyth, and Belmont OCC trial sites, some hybrids expressed intermediate susceptibility to GLS. In three seed corn fields, the female inbreds were intermediate to highly susceptible to GLS. However, only three commercial corn fields in Chatham-Kent and Elgin counties in Ontario had moderate levels of GLS. Grey leaf spot was not observed in Québec in 2012.

Common rust was the most prevalent disease in 2012, and was found in 155 fields in Ontario and 59 in Québec (Table 1). As in 2010 and 2011 (3, 4), the incidence of common rust was greater in southern Ontario than in eastern Ontario or Québec. Severe levels of common rust were observed in 58 fields, including 13 seed corn fields and 24 commercial corn fields in southern Ontario (Chatham-Kent, Elgin, Essex, Lambton, Middlesex, Huron, Oxford, Waterloo, and Wellington counties). By comparison, only two and six fields respectively had intermediate levels of common rust in eastern Ontario and Québec. At 13 of 21 OCC trials commercial hybrids displayed intermediate susceptibility to common rust, whereas intermediate to high susceptibility was observed at six other locations at Ridgetown, Blyth, Winham, Dublin, Waterloo and Alma. Hybrids at three of seven RGCQ trials showed intermediate susceptibility to common rust. In seed corn, 13 of 21 fields surveyed had female inbreds that were moderately to highly susceptible to common rust; however, two female inbreds were found to be highly resistant (no evidence of rust pustule formation). Southern rust (*Puccinia polysora* Underw.) was not found in 2012 in Ontario or Québec during our survey period.

Eyespot was detected in 115 fields in Ontario and 51 in Québec (Table 1). In contrast to previous years, no severe levels of eyespot were found in eastern Ontario or Québec in 2012. At the Ridgetown, Kerwood, Exeter, Blyth, and Wingham OCC trial sites, some hybrids exhibited intermediate to high levels of eyespot, while one female inbred in a seed corn field expressed intermediate susceptibility.

Brown spot (*Physoderma maydis*) was ubiquitous in both Ontario and Québec; however, in regions experiencing dry conditions symptoms on sheaths were reduced. Fusarium sheath rot was found most often in fields which were initially dry and subsequently experienced rains. Phaeosphaeria leaf spot (PLS), caused by *Phaeosphaeria maydis*, was found in four fields in Ontario, including two OCC trials. In each of these only a few plants with typical lesions (round or elongated spot surrounded by dark brown margins) were observed. Northern leaf spot was not found in Ontario or Québec in 2012.

Fungal Ear and Stalk diseases: Common smut was distributed across 95 fields in Ontario and 39 in Québec in 2012 (Table 1). The dry conditions did not decrease the percentage of affected crops; additionally severity (the percentage of infected plants and of infected kernels on an ear) increased. Six commercial corn fields in Norfork, Wellington, Dufferin, and Ottawa-Carleton counties in Ontario had a 10 – 80% incidence of common smut. At the Alma, Orangeville, Ottawa, and Pakenham OCC trials, some hybrids were moderately to highly susceptible to common smut. Four grain corn fields in Québec had 1 - 20% incidence of the disease. Head smut was detected in three fields in eastern Ontario and one in Québec, but at only low incidence levels (<1%).

Gibberella/Fusarium/Penicillum/Trichoderma (multiple pathogen) ear rots were observed in 103 fields in Ontario and 45 in Québec (Table 1). Three seed corn fields had a 5-30% incidence of ear rot, while five commercial fields had incidences of up to 30% in Waterloo, Wellington, and Dufferin counties in Ontario. Some hybrids expressed moderate to high susceptibility to ear rot at the Thorndale, Waterloo, Alma, Orangeville and Lancaster OCC trial sites. The incidence of ear rot caused by *Fusarium* spp. increased on short husked ears late in the season (September) because of more frequent rain in both provinces at that time. As in other years, many ears had black mould /spores on kernels damaged by birds or insects.

Two fields in Chatham-Kent and Essex, Ontario were found to have crazy top (*Sclerophthora macrospora*) at incidence levels up to 10%. As noted in 2011 (4), crazy top-infected plants usually also display other symptoms such as multiple barren ears, longer leaves on husks, and development of common smut on diseased tassels.

Stalk rots, including Anthracnose stalk rot/top-die back, *Fusarium* stalk rot, and *Pythium* stalk rot were found in 139 fields in Ontario and 62 in Québec (Table 1). Fourteen crops in Ontario and two in Québec had severe top die-back as evidenced by 50-90% incidence levels. Some hybrids expressed moderate to high susceptibility to top die-back at the Ridgetown, Wabash, Ilderton and Wincheser OCC trials. *Pythium* stalk rot (or early death), was observed in four fields in Ontario and two in Québec at incidence levels ranging from 10 to 30%. Early death was more evident in crops growing with adequate to excessive moisture than those experiencing drought.

Bacterial diseases: No typical Stewart's wilt symptoms were observed in 2012. When tested in the laboratory, plants with possible Stewart's wilt were found to be affected by NLB. However, the population of Corn flea beetle (CFB) once again increased slightly in southern Ontario in 2012. Although the incidence of Goss's bacterial wilt is reported to be increasing in the United States, it again was not detected in Ontario or Québec.

Virus diseases: No typical symptoms of virus diseases were observed at the time of the surveys. However, plants with red/purple discolourations, similar to those resulting from certain virus diseases, were observed in 14 Ontario and 2 Québec fields. In Ontario, reddish plants were seen mostly in Chatham-Kent and Essex counties. In one 24 ha Chatham-Kent field the incidence of discoloured plants was as high as 80% along its 40 × 200 m^2 border. At another location in Essex County, all hybrids had from 40-90% reddish-appearing plants. Red discolouration late in the season can suggest a problem with kernel set or ear size and although plants in these fields had normal plant and ear heights, in many of the affected plants kernel set was reduced, non-existent (barren ears) or arrested (beer canning or blunt ear symptom).

Insects: European corn borer (ECB) damage was observed at 57 fields in Ontario and 29 in Québec (Table 1). Some hybrids at the Winchester OCC trial, and Princeville, St. Albert, St-Alexis and St-Bonaventure RGCQ trials had a 10-30% incidence of ECB. ECB levels were higher in Québec than Ontario. Corn rootworm (CRW) damage was observed at 153 fields in Ontario and 63 in Québec (Table 1). As found in other years (1, 2, 3, 4), the main injury caused by CRW resulted from leaf feeding, silk pruning, or occasionally, damage to kernels.

Grasshoppers, most likely red-legged grasshopper (*Melanoplus femur-rubrum* De Geer), were observed in 153 fields in Ontario and 59 in Québec (Table 1). As noted for 2010 and 2011 (3, 4), grasshopper populations were again low in both Ontario and Québec. Corn flea beetle was detected in 25 fields in Chatham-Kent, Elgin, Essex, Lambton, Huron, Wellington, and Northumberland counties of Ontario at relatively low levels, but higher than levels in 2011. Corn blotch leaf miner (*Agramyza parvicornis* Loew) was found to be not as common as in other years in either Ontario or Québec.

Other insects, such as corn ear worm (*Helicoverpa zea*) were observed in seven fields in Ontario. As reported in the past, aphids, brown stink bug (*Euschistus servus*), picnic beetle (*Glischrochilus quadrisignatus*), Japanese beetle (*Popillia japonica*), and June beetle (*Phyllophaga* spp.) were observed in a few fields in Ontario and Québec, but only at very low populations.

Mites: Mites, most likely the two-spotted spider mite (*Tetranychus urticae* Koch = *T. bimaculatus* Harvey), were observed in 112 fields in Ontario and 35 in Québec (Table 1). Twenty-two fields in Ontario and five in Québec had very high mite populations on all leaves; these likely were related to the drought and contributed to premature plant senescence.

Drought: In 2012 a severe drought impacted much of the corn production areas of North America. Some regions experienced more than 70 days between late May and early August with no effective rainfall. In our survey we found 46 of 173 fields in Ontario and 10 of 67 in Québec to have significant evidence of drought stress. This varied across Ontario with southwestern regions having minimal drought effects; plant heights were around 180 cm while ears were slightly smaller than normal in size. The area around London, Niagara, and west of Toronto showed more obvious evidence of moisture stress with plants as short as 150 cm and ear size reduced to 50-80% of normal. The greatest effects of the drought occurred from Cobden east to Ottawa and along the Ottawa valley, with many fields having plant shorter than 150 cm and very small ears with little or no filling of kernels due to poor pollination. Substantial yield losses were expected in these areas.

Other damage: As reported in previous years, bird and other animal damage was severe in many fields in both Ontario and Québec. Likewise, hail damage was observed in both provinces in 2012.

Summary: Moisture stress was observed throughout much of Ontario and Québec early in the season, followed by more regular rainfall later in the season. This resulted in lower levels of foliar diseases than usual in 2012. However, NLB and common rust were still widely distributed and, as found in previous years, NLB caused severe damage at many locations in both Ontario and Québec. Levels of late-season ear and stalk diseases, and ear rot and stalk rot diseases in seed corn remained high since much of the seed corn production areas in Chatham-Kent and Essex counties received adequate rainfall. Common smut was observed more frequently on plants with shorter husks. As expected, mite severity was related to drought conditions and was more apparent in 2012 than in 2011. ALB, GLS, and eyespot were diseases of lesser importance in 2012 due to the unfavourable weather conditions. Stewart's wilt and Goss's wilt were once more not found in 2012. European corn borer, corn rootworm, and grasshopper were less problematic than usual in 2012 in both Ontario and Québec. We observed red-discoloured plants late in the season especially in Chatham-Kent and Essex Counties and, although plant height and ear length in the fields was near-normal, in many of the affected plants kernel set was reduced or non-existent (barren ears) or ear development was arrested (beer canning).

ACKNOWLEDGEMENTS: The 2012 survey was supported in part by: 1) the Seed Corn Growers of Ontario which obtained funding through the Farm Innovation Program (a component of Growing Forward) administered by the Agricultural Adaptation Council in Guelph for OMAFRA and AAFC; and 2) by an AAFC Growing Forward partnership with the Canadian Field Crop Research Alliance (CFCRA). We would also like to thank our grower co-operators and the following seed corn companies (Dow, Hyland, Maizex, Pioneer Hi-Bred and Pride) for access to their seed fields. We would also like to thank Julie Durand with Recherche Semican, Québec, for providing us the locations of Réseaux Grandes Cultures du Québec (RGCQ), and finally two OMAFRA summer students Hillary Mann and Josh Johnston.

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Table 1a. Distribution of diseases and pests in corn fields in Ontario in 2012

County	# of Fields	NLB	ALB	GLS	Rust	Eyespot	Smut	Ear rot	Stalk rot	ECB	CRW	Grasshoppers	Mite	Drought
Chatham-Kent	34	34	26	33	33	17	23	16	20	10	26	21	18	1
Dufferin	3	3	2		3	3	3	3	2	1	3	3	2	
Durham	3	3	2		3	3		3	3	1	2	3	2	
Elgin	16	16	10	10	15	12	8	12	15	3	14	14	9	2
Essex	6	6	5	6	5	2	6	2	4	4	5	5	3	2
Frontenac	5	4	1		3	3	2	1	2	2	4	5	2	1
Hastings	3	1	3		1	3	1	2	3	1	3	3	1	2
Huron	11	11	9	9	11	9	7	10	11	4	11	11	9	4
Lambton	10	10	6	9	9	6	3	3	10	2	9	10	2	
Lanark	4	2	3		4	1	2	2	4	1	3	4	4	2
Leeds & Grenville	5	2	1		4	1	3	3	3	2	4	5	4	
Middlesex	8	8	8	8	8	6	5	4	8	4	8	8	4	2
Norfolk	4	4	2	3	4	3	3	1	3	2	4	4	3	2
Northumberland	4	2	2	1	3	4	1	1	4	1	4	4	1	1
Ottawa-Carleton	7	3	3		5	6	2	4	5	3	7	7	7	7
Oxford	7	7	3	6	7	7	5	4	6	1	6	7	5	4
Perth	8	6	8	7	7	5	4	5	5	2	7	7	6	1
Peterborough	1	1	1		1	1		1	1		1	1	1	
Prescott & Russell	4	3	2		3	4	2	2	4	2	3	4	4	4
Renfrew	7	1	1		4	4	1	3	4	1	7	5	7	4
Simcoe	1	1			1	1	1	1	1		1	1		
Stormont, Dundas & Glengarry	8	8	8	2	8	5	5	7	8	4	8	8	7	1
Waterloo	7	6	5	1	6	4	3	6	7	4	6	6	6	2
Wellington	6	6	6	5	6	4	5	6	5	2	6	6	5	4
York	1	1	1		1	1		1	1		1	1		
Total	**173**	**149**	**118**	**100**	**155**	**115**	**95**	**103**	**139**	**57**	**153**	**153**	**112**	**46**

NLB = northern leaf blight, ALB = Anthracnose leaf blight, GLS = Gray leaf spot, Rust = common rust. PLS = Phaeosphaeria leaf spot, Smut = Common smut. Ear rot: including Gibberella ear rot, Fusarium ear rot, Penicillium ear rot etc. Stalk rot: including 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 red-legged grasshopper, and Mites, most likely **t**wo-spotted spider mite. Drought refers to fields that appeared to suffer from lack of moisture due to the extensive drought conditions in many parts of Ontario and Québec in 2012.

Table 1b. Distribution of diseases and pests in corn fields in Québec in 2012

County	# of Fields	NLB	ALB	GLS	Rust	Eyespot	Smut	Ear rot	Stalk rot	ECB	CRW	Grasshoppers	Mite	Drought
Argenteuil	2	2	1		2	2		2	2		2	2	1	
Beauharnois-Salaberry	3	2	3		3	3	3	2	3	2	3	3	1	
Bécancour	4	2	3		3	2	2	1	3	4	4	4	2	
Brome-Missisquoi	4	2	2		3	3	1	1	3	2	4	4	2	1
D'Arthabaska	4	1	2		3	3	2	2	4	2	4	4	1	
D'Autray	2	2	2		2	2	2	2	2		2	2	1	
Drummond	3	1	2		3	2	3	2	3	2	3	3	3	
Haut-Richelieu	3	2	2		3	1		1	3	1	3	2	1	1
Haut-Saint-Laurent	3	3	1		2	3	2	2	2	1	3	3	1	
Jardins-de-Napierville	3	1	3		3	2	1	1	2	2	2	3	1	
Joliette	1	1	1		1	1	1	1	1	1	1	1		
L'Érable	1	1	1		1	1	1	1	1	1	1			
Maskinonge	4	3	4		4	4	3	4	3	1	4	3	3	
Maskoutains	6	4	6		5	3	4	6	6	4	6	4	5	2
Mirabel	3	1	2		3	3	2	2	3	1	1	3	2	
Montcalm	2	1	1		2	2	2	2	2	2	2	1	1	
Nicolet-Yamaska	7	2	7		5	6	4	6	7	2	7	7	7	3
Roussillon	2		2		2	2		1	2		1	1	1	1
Rouville	2		1		1	1	1	2	2		2	2	2	
Trois-Rivières	2	1	2		2	2	1	1	2		2	2		
Vaudreuil-Soulanges	6	5	5		6	3	4	3	6	1	6	5	4	2
Total	**67**	**37**	**53**	**0**	**59**	**51**	**39**	**45**	**62**	**29**	**63**	**59**	**35**	**10**

NLB = northern leaf blight, ALB = Anthracnose leaf blight, GLS = Gray leaf spot, Rust = common rust. PLS = Phaeosphaeria leaf spot, Smut = Common smut. Ear rot: including Gibberella ear rot, Fusarium ear rot, Penicillium ear rot etc. Stalk rot: including 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 red-legged grasshopper, and Mites, most likely two-spotted spider mite. Drought refers to crops that appeared to suffer from lack of moisture due to the extensive drought conditions in many parts of Ontario and Québec in 2012.

CROP / CULTURE: Oat
LOCATION / RÉGION: Saskatchewan

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TITLE / TITRE: 2012 SASKATCHEWAN OAT FUSARIUM HEAD BLIGHT SURVEY

ABSTRACT: Panicles from 66 oat fields across Saskatchewan were sampled from late July to early September and threshed. The grain was tested by agar plating and morphological identification and by Real-time PCR to detect five *Fusarium* spp. Quantities of all species were low. The most common species detected by both methods was *F. poae* followed by *F. avenaceum* and *F. graminearum.* However PCR was generally more sensitive than plating in detection and revealed *F. sporotrichioides* and *F. culmorum* in a few samples.

INTRODUCTION AND METHODS: To identify and quantify the *Fusarium* species affecting oat crops in Saskatchewan in 2012, 66 fields from 15 Crop Districts throughout the province were sampled from July 23 to September 7, 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 min., rinsed with water to remove residual NaOCl and air dried. Fifty randomly selected 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 four *Fusarium* species (*F. graminearum, F. poae, F. culmorum,* and *F. avenaceum*) and primers specific for *F. sporotrichioides* were designed based on available DNA sequence information (Halstensen et al., 2006; Yli-Mattila et al., 2008; Nicolaisen et al., 2009). SYBR Green was used for *F. sporotrichioides.* 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 from the plate microbiological method and real-time PCR are provided in Table 1. *Fusarium poae* was the most common species isolated by the plate method (42.2%), followed by *F. avenaceum* and *F. graminearum*, both at 4.6%. A comparison of the two methods indicates real-time PCR was more sensitive than the plate method in detecting the various *Fusarium* species. *Fusarium avenaceum, F. graminearum* and *F. poae* were detected in all the crop samples by real-time PCR, while 90.9% and 63.6% of the crop samples were determined to have *F. sporotrichioides* and *F. culmorum*, respectively, at the 0.001 pg/ng detection limit (Table 1). However, the quantity of most *Fusarium* species was low, except for *F. poae* and *F. avenaceum* (Table 2).

The quantity of *Fusarium* DNA detected by real-time PCR in 2012 ranged from 0.001 to 3.571 pg/ng, which was similar to 2009 (0.002 to 3.509 pg/ng) and 2010 (0.010 to 4.793 pg/ng) (Yajima et al. 2011), but far higher than in 2011 (0.01 to 0.985 pg/ng) (Beattie et al. 2012). Mean and ranges of *Fusarium* DNA quantity varied among crop districts (Tables 3-5). The highest mean quantity of *F. avenaceum* was found in crop district 7A (Table 3). *Fusarium culmorum* was detected at relatively low levels in most crop districts, except 2A, 3B, 9AE and 9B, and crop district 5B had the highest mean quantity (Table 3). The highest mean quantity of *F. graminearum* was detected in crop district 1A (Table 4). *Fusarium poae* levels were highest in crop districts 2B, 5B, 8A and 9AE, with mean quantities of 0.884, 0.812, 0.871 and

0.817 pg/ng, respectively (Table 4). *Fusarium sporotrichioides* was detected with a mean quantity above 0.1 pg/ng in crop districts 2B, 5A, 5B and 6A (Table 5).

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Table 1. *Fusarium* spp. detected in Saskatchewan oat crops in 2012.

	Plate Method		RT-PCR Method (% of Crops)	
Fusarium spp.	**% of Crops**	**% of Kernels[a]**	**>0.001[b]**	**>0.10[b]**
F. avenaceum	5	9	100	33
F. culmorum	0	0	64	5
F. graminearum	5	4	100	6
F. poae	42	17	100	85
F. sporotrichioides	0	0	91	21

[a]Percentage of infected kernels from infected crops.
[b]*Fusarium* DNA/Extracted DNA (pg/ng)

Table 2. *Fusarium* DNA abundance in Saskatchewan oat crops in 2012 (% of crops).

Range*	*F. avenaceum*	*F. culmorum*	*F. graminearum*	*F. poae*	*F. sporotrichioides*
0.001-0.100	67	96	94	15	79
0.101-0.500	21	2	6	46	18
0.501-1.000	5	2	0	27	3
1.001-2.000	6	2	0	6	0
2.001-3.000	2	0	0	3	0
3.001-4.000	0	0	0	3	0
4.001-5.000	0	0	0	0	0

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

Table 3. Quantity of *Fusarium avenaceum and F. culmorum* (pg/ng; *Fusarium* DNA/Extracted DNA) detected in Saskatchewan Crop Districts in 2012.

		F. avenaceum			*F. culmorum*		
Crop District	**No. of Crops**	**Detected (%)**	**Mean**	**Range**	**Detected (%)**	**Mean**	**Range**
1A	5	100	0.144	0.027-0.560	100	0.014	0.005-0.021
2A	5	100	0.089	0.008-0.298	0	-	-
2B	8	100	0.140	0.017-0.794	100	0.050	0.009-0.231
3B	1	100	0.008	-	0	-	-
4B	1	100	0.017	-	100	0.005	-
5A	3	100	0.062	0.010-0.163	66	0.005	0.000-0.008
5B	11	100	0.246	0.027-1.649	55	0.177	0.000-1.159
6A	8	100	0.083	0.005-0.390	75	0.021	0.000-0.076
6B	3	100	0.027	0.002-0.045	66	0.008	0.000-0.016
7A	4	100	0.734	0.023-2.731	100	0.017	0.010-0.022
8A	2	100	0.261	0.067-0.455	100	0.014	0.012-0.014
8B	6	100	0.298	0.009-1.193	17	0.001	0.000-0.003
9AE	3	100	0.484	0.054-1.045	0	-	-
9AW	5	100	0.372	0.025-1.603	100	0.013	0.006-0.023
9B	1	100	0.185	-	0	-	-

Table 4. Quantity of *Fusarium graminearum and F. poae* (pg/ng; *Fusarium* DNA/Extracted DNA) detected in Saskatchewan Crop Districts in 2012.

		F. graminearum			***F. poae***		
Crop District	**No. of Crops**	**Detected (%)**	**Mean**	**Range**	**Detected (%)**	**Mean**	**Range**
1A	5	100	0.097	0.028-0.295	100	0.125	0.041-0.269
2A	5	100	0.020	0.013-0.034	100	0.266	0.074-0.662
2B	8	100	0.047	0.012-0.089	100	0.884	0.116-3.571
3B	1	100	0.020	-	100	0.078	-
4B	1	100	0.020	-	100	0.050	-
5A	3	100	0.025	0.015-0.033	100	0.189	0.123-0.277
5B	11	100	0.051	0.013-0.212	100	0.812	0.235-3.392
6A	8	100	0.027	0.007-0.052	100	0.776	0.146-2.209
6B	3	100	0.021	0.004-0.035	100	0.327	0.086-0.547
7A	4	100	0.028	0.017-0.043	100	0.409	0.239-0.578
8A	2	100	0.069	0.034-0.103	100	0.871	0.203-1.539
8B	6	100	0.010	0.003-0.015	100	0.773	0.321-1.724
9AE	3	100	0.016	0.011-0.020	100	0.817	0.225-1.875
9AW	5	100	0.028	0.013-0.043	100	0.235	0.061-0.667
9B	1	100	0.026	-	100	0.701	-

Table 5. Quantity of *Fusarium sporotrichioides* (pg/ng; *Fusarium* DNA/Extracted DNA) detected in Saskatchewan Crop Districts in 2012.

		F. sporotrichioides		
Crop District	**No. of Crops**	**Detected (%)**	**Mean**	**Range**
1A	5	80	0.025	0.000-0.069
2A	5	100	0.036	0.006-0.105
2B	8	88	0.143	0.000-0.614
3B	1	100	0.017	-
4B	1	100	0.009	-
5A	3	66	0.172	0.000-0.424
5B	11	91	0.106	0.000-0.604
6A	8	88	0.165	0.000-0.453
6B	3	100	0.043	0.009-0.069
7A	4	100	0.065	0.005-0.110
8A	2	100	0.074	0.054-0.093
8B	6	100	0.094	0.045-0.164
9AE	3	66	0.077	0.000-0.211
9AW	5	100	0.050	0.009-0.158
9B	1	100	0.097	-

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

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TITLE / TITRE: CROWN RUST OF OAT IN MANITOBA, SASKATCHEWAN AND ONTARIO IN 2010

ABSTRACT: The incidence and severity of crown rust was assessed in 203 fields with wild oat present and 53 fields of common oat in Manitoba and Saskatchewan. Crown rust was found in 55-60% of all wild and common oat populations at mean severities of 26 and 9%, respectively. No virulence was detected to resistance gene *Pc91* in collections from Manitoba and Saskatchewan. From several Ontario collections, no virulence was detected to the resistance genes *Pc45, Pc59, Pc91, Pc94* and *Pc97*.

INTRODUCTION AND METHODS: Surveys for incidence and severity of oat crown rust (caused by *Puccinia coronata* Cda f. sp. *avenae* Eriks.) were conducted in Manitoba from July 29 to August 19, and in Saskatchewan on August 11 and 12, 2010. Crown rust collections were obtained from wild oat (*Avena fatua* L.) and common oat (*A. sativa* L.) in farm fields, and susceptible and resistant oat lines and cultivars grown in uniform rust nurseries. The nurseries were located at Brandon, Emerson, and Morden, MB, and Indian Head and Regina, SK. Samples from Ontario were collected between July 5 and August 19. For virulence studies, single-pustule isolates (spi) were established from the rust collections. Races were identified using 16 standard oat crown rust differentials (Table 1) as described by Chong et al. (2000). In addition, single *Pc*-gene lines with *Pc91, Pc94*, or *Pc96* were used as supplemental differentials. Oat lines with putative new crown rust resistance genes, *temp_pc97* and *temp_Pc98* were included in the differential sets to determine their reactions to the spi established from the rust collections.

RESULTS AND COMMENTS: Wild oat plants were sampled in 203, and common oat in 53 fields in Manitoba and Saskatchewan in 2010. Wild oat plants infected with *P. coronata* f. sp. *avenae* were found in 121 (60%) of the 203 fields, while infected common oat plants were found in 29 (55%) of the 53 fields.

In fields with infected wild oat plants, the percent incidence of infection of plants by *P. coronata* f. sp. *avenae*) ranged from trace to 100%, with an average of 84%. The severity of infection on these plants (percent leaf area covered by pustules) ranged from trace to 80%, with a mean of 26%. The incidence of infection of common oat plants in fields with infected plants ranged from trace to 100%, with an average of 51%. The severity of infection ranged from trace to 60%, with a mean of 9%.

Wild oat collections yielded 202 spi, 156 from Manitoba and 46 from Saskatchewan. From these, 120 races were identified using the 21 crown rust differentials listed in Table 1. The number of spi of each race ranged from 1 to 9. Only one spi was detected for 89 of the races identified. No spi from wild oat were identified with virulence on the resistance genes *Pc91* or *Pc94*.

Common oat collections yielded 52 spi, 44 from Manitoba and 8 from Saskatchewan. These yielded 44 races with the number of isolates per race ranging from 1 to 4. There was only one spi for 38 of the races identified. None of the spi from common oat fields had virulence on the resistance genes *Pc91* or *Pc97*.

Collections from the uniform rust nurseries yielded 53 spi. These yielded 45 races with their isolates ranging from 1 to 4. Only one spi was identified for 39 of the races and no spi possessed virulence on resistance genes *Pc54, Pc58, Pc91, Pc94* and *Pc96*. In 2010, none of the spi from the eastern prairie region was virulent on *Pc91* (Table 1), despite virulence on *Pc91* having been detected in this region in surveys from previous years. Greater than 50% of all spi possessed virulence on resistance genes *Pc38, Pc39, Pc51, Pc56,* and *Pc68*. The high levels of virulence on *Pc38, Pc39,* and *Pc68* likely reflect the widespread use of *Pc68* on the eastern prairies, and the deployment of *Pc38* and *Pc39* in combination in the eastern prairies, as well as in North Dakota and Minnesota since the 1980s.

The collections from Ontario yielded 20 spi. Of the 19 races identified, none possessed virulence on resistance genes *Pc45, Pc59, Pc91, Pc94* and *Pc97* (Table1). Greater than 50% of the spi were virulent on resistance genes *Pc38, Pc39, Pc48* and *Pc68*.

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Chong, J., Leonard, K.J., and Salmeron, J.J. 2000. A North American system of nomenclature for *Puccinia coronata* f. sp. *avenae.* Plant Dis. 84:580-585.

Table 1. Frequencies (%) of virulence of *Puccinia coronata* f. sp. *avenae* isolates from Manitoba and eastern Saskatchewan (eastern prairie region) and from Ontario on 16 standard and five supplemental crown rust differential oat lines in 2010.

Oat lines and *Pc* gene present	**Wild Oat**		**Commercial Oat Field**		**Uniform Rust Nursery**		**Eastern Canada**	
	# isolates	**Percent**	**# isolates**	**Percent**	**# isolates**	**Percent**	**# isolates**	**Percent**
Standard								
Pc38	194	96	51	98	50	94	17	85
Pc39	190	94	50	96	51	96	11	55
Pc40	94	47	23	44	27	51	2	10
Pc45	27	13	6	12	1	2	0	0
Pc46	79	39	18	35	21	40	6	30
Pc48	15	7	2	4	16	30	16	80
Pc50	16	8	8	15	5	9	1	5
Pc51	103	51	23	44	31	58	2	10
Pc52	15	7	2	4	16	30	7	35
Pc54	5	2	3	6	0	0	2	10
Pc56	146	72	38	73	38	72	4	20
Pc58[a]	4	2	2	4	0	0	1	5
Pc59[a]	20	10	4	8	0	0	0	0
Pc62	15	7	7	13	4	8	3	15
Pc64	27	13	16	31	12	23	4	20
Pc68	118	58	41	79	33	62	15	75
Supplemental								
Pc91	0	0	0	0	0	0	0	0
Pc94	0	0	5	10	0	0	0	0
Pc96	5	2	1	2	0	0	2	10
Putative new gene[b]								
Temp_Pc97	4	2	0	0	2	4	0	0
Temp_Pc98	6	3	6	12	7	13	0	0
Total	202		52		53		20	

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

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba and Eastern Saskatchewan, and Eastern Canada

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TITLE / TITRE: CROWN RUST OF OAT IN MANITOBA, SASKATCHEWAN AND EASTERN CANADA IN 2011

ABSTRACT: The incidence and severity of oat crown rust in 2011 was determined for 218 fields with wild oat present, and 39 fields of common oat. Plants with crown rust were found in 60-65% of total fields with wild or common oat at mean severities of 19 and 7%, respectively. No virulence was detected on resistance gene *Pc91* in collections from Manitoba and Saskatchewan. No virulence was detected on resistance genes *Pc45, Pc51, Pc58, Pc59, Pc91, Pc94* or *Pc98* in collections from eastern Canada.

INTRODUCTION AND METHODS: Surveys for incidence and severity of oat crown rust (caused by *Puccinia coronata* Cda f. sp. *avenae* Eriks.) were conducted in Manitoba and Saskatchewan from July 21 to September 21 in 2011. Crown rust collections were obtained from: wild oat (*Avena fatua* L.) and common oat (*A. sativa* L.) in commercial farm fields, as well as susceptible and resistant oat lines and cultivars grown in uniform rust nurseries. The nurseries were located at Brandon, Emerson, and Morden, MB, and at Indian Head and Regina, SK. Samples from 20 fields in Ontario and Quebec were collected between July 18 and August 18. For virulence studies, single-pustule isolates (spi) were established from the rust collections. Races were identified using 16 standard oat crown rust differentials (Table 1) as described by Chong et al. (2000). In addition, single *Pc*-gene lines with *Pc91, Pc94*, or *Pc96* were used as supplemental differentials. Oat lines with putative new crown rust resistance genes, *temp_pc97* and *temp_Pc98* were included in the differential sets to determine their reactions to the single-pustule isolates established from the rust collections.

RESULTS AND COMMENTS: Two hundred eighteen fields with wild oat present and 39 fields of common oat lines were surveyed in Manitoba and Saskatchewan in 2010. Wild oat plants infected with *P. coronata* f. sp. *avenae* were found in 139 (64%) of the fields, and infected common oat plants were found in 24 (62%) of the fields. In general, the greatest incidence and severity of crown rust was observed in southwestern Manitoba and southeastern Saskatchewan.

In fields with wild oat plants infected by *P. coronata* f. sp. *avenae* the percent incidence of infected plants ranged from trace to 100%, with a mean of 62%.The severity of infection (percent leaf area covered by pustules) ranged from trace to 100%, with a mean of 19%. The incidence of infection of common oat plants in fields with infected plants ranged from trace to 100%, with an average of 55%. The severity of infection ranged from trace to 60%, with a mean of 7%.

Wild oat samples yielded 208 spi. One hundred fifteen races were identified from these using the crown rust differentials listed in Table 1. The number of spi of each race ranged from 1 to 10. Only one spi was obtained for 83 of the races identified. No spi were identified with virulence on the resistance genes *Pc91* and *Pc94* from wild oat.

Common oat collections yielded 38 spi. Thirty two races were identified from these, with the number of isolates of each race ranging from 1 to 3. A single spi was obtained for 26 of the races identified. None of the spi had virulence on the resistance genes *Pc54, Pc58, Pc91* and *Pc96* from common oat fields.

Forty-three spi were obtained from collections from the uniform rust nurseries, yielding 37 races numbering from 1 to 4 isolates of each. Only a single spi was identified for 34 of the races, and no spi possessed virulence to resistance genes *Pc58, Pc91, Pc94* and *Pc97*. In 2011, none of the spi from the eastern prairie region was virulent to *Pc91* or *Pc94* (Table 1), despite virulence to *Pc91* having been detected in this region from surveys in previous years. Greater than 50% of all spi possessed virulence on resistance genes *Pc38, Pc39, Pc56,* and *Pc68*. The high levels of virulence on *Pc38, Pc39,* and *Pc68* likely reflect the widespread use of *Pc68* on the eastern prairies, and the deployment of *Pc38* and *Pc39* in combination on the eastern prairies, as well as in North Dakota and Minnesota since the 1980s.

Twenty four spi were made from collections from eastern Canada. Twenty one races were identified and only a single race was represented by more than one isolate. None of the races possessed virulence to the resistance genes *Pc45, Pc51, Pc58, Pc59, Pc91, Pc94* and *Pc98* (Table1). Fifty percent or more of the spi possessed virulence to the resistance genes *Pc38, Pc48* and *Pc68*.

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Chong, J., Leonard, K.J., and Salmeron, J.J. 2000. A North American system of nomenclature for *Puccinia coronata* f. sp. *avenae.* Plant Dis. 84:580-585.

Table 1. Frequencies (%) of virulence of *Puccinia coronata* f. sp. *avenae* isolates from Manitoba and eastern Saskatchewan (Eastern Prairie Region, and from eastern Canada in 2011 on 16 standard and four supplemental crown rust differential oat lines.

Oat lines and *Pc* gene present	**Wild Oat**		**Commercial Oat Field**		**Uniform Rust Nursery**		**Eastern Canada**	
	# isolates	**Percent**	**# isolates**	**Percent**	**# isolates**	**Percent**	**# isolates**	**Percent**
Standard								
Pc38	202	97	36	95	38	88	17	71
Pc39	203	98	38	100	43	100	8	33
Pc40	106	51	16	42	19	44	3	13
Pc45	28	14	8	21	7	16	0	0
Pc46	72	35	9	24	10	23	3	13
Pc48	20	10	3	8	12	28	14	58
Pc50	18	9	2	5	2	5	1	4
Pc51	84	40	20	53	19	44	0	0
Pc52	18	9	3	8	10	23	6	25
Pc54	2	1	0	0	6	14	1	4
Pc56	142	68	24	63	27	63	11	46
Pc58[a]	3	1	0	0	0	0	0	0
Pc59[a]	14	7	2	5	2	5	0	0
Pc62	3	1	1	3	2	5	2	8
Pc64	28	14	3	8	4	9	7	29
Pc68	110	53	28	74	22	51	12	50
Supplemental								
Pc91	0	0	0	0	0	0	0	0
Pc94	0	0	1	3	0	0	0	0
Pc96	2	1	0	0	2	5	3	13
Putative new gene[b]								
Temp_Pc97	6	3	1	3	0	0	3	13
Temp_Pc98	6	3	1	3	2	5	0	0
Total	208		38		43		24	

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

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: FUSARIUM HEAD BLIGHT IN MANITOBA OAT CROPS – 2012

ABSTRACT: Nineteen oat crops in southern Manitoba were monitored for fusarium head blight (FHB) to assess disease severity and identify *Fusarium* species involved. There was the usual scarce visual evidence of FHB. *Fusarium poae* predominated and was isolated from all crops and 79% of kernels positive for *Fusarium*; other species included *F. graminearum*, *F. sporotrichioides* and *F. avenaceum*.

INTRODUCTION AND METHODS: Fusarium head blight (FHB) in southern Manitoba oat crops in 2012 was assessed in surveys of 19 commercial fields made July 18 - 25, when crops were at the early- to soft-dough (ZGS 82-86) 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 45 to the north, the Manitoba/North Dakota border in the south, Hwy #12 to the east, and Hwy #s 10 (south) and 83 (north) to the west. Fusarium head blight in each field was assessed at each of 3 locations by sampling a minimum of 80-100 plants gathered as a clump for the presence of infected spikelets on panicles (disease incidence), and for the average proportion of putatively infected spikelets/ panicle (spi). Fusarium head blight severity was calculated as the 'FHB Index' (% incidence x % spi) / 100. Several affected panicles, or 'normal' panicles, as necessary, were collected as close to the original clumps sampled as possible at 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). *Fusarium* spp. present were later identified and quantified based on morphological traits as described in standard taxonomic keys.

RESULTS AND COMMENTS: The growing conditions in Manitoba in 2012 were difficult to characterize due to considerable variability in rainfall among the five major agricultural regions and reporting sites within these. Soil moistures and temperatures were conducive to early seeding (late April to mid-May) and the emergence of earlier-seeded crops was rated as good to excellent. Cooler conditions prevailed in the latter half of May, but warm weather returned in mid-June and June, July and August were generally very warm, with 2012 being the hottest summer on record at many locations. Precipitation was spotty throughout June and July with some areas receiving adequate levels while others remained dry. Crop development was more rapid than normal, and had a somewhat negative impact on seed set and grain filling. Frost in many areas on May 30 caused minor injury to particular crops, and several fast-moving systems accompanied by strong winds or hail resulted in temporary crop lodging. August was generally dry leading to favourable harvest conditions for the early-matured crops.

Oat was grown on about 190,000 ha (470,000 acres) in Manitoba in 2012 (MASC 2012), a 17% increase compared to 2011 (Tekauz et al. 2012), but similar to the acreage seeded in 2010 (Tekauz et al. 2011). Seven cultivars occupied near 90% of the acreage: 'Souris' (27%), 'Furlong' (14%), 'Pinnacle' (11%), 'Triactor' (10%) 'Summit' (10%) %) 'Leggett' (9%), and 'Ronald' (6%) (MASC 2012). These proportions are quite similar to those reported for 2011 (Tekauz at al. 2012). For the 15 fields where the previous year's crop stubble was recognizable, 3 crops had been seeded back into a cereal while for most others the stubble crop was canola.

Only 11 of the oat crops monitored appeared to show evidence of FHB, based on the presence of scattered orange-pink or otherwise discoloured spikelets on panicles. Overall, the average incidence of FHB was estimated to be 0.3% (range 0 – 1.3%), spi 2.8% (range 0 – 5.0%) and the resulting FHB Index 0.01% (range 0 – 0.06%). As such, FHB was estimated to have caused no loss of yield in Manitoba oat crops in 2012. Low to very low severities of mid-season FHB are typical for oat in Manitoba (Tekauz and Gilbert 2011). While moisture was abundant early in the growing season, this was accompanied by cool conditions which likely curtailed inoculum development on overwintered straw. Subsequent very dry and warm conditions in many regions would have further reduced the likelihood of *Fusarium* infection.

Fusarium colonies developed from all 19 crops sampled and from an average of 16.7% of the oat kernels plated on potato dextrose agar medium. *Fusarium poae* dominated in 2012 (Table 1), as in 2011 (Tekauz et al. 2012). *Fusarium graminearum* was detected in about half of the fields and predominated in only one. *Fusarium sporotrichioides* was identified from only three fields at low levels, but was the most prevalent species in one of these. *Fusarium avenaceum* was isolated in one field after not being observed on oat for the past two years (Tekauz at al. 2012, 2011). Three oat crops (all from the eastern region) with noteworthy statistics included one near Niverville in which *Fusarium* was isolated from 58% of mainly randomly-chosen kernels (of which 48% was *F. poae)* and two crops near St. Malo and Anola, with respectively 34 and 30% *Fusarium*-infected kernels, all *F. poae*.

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Table 1. *Fusarium* spp. isolated from Manitoba oat crops in 2012.

Fusarium spp.	Percent of fields	Percent of kernels
F. avenaceum	1	1.2
F. graminearum	47	17.4
F. poae	100	79.0
F. sporotrichioides	16	2.4

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: LEAF SPOT DISEASES OBSERVED IN MANITOBA OAT CROPS IN 2012

ABSTRACT: Nineteen oat crops in southern Manitoba were monitored for the occurrence and severity of leaf spots and to identify the causal pathogen species. Less than half of the crops had visible evidence of leaf spotting and these were affected at only trace levels. As found in previous years, *Pyrenophora avenae* (pyrenophora leaf blotch) was the principal pathogen isolated from foliar lesions, and caused most of the trace damage observed.

INTRODUCTION AND METHODS: For 2012, leaf spot diseases in oat were assessed in 19 commercial fields in Manitoba in surveys made July 18 – 25, at which time the plants were at the early- to soft-dough (ZGS 82-86) 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 45 to the north, the Manitoba/North Dakota border in the south, Hwy #12 to the east, and Hwy #s 10 (south) and 83 (north) 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 leaves) and lower leaf canopies, using a six-category scale: 0 or nil (no visible symptoms); trace (<1% leaf area affected); very slight (1-5%); slight (6-15%); moderate (16-40%); and severe (41-100%). 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 later placed in moist chambers for 3-5 days to promote pathogen sporulation, identify the causal agent(s) and disease(s) present, and estimate their relative importance.

RESULTS AND COMMENTS: The growing conditions in Manitoba in 2012 were difficult to characterize due to considerable variability in rainfall among the five major agricultural regions and reporting sites within these. Soil moistures and temperatures were conducive to early seeding (late April to mid-May) and the emergence of earlier-seeded crops was rated as good to excellent. Cooler conditions prevailed in the latter half of May, but warm weather returned in mid-June and June, July and August were generally very warm, with 2012 being the hottest summer on record at many locations. Precipitation was spotty throughout June and July with some areas receiving adequate levels while others remained dry. Crop development was more rapid than normal, and had a somewhat negative impact on seed set and grain filling. Frost in many areas on May 30 caused minor injury to particular crops, and several fast-moving systems accompanied by strong winds or hail resulted in temporary crop lodging. August was generally dry leading to favourable harvest conditions for the early-matured crops. Similar conditions continued throughout September. Accumulation of growing degree days from April 1 to August 26 was above normal in most regions, while total precipitation was somewhat below normal in the eastern and central regions but above normal in the Interlake, southwest and northwest. Overall, cereal crop yields and quality were described as ‘good’.

Oat crops were grown on some 190,000 ha (470,000 acres) in Manitoba in 2012, a 17% increase compared to 2011 (Tekauz et al. 2012), but similar to the acreage seeded in 2010 (Tekauz et al. 2011). Seven cultivars occupied near 90% of the acreage: ‘Souris’ (27%), ‘Furlong’ (14%), ‘Pinnacle’ (11%), ‘Triactor’ (10%) ‘Summit’ (10%) %) ‘Leggett’ (9%), and ‘Ronald’ (6%) (MASC 2012). These proportions are quite similar to those reported for 2011 (Tekauz at al. 2012). For the 15 fields where the previous year’s crop stubble was recognizable, 3 crops had been seeded back into a cereal residue while most others were into canola.

Leaf spots were observed in the upper and/or lower leaf canopies of only 9 (47%) of the oat crops monitored, a much lower proportion than usual (Tekauz et al., 2012, 2011). All crops with visible leaf spotting had severity levels in the upper canopy rated as trace or very slight. In the lower canopy, trace to slight levels were observed in 79% of affected crops, moderate levels in 11%, and the leaves had senesced in the remaining 10%. Consequently, no loss of yield due to leaf spots was expected in Manitoba oat crops in 2012. The fungal pathogens would not have thrived during the relatively dry mid-season experienced in most of the province.

Pyrenophora avenae (pyrenophora leaf blotch) was the most prevalent pathogen and caused most of the minor damage observed (Table 1). This is typical for the area (Tekauz et al. 2012, 2011). *Stagonospora avenae* f. sp. *avenae* (stagonospora leaf blotch) was observed in 5 fields, resulting in relatively little damage. *Cochliobolus sativus* (spot blotch) was not detected in 2012; this follows a marked decrease in 2011 (Tekauz et al. 2012). *Pyrenophora avenae* remains the dominant component of the leaf spot complex of oat in Manitoba.

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Table 1. Incidence and isolation frequency of leaf spot pathogens from oats crops sampled in southern Manitoba in 2012.

Pathogen	**Incidence (% crops)**	**Frequency* (% isolations)**
Pyrenophora avenae	47	81
Stagonospora avenae f. sp. *avenae*	26	19

*indicative of the relative amount of foliar damage observed

CROP / CULTURE: Oat
LOCATION / RÉGION: Central and Eastern Ontario

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TITLE / TITRE: DISEASES OF OAT IN CENTRAL AND EASTERN ONTARIO IN 2012

ABSTRACT: Fifteen oat crops in Ontario were monitored for presence of diseases. Ten diseases were observed, all at slight levels, except for severe crown rust in one crop. Only slight fusarium head blight was observed with *Fusarium poae* identified as the predominant causal species.

INTRODUCTION AND METHODS: A survey to document the presence of various diseases in central and eastern Ontario oat crops was conducted in the third week of July when plants were at the soft dough stage of development. Fifteen fields were chosen at random in the regions 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 panicles (heads) 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 with a 14-hour photoperiod using fluorescent and long wavelength ultraviolet tubes. The *Fusarium* species isolated were identified by microscopic examination using standard taxonomic keys.

RESULTS AND COMMENTS: A total of ten diseases was observed (Table 1). Barley yellow dwarf (BYD) was the most common and was found in all fields at a mean severity of 1.7. However, no severe infection by BYDV was seen and the disease likely caused little or no reduction of yield. Halo blight (*Pseudomonas syringae* pv. *coronafaciens*), pyrenophora leaf blotch (*Pyrenophora avenae*) and spot blotch (*Cochliobolus sativus*) also were relatively common, observed in 13, 12, and 11 fields at mean severities of 1.8, 2.0, and 1.5, respectively. No severe levels of these diseases were found and none would have resulted in substantial damage to the crop. Other foliar diseases observed included crown rust (*Puccinia coronata* f.sp. *avenae*) and stagonospora leaf blotch (*Stagonospora avenae* f.sp. *avenaria*) in 9 and 7 fields at average severities of 2.2 and 1.6, respectively. One crop had a severe level of crown rust; none had a severe level of stagonospora leaf blotch. The incidence and severity of crown rust decreased in 2012 compared to 2011 and previous years, when it was the most prevalent disease of oats in Ontario (Xue and Chen 2012).

Ergot (*Claviceps purpurea*), loose smut (*Ustilago nuda*) and take-all root rot (*Gaeumannomyces graminis* var. *avenae*) were recorded in 9, 9, and 14 fields at mean severities of 0.7, 0.7, and 0.8%, respectively. These diseases likely resulted in minimal damage.

Fusarium head blight occurred in all fields at a mean FHB index of 0.08% (range 0.01 to 0.25%; Table 1). Severe levels of FHB were not observed. Five *Fusarium* species were isolated from discoloured kernels, with *F. poae* as the predominant species (Table 2). This species occurred in 93% of fields and on 27.2% of kernels. Other species isolated included *F. avenaceum, F. equiseti, F. graminearum* and

F. sporotrichioides. These were documented in 13-33% of fields and on 0.3-1.0% of kernels and may be considered minor contributors to FHB in oat in 2012.

Overall, the incidence and relative prevalence of foliar diseases of oat in 2012 were similar to those found in 2011 (Xue and Chen 2012). None of the surveyed oat crops suffered from severe infection by any disease, except the one severely affected by crown rust. Crown rust has traditionally been the predominant disease of oat in Ontario, causing an estimated annual yield reduction of at least 10%. However, in 2012 it had a minor impact on the crop, likely due to the record warm and dry summer conditions in much of Ontario. Fusarium head blight, while observed in all surveyed fields, was found at only slight levels and likely had little effect on grain yield or quality in 2012. *Fusarium poae* remained the predominant species recovered from infected kernels in Ontario, as it has been since 2006 (Xue and Chen 2012). The high temperatures and low number of rainfall events in June, July and August in central and eastern Ontario in 2012 were unfavorable for FHB development and likely responsible for the low disease severity observed.

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Xue, A.G., and Chen, Y. 2012. Diseases of oat in central and eastern Ontario in 2011. Can. Plant Dis. Surv. 92: 94-95. (www.phytopath.ca/cpds.shtml)

Table1: Prevalence and severity of oat diseases in central and eastern Ontario in 2012.

DISEASE	NO. CROPS AFFECTED (n=15)	DISEASE SEVERITY IN AFFECTED CROPS*	
		MEAN	RANGE
Barley yellow dwarf	15	1.7	1.0-3.0
Crown rust	9	2.2	1.0-7.0
Halo blight	13	1.8	1.0-4.0
Pyronophora leaf blotch	12	2.0	1.0-5.0
Spot blotch	11	1.5	1.0-3.0
Stagonospora leaf blotch	7	1.6	1.0-3.0
Ergot (%)	9	0.7	0.5-1.0
Loose smut (%)	9	0.7	0.5-2.0
Take-all (%)	14	0.8	0.2-1.5
Fusarium head blight**	15		
Incidence (%)		1.7	1.0-5.0
Severity (%)		4.5	1.0-10.0
Index (%)		0.08	0.01-0.25

*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 discoloured kernels of oat in central and eastern Ontario in 2012.

***Fusarium* spp.**	**% AFFECTED FIELDS**	**% KERNELS**
Total *Fusarium*	100	30.0
F. avenaceum	20	1.0
F. equiseti	33	0.8
F. graminearum	13	0.3
F. poae	93	27.2
F. sporotrichioides	20	0.7

CROP / CULTURE: Spring and Winter Wheat
LOCATION / RÉGION: Southern Alberta

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TITLE / TITRE: SURVEY OF STRIPE RUST AND OTHER FOLIAR DISEASES OF WHEAT IN 2012 IN SOUTHERN ALBERTA

ABSTRACT: One hundred and sixty-nine wheat and five triticale fields in southern Alberta were surveyed. The most common diseases were leaf spots, particularly under minimum till. Stripe rust incidence was lower than leaf spot incidence but severity was higher. Although winter wheat lacks stripe rust resistance and rust was widespread in the fall of 2011, winter survival of the rust was rare. In 2012 rust pustules did not appear in spring wheat until the adult plant stage. Stripe rust was most severe in Alberta census districts 2, 3, and 5. After the 2011 epidemic year, there was a decrease in area sown to susceptible spring wheat cultivars and an increase in foliar fungicide applications.

INTRODUCTION AND METHODS: Commercial crops of wheat and triticale were surveyed for stripe rust (*Puccinia striiformis*) in southern Alberta from October 15, 2011 to August 16, 2012. The counties surveyed included all those in Census Districts (CD) 1, 2, 3 and 5. Fields were traversed in a "V" pattern and 10 sites separated by 25 m each were evaluated for disease incidence and severity. Incidence was estimated visually as percent infected plants per 4 m row. Infected leaves occurring within each observation point were evaluated for severity using the modified Cobb Scale (Peterson et al. 1948). Plant developmental stage was assessed using the Feekes Scale (Large 1954). Grass species in headlands were also examined for stripe rust. Where no stripe rust was recorded, fields were classified as clean. Incidence levels of 1% to 2% with severity levels of 1% to 3% were classed as trace. Incidence and severity levels from trace to 5% were classified as light. Moderate levels ranged in incidence from 6% to15% and severity from 16% to 20%. Infection levels in excess of 16% incidence and 20% severity were classified as severe (Table 1).

Conditions in the fall of 2011 allowed for widespread infection in emerging winter wheat. During the 2012 growing season, conditions in the spring favored rapid establishment of the crops. Frequent and heavy rainstorms combined with low temperatures caused fields to be saturated for long periods. Conditions also favorable for stripe rust infection occurred throughout most of the growing season, but high temperatures in August limited disease development. The susceptible cultivars Radiant and AC Bellatrix filled nearly all the winter wheat area in southern Alberta. Lillian, the dominant hard red spring wheat cultivar grown in 2012, is nearly immune to stripe rust and popular varieties such as Harvest, Carberry and CDC Go have good resistance. All durum and triticale cultivars grown on the prairies are highly resistant or immune (Randhawa et al. 2012).

RESULTS AND COMMENTS: While spring surveys in 2012 indicated the stripe rust pathogen generally did not survive the winter (Table 1), a severely infected crop of winter wheat was observed near Taber in mid-June. This indicated that localized overwintering may have occurred in the area. At the adult stage (Feekes 9-11), 47% of all surveyed winter wheat in CD 2 had moderate to severe levels. Lower incidence and severity were observed in CDs 2 and 5. Census District 1 was not surveyed at the adult stage (Table 2). Significant levels of stripe rust were not observed in spring wheat in 2012 until crops reached the adult stage. Severely infected crops were most common in CD 2 but were also observed in CD 3 and CD 5.

Many fields exhibited only very low levels of stripe rust and this was likely attributable to widespread seeding of resistant cultivars such as Lillian. Also, by mid-July, fungicide spraying to control stripe rust was widespread in CD 2 and CD 5. Low disease levels were observed in durum wheat crops and triticale crops were clean. Stripe rust-infected foxtail barley was first observed in mid-July and persisted for the remainder of the growing season; infections were always associated with an infected wheat crop and occurred in only 5% of the fields studied. A decrease in losses due to stripe rust was observed in 2012 compared to 2011 and this was attributed to the seeding of fewer hectares to susceptible varieties and the increased use of fungicides by producers, particularly on the susceptible winter wheat crop. Leaf spots (predominantly tan spot) were observed in 46% of all surveyed fields with the most severe instances occurring in CD 2 and CD 3 under minimal tillage.

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Randhawa, H., Puchalski, B. J., Frick, M., Goyal, A., Despins, T., Graf, R. J., Laroche, A., and Gaudet, D. A. 2012. Stripe rust resistance among western Canadian spring wheat and triticale varieties. Can. J. Plant Sci. 92:713-722.

Table 1. Frequency of stripe rust reaction in Alberta fields by crop type and stage of development.

Crop Type	**Crop Stage**	**Clean**	**Trace**	**Light**	**Moderate**	**Severe**
Winter Wheat, Fall 2011	Feekes 2 to 3	0*	0	0	0	6
Winter Wheat, Spring 2012	Feekes 2 to 8	47	6	3	3	1
Winter Wheat, Summer 2012	Feekes 9 to 11	7	5	1	4	5
Spring Wheat, Spring 2012	Feekes 2 to 8	17	0	0	0	0
Spring Wheat, Summer 2012	Feekes 9 to11	34	10	7	3	7
Durum Wheat, Summer 2012	Feekes 9 to 11	1	1	1	0	0
Triticale, Summer 2012	Feekes 9 to 11	5	0	0	0	0

* No. of fields

Table 2. Adult plant stripe rust reaction by census district.

Census District (*counties*)	**Clean**	**Trace**	**Light**	**Moderate**	**Severe**
CD 3 (*Cardston, Willow Creek, Pincher Creek)*	7*	4	1	1	1
CD 5 (Vulcan, Wheatland)	30	2	5	0	2
CD 2 Winter Wheat *(Taber, Warner, Newell, Lethbridge)*	3	5	1	3	5
CD 2 Spring Wheat *(Taber, Warner, Newell, Lethbridge)*	7	5	2	3	4

* No. of fields

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

NAMES AND AGENCIES / NOMS ET ETABLISSEMENTS:
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TITLE / TITRE: **LEAF SPOTTING DISEASES OF COMMON AND DURUM WHEAT IN SASKATCHEWAN IN 2012**

ABSTRACT: Leaf spot diseases were surveyed in 138 crops of wheat over 20 Saskatchewan crop districts. Percent severity overall and of specific pathogens isolated were compared relative to soil zone, previous crop histories and tillage systems in the fields. Overall severity was slightly lower than in 2011 and highest in the black/grey soil zone. *Pyrenophora tritici-repentis* was the most prevalent and widespread pathogen followed by *Cochliobolus sativus*, which was more severe than usual, possibly due to above-normal summer temperatures. In all soil zones no consistent differences in disease severity or specific pathogens isolated were found among tillage systems.

INTRODUCTION AND METHODS: A survey for leaf spotting diseases of common and durum wheat was conducted between the milk and dough growth stages in 2012. There was a total of 138 crops (74% common wheat and 26% durum wheat) sampled in 20 crop districts (CD). In each field, 50 flag leaves were collected at random and air-dried at room temperature. Percentage of leaf area affected by leaf spots (severity) was recorded for each leaf, and a mean percentage leaf area with spots was calculated for each crop and CD. For the 56 crops with the highest leaf spot severity, 1 cm^2 surface-disinfested leaf pieces were plated on water agar for identification and quantification of leaf spotting pathogens.

Information on the previous crop and tillage method was obtained for most of the fields. Comparisons of disease and fungal levels among tillage systems and among previous crop histories was done separately for soil zone (SZ) 1 (Brown), SZ2 (Dark Brown), and SZ3 (Black/Grey). Tillage system was classified as conventional, minimum**,** or zero, while previous crop histories were a cereal, a noncereal (oilseed or pulse), or summerfallow.

RESULTS AND COMMENTS: Leaf spots were observed in all crops surveyed (Table 1). For individual crops, percent flag leaf area infected ranged from trace to 30%. Overall mean leaf spot severity (10%) was slightly lower than in 2011 (11.6%) and 2010 (11.3%), but higher than in 2009 (7.0%) (Fernandez et al. 2010, 2011, 2012).

For all crops combined, mean leaf spot severity was greatest in SZ3 and lowest in SZ1 (Table 1), which agrees with previous surveys (Fernandez et al., 2010, 2011, 2012). The CDs with the greatest mean leaf spot severity were 5A/5B (east), followed by 9A/9B (north), 6A/6B (central), 8A/8B (north), and 1A/1B (south-east), while the CDs with the lowest mean severity were 3AN/3AS (south-central) and 4A/4B (south-west).

As in previous years**,** *Pyrenophora tritici-repentis* (tan spot) was the most prevalent and widespread leaf spot pathogen (Fernandez et al., 2010, 2011, 2012) (Table 1). This was followed in frequency and number of fields by *Cochliobolus sativus* (spot blotch), which was present at higher levels than in the previous years. Higher temperatures in the growing season in 2012 in all soil zones (mean temperatures in June-July: 18.2°C in 2012, 17.1°C in 2011, 16.7°C in 2010, 15.6°C in 2009) might account for the higher level of *C. sativus* than in recent years. Among species of the septoria leaf complex*,* *Stagonospora nodorum* was the most common, with *Septoria tritici* and *S. avenae* f.sp. *triticea,* being isolated less frequently.

For all crops combined, *P. tritici-repentis* was most common in SZ1 and least common in SZ3 (Table 1). The greatest mean percentage of isolations of *P. tritici-repentis* was observed in southern CDs (1A/1B, 3AN/3AS, 3BN/3BS, 4A/4B), while the lowest percentage isolations of this pathogen were in eastern (5A/5B) and northern (8A/8B, 9A/9B) CDs. Conversely, the greatest percent isolations of the septoria leaf complex were observed in SZ3. *Septoria nodorum* was isolated most frequently from eastern (5A/5B) and northern (8A/8B, 9A/9B) CDs. *Cochliobolus sativus* was most common in SZ2, similar to observations made in 2011 (Fernandez et al., 2012), and was isolated least frequently from western CDs (7A/7B).

Comparison of common wheat crops alone among SZs showed the same trend as for all crops combined, with a similar higher isolation of *P. tritici-repentis* from SZ1 and SZ2 (Table 1) than in SZ3 (35%). In contrast the septoria leaf complex was most common in SZ3 (65%) and *C. sativus* was least common in SZ1.

As for previous years, durum wheat was most represented in SZ1 and least in SZ3 (proportion of durum vs. common wheat: 41% for SZ1, 31% for SZ2, 4% for SZ3). When common and durum wheat were compared within SZ1 or SZ2 (Table 1), leaf spot severity was similar for the two crop species in both soil zones. In SZ2, *P. tritici-repentis* was more frequently isolated from common than from durum wheat, and in both soil zones *S. tritici* was isolated the most from common wheat, whereas *C. sativus* was most common from durum wheat. Observations for the septoria leaf complex are similar to previous years whereas observations for *P. tritici-repentis* in SZ2 differ from previous years when this fungus was more prevalent in durum than in common wheat (Fernandez et al., 2010, 2011, 2012). The greater presence of *C. sativus* in durum than common wheat is similar to observations made in 2011 (Fernandez et al., 2012). However, in the present survey *C. sativus* was the most prevalent pathogen in durum wheat in SZ2, which would explain the lower than expected presence of *P. tritici-repentis* in this crop species.

Pyrenophora teres was isolated throughout the province from 14% of the common and durum wheat crops, with percentage isolations ranging from <1% to 13%, and an overall mean of 3%. A *Pseudoseptoria* species was detected in four durum wheat fields in CDs 3AS (1), 3BS (1), and 4B (2). Percentage isolations ranged from <1% to 3%. *Ascochyta graminicola* and *Phaeoseptoria vermiformis* were isolated from 27% and 18% of all samples respectively, particularly in SZ3; overall these species constituted 7-8% of all fungal isolates. Other fungal species were observed on the leaf tissue; the most common was *Fusarium avenaceum*, which was present in 48% of all samples and 70% of the samples in SZ3, and constituted 5% of all fungal isolates.

Classification of fields according to tillage system revealed no consistent differences of leaf spot severity among tillage systems across all soil zones (Table 2). Differences in fungal isolations among tillage systems were also not consistent across all soil zones. In all soil zones, *P. tritici-repentis* was isolated at a higher mean frequency from zero-till than minimum-till fields; in SZ1 and SZ2, this fungus was more frequent in zero-till than conventional-till fields. In SZ1 and SZ2, the septoria leaf complex was also more common in zero-till than in minimum-till, whereas *C. sativus* was most common in minimum-till.

Classification of fields according to previous crop showed no consistent differences for leaf spotting severity or for percent fungal isolations within soil zones (Table 3). In wheat mean severity of leaf spots when preceded by another cereal crop was no higher than when preceded by a noncereal crop or by summerfallow. Wheat preceded by a pulse crop had the lowest severity of leaf spots in SZ1 and these were mostly attributed to *P. tritici-repentis*. Isolation frequency of this pathogen was the highest, or among the highest, in wheat crops preceded by summerfallow, while it was lowest, or among the lowest, in wheat preceded by another cereal crop. Wheat preceded by an oilseed crop had the highest, or among the highest isolation frequencies of the septoria leaf complex. This agrees with results from 2011 (Fernandez et al., 2012) when *S. nodorum* was isolated more frequently from wheat preceded by an oilseed than from other crop sequence categories.

ACKNOWLEDGEMENT:
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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 2012.

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]
<u>Common and durum wheat</u>:							
Soil Zone:							
1 (Brown)	45	6.0	59/13	13/6	16/4	12/10	21/12
2 (Dark Brown)	4	8.7	48/17	15/12	14/6	8/15	35/14
3 (Black/Grey)	52	14.3	27/26	38/17	11/17	18/17	18/26
		----------	----------	----------	----%----	----------	----------
Crop District:							
1A/1B	16	10.2	73/6	3/2	9/2	8/5	18/5
2A/2B	17	8.6	41/7	23/3	-/-	8/5	50/7
3AN/3AS	9	4.8	56/3	<1/1	-/-	1/2	65/2
3BN/3BS	13	8.1	60/3	-/-	-/-	43/2	11/3
4A/4B	16	3.7	71/3	2/1	-/-	3/2	25/3
5A/5B	17	18.7	24/9	45/9	8/6	6/6	21/9
6A/6B	16	10.9	48/10	13/9	16/6	11/10	21/10
7A/7B	9	8.9	52/4	20/4	16/4	7/4	5/4
8A/8B	8	10.6	20/5	35/4	9/3	30/3	25/5
9A/9B	17	11.8	33/6	29/6	13/6	25/3	11/6
Mean/total	138	10.0	45/56	25/39	12/27	12/42	24/54
<u>Common vs. durum wheat:</u>							
Soil Zone 1 (Brown):							
Common wheat	26	5.7	55/4	23/3	21/3	4/3	9/4
Durum wheat	18	6.6	61/9	4/3	<1/1	16/7	28/8
Soil Zone 2 (Dark Brown):							
Common wheat	27	8.9	53/10	16/9	16/5	9/10	17/9
Durum wheat	12	8.2	34/6	12/3	1/1	4/4	63/6

[1] Number of crops sampled. All crops had leaf spot lesions on the flag leaves.
[2] Mean percent flag leaf infected.
[3] Mean percentage fungal isolation/number of crops where the fungus occurred. For each CD, the number of crops where *P. tritici-repentis* was isolated is the total number of crops plated for fungal identification and quantification.

Table 2. Incidence and severity of leaf spotting diseases, and mean percentage isolation of the most common leaf spotting pathogens, by tillage system within each soil zone for common and durum wheat crops surveyed in Saskatchewan in 2012.

Soil Zone/ Tillage system	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]
		----------	----------	----------	%	----------	----------
Zone 1 (Brown)							
Conventional	7	2.9	49/2	-/-	-/-	43/2	6/2
Minimum	15	7.7	58/7	5/3	7/2	5/6	32/7
Zero	12	9.0	65/4	22/3	25/2	4/2	5/3
Zone 2 (Dark Brown)							
Minimum	6	4.1	16/1	5/1	-/-	4/1	76/1
Zero	25	10.6	52/12	15/9	13/5	8/12	26/11
Zone 3 (Black/Grey)							
Conventional	8	16.6	42/4	62/2	8/2	8/4	14/4
Minimum	11	15.4	18/4	44/3	11/3	18/3	24/4
Zero	29	13.7	38/16	29/14	12/10	16/9	20/16

[1] Number of wheat crops with leaf spot lesions on the flag leaves, 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 where the fungus occurred.

Table 3. Incidence and severity of leaf spotting diseases, and mean percentage isolation of the most common leaf spotting pathogens, by previous crop within each soil zone for common and durum wheat crops surveyed in Saskatchewan in 2012.

Soil Zone/ Previous Crop	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	5.6	34/2	-/-	-/-	1/2	65/2
Oilseed	10	10.6	66/3	43/1	17/1	6/1	11/3
Pulse	9	3.1	79/2	<1/1	-/-	37/1	2/1
Fallow	12	7.2	57/6	9/4	16/3	13/6	15/6
Zone 2 (Dark Brown)							
Oilseed	11	9.0	26/4	17/4	15/2	10/4	39/4
Fallow	4	15.8	46/4	25/2	-/-	4/4	37/4
Zone 3 (Black/Grey)							
Cereal	3	12.3	33/1	12/1	6/1	46/1	3/1
Oilseed	35	14.1	26/15	40/14	11/12	17/9	17/15
Fallow	10	16.5	60/5	39/2	14/2	6/5	16/6

[1] Number of wheat crops with leaf spot lesions on the flag leaves, 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 where the fungus occurred.

CROP / CULTURE: Wheat
LOCATION / RÉGION: Saskatchewan

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TITLE / TITRE: FUSARIUM HEAD BLIGHT IN COMMON AND DURUM WHEAT IN SASKATCHEWAN IN 2012

ABSTRACT: In 2012, Fusarium head blight (FHB) incidence and severity were assessed in 137 wheat crops in Saskatchewan. FHB occurred in 87% and 85% of the common and durum wheat crops, respectively and the provincial mean FHB severities were 1.2% for common wheat and 0.9% for durum wheat.

INTRODUCTION AND METHODS: Fusarium head blight (FHB) incidence and severity were assessed in 137 wheat crops in Saskatchewan in 2012: 103 common wheat (Canada Western Red Spring and Canada Prairie Spring classes) and 34 durum wheat (Canada Western Amber Durum class). Fields 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 in the Irrigation Zone (fields located along the South Saskatchewan River in west-central and central regions of the province).

Crop adjustors with Saskatchewan Crop Insurance Corporation and irrigation agrologists with Saskatchewan Ministry of Agriculture collected 50 spikes at random 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 the presence of *Fusarium* spp. on diseased kernels.

RESULTS AND COMMENTS: Approximately 3.4 million hectares (8.4 million ac) of spring wheat and 1.7 million hectares (4.1 million ac) of durum wheat were seeded in Saskatchewan in 2012 (Saskatchewan Ministry of Agriculture 2012). Excess precipitation early in the growing season created many challenges for farmers in 2012. Crops were stressed from excess moisture and disease pressure. 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 across the province reported varying quality and yields from region to region. The average yields for spring wheat of 2.4 tonnes per ha (35.6 bu/ac) and durum wheat of 2.4 tonnes per hectare (35.2 bu/ac) are higher than the 10-year averages of 2.2 and 2.1 tonnes per hectare respectively (32.5 and 31.9 bu/acre), respectively (Saskatchewan Ministry of Agriculture 2012).

In 2012, FHB occurred in 87% and 85% 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 irrigation zones for common wheat and soil zones 2 and 3 for durum wheat (100% of common and durum wheat samples exhibited some symptoms). The highest mean severity for common wheat was in zone 3 and the highest mean for durum was in zones 2 and 3. The sample with the highest FHB severity (6.9%) was from a common wheat crop in soil zone 2.

Overall, the provincial mean FHB severities for common wheat (1.2%) and durum wheat (0.9%) in 2012 were higher than in 2011 for common wheat (0.6%) and the same as in 2011 for durum wheat (0.9%). The provincial mean FHB severity in 2012 for common wheat (1.2%) was similar to 2010 (1.1%) and for durum wheat (0.9%) lower than in 2010 (2.0%), which was the first year since 2001 that the provincial annual mean FHB severities exceeded 1% (Dokken-Bouchard et al. 2012).

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, 2012.

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	38% (13)	0.4% (0 – 3.7%)	74% (19)	0.4% (0 – 1.4%)
Zone 2 Dark Brown	90% (31)	1.3% (0 – 6.9%)	100% (13)	1.5% (0.6 – 3.6%)
Zone 3 Black/Grey	96% (53)	1.4% (0 – 4.7%)	100% (2)	1.5% (1.4 – 1.6)
Irrigation Zones	100% (6)	1.2% (0.5 – 2.4%)	–	–
Overall Total/Mean	87% (103)	1.2%	85% (34)	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: Spring Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: FUSARIUM SPECIES ASSOCIATED WITH HEADS, CROWNS AND ROOTS OF SPRING WHEAT IN MANITOBA IN 2012

ABSTRACT: *Fusarium* species were isolated from the kernels of 29 wheat crops in southern Manitoba and from the heads, crowns and roots of 20 plants with symptoms of 'white heads'. *Fusarium graminearum* was the predominant pathogen on kernels accounting for 88% of all isolations followed by *F. sporotrichioides* at 9.9%. No *Fusarium* species were isolated from white heads, but *F. graminearum* and *F. equiseti* were found on root and crown tissue at 35 and 65% levels respectively.

INTRODUCTION AND METHODS: Twenty-nine spring wheat fields were surveyed between July 18 and 27, 2012 in southern Manitoba to monitor the incidence and severity of fusarium head blight (FHB). Disease symptoms in each field were assessed at growth stage ZGS 83-85 by rating about 100 spikes at three locations for incidence and severity; spikes were collected from each field for subsequent pathogen identification. From each field collection, 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 initially unknown, 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.

In 2012, 'white heads' were common in farm fields and experimental plots in Manitoba. Initially, symptoms occurred on single tillers of a plant, but extended to all tillers later in the season. The heads, crowns and roots of 20 such plants were dissected, surface-sterilised and later examined for *Fusarium* species.

RESULTS AND COMMENTS: Average disease levels were generally low within the regions surveyed, with an average FHB index of 1.1%. This level of FHB is even lower than the relatively low levels reported in recent years (Gilbert et al. 2010, 2011). Disease development was restricted due to hot, dry weather throughout anthesis and grainfill. Low disease levels were reflected in the number of kernels yielding *Fusarium* species. Kernels from 13 of the 29 fields yielded 6-10 isolations of *Fusarium* (average 7.9) out of a possible10, but the remainder of the fields averaged only 2.5 *Fusarium*-infested kernels. *Fusarium* species were isolated from 49% of 290 kernels examined in 2012.

As in other years, *F. graminearum* was the predominant species, accounting for 88.8% of isolations. Other species isolated included *F. sporotrichioides* (10%), and at very low levels, *F. poae* and *F. culmorum* (0.6%, each from a single kernel).

Two *Fusarium* species were isolated from 17% of the root and crown samples examined. These were *F. graminearum* (35%) and *F. equiseti* (65%). In general, one or the other was isolated from a plant but in one case both were isolated from a single plant. No *Fusarium* species were isolated from white heads.

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CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: LEAF SPOT DISEASES IN MANITOBA SPRING WHEAT - 2012

ABSTRACT: Leaf spot pathogens of wheat were isolated and identified from diseased leaf tissue taken from 29 spring wheat fields in southern Manitoba. The predominant pathogen was *Pyrenophora tritici-repentis,* causal agent of tan spot isolated from 78.8% of samples. However, overall disease severity was low, due probably to the hot, dry summer and widespread foliar fungicide use.

INTRODUCTION AND METHODS: Prevalence and severity of foliar diseases of spring wheat was assessed in 29 southern Manitoba producers' fields through surveys conducted between July 18 and 27, 2012. Affected leaf samples were collected between the soft dough and mid dough stages of development (ZGS 83-85). Severity of diseases on upper (flag and flag^{-1} leaves) and lower leaf canopies was 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 264 samples of diseased leaf tissue was surface-sterilized and placed in moisture chambers for 5-7 days to promote pathogen sporulation for disease identification.

RESULTS AND COMMENTS: The average level of necrosis resulting from leaf spots on both the upper and lower leaf canopies was low (0.9 and 2.4, respectively on the 0-4 severity scale), probably the result of a combination of hot, dry weather in July, and foliar fungicide use. Leaf spot pathogens were isolated from only 85 of the 264 leaf tissue samples examined.

Pyrenophora tritici-repentis, causal agent of tan spot, was the dominant pathogen, accounting for 79% of isolations (Table 1), similar to levels in 2011 (Gilbert et al. 2011) . The pathogen was isolated from 23 of the 29 fields sampled. As found last year, levels of *Stagonospora nodorum, Cochliobolus sativus* and *Septoria tritici* were low, 9.4, 5.9, and 3.5%, respectively of total isolations.

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Table 1. Prevalence and isolation frequency of leaf spot pathogens in hard red spring wheat fields in Manitoba in 2012.

	Disease/Pathogen			
	Septoria nodorum blotch *(Stagonospora nodorum*)	**Septoria tritici blotch *(Septoria tritici)***	**Tan spot *(Pyrenophora tritici-repentis*)**	**Spot blotch *(Cochliobolus sativus)***
Wheat crops affected (n = 29)	3	3	23	3
Isolations (%) (Total = 85)	9.4	5.9	78.8	3.5

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 2012

ABSTRACT: In field surveys conducted from June to August, wheat leaf rust was found at relatively low levels in commercial crops, trap plots and nurseries. Stripe rust was found at only trace levels. The dry and hot conditions during much of the growing season limited the development of these diseases.

INTRODUCTION AND METHODS: The severity of leaf rust and stripe rust was estimated at various locations throughout southern Manitoba and south-east Saskatchewan during June, July and August 2012. Locations surveyed included the Manitoba Crop Variety Evaluation Trials (MCVET), commercial fields, and nurseries. Diseased leaf samples were collected for virulence analysis from nine locations in Manitoba and seven locations in Saskatchewan.

RESULTS AND COMMENTS: Wheat leaf rust, caused by *Puccinia* triticina Eriks., was first observed on spring wheat in June. It was found at lower than normal levels in test plots and nurseries throughout southern Manitoba and south-eastern Saskatchewan, likely due to the relatively dry conditions through June, July and August. Most commercial wheat fields in Manitoba were also sprayed with foliar fungicides and did not suffer economic losses due to rust infection. In nonsprayed nurseries and trap plots the leaf rust development occurred relatively late in the season when most wheat was ripening.

Wheat stripe rust (*Puccinia striiformis* Westend. f.sp. *tritici*) was found at only trace levels during our field surveys. The hot summer weather combined with the relatively dry conditions stopped development of a stripe rust epidemic. The few stripe rust pustules that had formed early in the season rapidly converted to teliospore formation and the disease did not spread or develop further.

Table 1. Average percentage (%) of the flag leaf infected with leaf rust in surveys from 2001 to 2012 in Manitoba and 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
2012*	8.0	2.0

* Determined from AC Barrie in nonsprayed nurseries and trap plots. Other years were determined from commercial fields.

CROP / CULTURE: Winter Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: FUSARIUM HEAD BLIGHT OF WINTER WHEAT IN MANITOBA – 2012

ABSTRACT: Thirty-eight winter wheat crops in Manitoba were monitored for fusarium head blight (FHB) to assess disease severity and identify causal *Fusarium* species. The mean FHB Index was 0.2%, one of the lowest levels recorded in 15 years. No losses due to FHB were expected. *Fusarium graminearum* was the principal species isolated from kernels positive for *Fusarium*, as is typical.

INTRODUCTION AND METHODS: The prevalence of fusarium head blight (FHB) in winter wheat in Manitoba in 2012 was assessed by monitoring 38 farm fields from July 5 to 11 when most crops were at the early milk to soft dough stage of growth (ZGS 71-85). Because winter wheat is not grown intensively in Manitoba (in 2012 it constituted nearly 10% of the total wheat acreage of 0.9M ha [2.0M acres] in the province (MASC 2012), the fields were not surveyed at random. Instead 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 Highways #67 to the north, #3 and the USA border to the south, #12 to the east, and #21 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 ones 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 onto potato dextrose agar in Petri plates (10 kernels/plate) to identify and quantify the *Fusarium* spp. present, based on morphological traits described in standard taxonomic keys.

RESULTS AND COMMENTS: Stand establishment of 2011 fall-sown crops (i.e. winter wheat, fall rye) was rated as satisfactory in late September, and winter-kill was minimal (<5%) in most regions. The growing conditions in Manitoba in 2012 were difficult to characterize due to considerable variability in precipitation among the five major agricultural regions and reporting sites within these. Soil moistures and temperatures were conducive to early seeding (late April to mid-May) and the emergence of earlier-seeded crops was rated as good to excellent. Cooler conditions prevailed in the latter half of May, but warm weather returned in mid-June and June, July and August were generally very warm, with 2012 being the hottest summer on record at many locations. Precipitation was spotty throughout June and July with some areas receiving adequate levels while others remained dry. Crop development was more rapid than normal, and had a somewhat negative impact on seed set and grain filling. Frost in many areas on May 30 caused minor injury to particular crops, and several fast-moving systems accompanied by strong winds or hail resulted in temporary crop lodging. August was generally dry leading to favourable harvest conditions for the early-matured crops. Accumulation (April 1 to August 26) of growing degree days was above normal in most regions, while total precipitation was below normal in the Eastern and Central regions, but somewhat higher than normal in the Interlake, southwest and northwest. Generally, cereal crop yields and quality were categorized as ‘good’.

Winter wheat was grown on about 80,000 ha (196,000 acres) in Manitoba in 2011/12, an increase of 300% compared to 2010/11 when adverse conditions reduced both seeded and production acres (Tekauz et al. 2012). ‘CDC Falcon’ once again was the predominant winter wheat cultivar planted, occupying 68% of the winter wheat area. It was the cultivar in 26 of the 38 crops sampled. ‘CDC Buteo’ was the next most common cultivar, occupying 18% of the acreage, and was sampled in 8 fields. Foliar fungicides are applied routinely to most winter wheat crops in Manitoba. In 2012 most of the 25 crops for which information was available had been sprayed once or more with propiconazole-, tebuconazole-, metconazole- or prothioconazole + tebuconazole-based products.

Symptoms of FHB (bleaching of spikes) were observed in 31 of the 38 winter wheat crops visited. Overall, incidence of FHB was 0.3% (range 0 - 2%), SPI 50% (range 0 - 100%) and the resulting FHB Index (%incidence x %SPI / 100) was 0.2% (range 0 – 1.0%). As such, FHB was estimated to have caused little or no yield loss in winter wheat in 2012. The severity of FHB was lower than in 2011 (Tekauz et al. 2012) and much below the 10-year (2001-2010) average of 3.8% (Tekauz and Gilbert 2011). This was one of the lowest levels of FHB recorded for winter wheat in Manitoba since systematic surveys were initiated in 1998. As such, levels of fusarium damaged kernels and deoxynivalenol in harvested grain likely were very low. While conditions early in the 2012 growing season appeared favourable for inoculum development, the low levels of FHB in Manitoba in 2011 likely resulted in reduced carry-over of *Fusarium* in overwintered straw and stubble. Subsequent dry and hot conditions in many locales would have further reduced floral infection and manifestation of FHB symptoms. However, without foliar fungicide use, FHB severity would probably have been somewhat higher.

Fusarium colonies developed from only 21% of the kernels plated on potato dextrose agar. As observed annually (Tekauz et al. 2012), *F. graminearum* was the dominant *Fusarium* species isolated; it was found in all crops with visible FHB symptoms (31 of 38) as well as in two asymptomatic crops and was isolated from 98% of *Fusarium*-positive kernels (Table 1). *Fusarium culmorum*, *F. poae* and *F. sporotrichioides* were detected in one or two fields, each at low levels. One unusual finding consisted of a winter wheat crop near Arnaud MB in which *F. culmorum* was the dominant species, comprising 12% of the total of 20% *Fusarium*-infested kernels. This species does not normally dominate the *Fusarium* flora in crops from Manitoba.

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Table 1. *Fusarium* spp. isolated from kernels of winter wheat grown in Manitoba in 2011-2012.

***Fusarium* spp.**	**Percent of fields**	**Percent of kernels**
F. culmorum	3	1.5
F. graminearum	82	98.0
F. poae	5	0.5
F. sporotrichioides	3	0.3

CROP / CULTURE: Winter Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: LEAF SPOT DISEASES OF MANITOBA WINTER WHEAT CROPS IN 2012

ABSTRACT: Thirty-eight winter wheat crops were monitored in Manitoba to assess severity of leaf spot diseases and identify the causal pathogens. Leaf spotting was observed in 61% of crops, but at very low severities. Minimal or no losses were expected. *Pyrenophora tritici-repentis* (tan spot) was the principal species isolated from diseased tissue and caused most of the damage observed.

INTRODUCTION AND METHODS: The incidence and severity of leaf spot diseases of winter wheat in Manitoba in 2012 were assessed by surveying 38 farm fields July 5-11 when most crops were at the early milk to soft dough stages of growth (ZGS 72-85). Because winter wheat is not grown intensively in Manitoba (in 2012 it constituted nearly 10% of the total wheat acreage of 0.9M ha [2.0M acres] in the province - MASC 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 Highways #67 to the north, #3 and the US border to the south, #12 to the east, and #21 to the west. Leaf spots were rated on approximately 10-20 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 or nil (no visible symptoms); trace (< 1% leaf area affected); very slight (1-5%); slight (6-15%); moderate (16-40%); and severe (41-100%). Leaves with putative 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 identify the causal pathogen(s) and disease(s) present.

RESULTS AND COMMENTS: Stand establishment of 2011 fall-sown crops (i.e. winter wheat, fall rye) was rated as satisfactory in late September (2011), and winter-kill was minimal (<5%) in most regions. The growing conditions in Manitoba in 2012 were difficult to characterize due to considerable variability in precipitation among the five major agricultural regions and reporting sites within these. Soil moistures and temperatures were conducive to early seeding (late April to mid-May) and the emergence of earlier-seeded crops was rated as good to excellent. Cooler conditions prevailed in the latter half of May, but warm weather returned in mid-June and June, July and August were generally very warm, with 2012 being the hottest summer on record at many locations. Precipitation was spotty throughout June and July with some areas receiving adequate levels while others remained dry. Crop development was more rapid than normal, and had a somewhat negative impact on seed set and grain filling. Frost in many areas on May 30 caused minor injury to particular crops, and several fast-moving systems accompanied by strong winds or hail resulted in temporary crop lodging. August was generally dry leading to favourable harvest conditions for the early-matured crops. Accumulation (April 1 to August 26) of growing degree days was above normal in most regions, while total precipitation was below normal in the eastern and central regions, but somewhat higher than normal in the Interlake, southwest and northwest. Generally, cereal crop yields and quality were categorized as ‘good’.

Winter wheat was grown on about 80,000 ha (196,000 acres) in Manitoba in 2011/12 (MASC 2012), an increase of 300% compared to 2010/11 when adverse conditions reduced both seeded and production areas (Tekauz et al. 2012). ‘CDC Falcon’ once again was the predominant winter wheat cultivar planted, occupying 68% of the Manitoba winter wheat acreage. It was grown on 26 of the 38 fields sampled. ‘CDC Buteo’ was the next most common cultivar, occupying 18% of the area, and was sampled in 8 fields. Foliar fungicides are applied routinely to most winter wheat crops in Manitoba, and in 2012 for the 25 crops for which information was available, most had been sprayed with a propiconazole-, tebuconazole-, metconazole- or prothioconazole + tebuconazole-based product.

Leaf spotting pathogens were recovered from 23 (61%) of the 38 crops sampled, a lower proportion than usual. Disease levels in the upper canopy were zero, or trace to slight in 95% of fields, and moderate or severe in the remainder. In the lower canopy, zero and trace to slight leaf spot levels were recorded in 18% of the fields, moderate levels in 21%, while 61% had senesced. The upper canopy severity levels suggest that leaf spots caused little, if any, damage to winter wheat crops in Manitoba in 2012 and they were some of the lowest severity values documented since systematic monitoring began in 1999 (Tekauz et al. 2000). The widespread use of foliar fungicides as part of winter wheat management in Manitoba, combined with low levels of disease in 2011 (Tekauz et al. 2012) that would have caused reduced inoculum carry-over, likely contributed to the minimal leaf spot damage observed.

Pyrenophora tritici-repentis, causal agent of tan spot, predominated in 2012 (Table 1), as has been the case in both spring and winter wheat in Manitoba in most years (Gilbert et al. 2012, 2011; Tekauz et al. 2012, 2011). The pathogen was recovered from 61% of fields and probably caused almost all of the foliar damage observed. *Cochliobolus sativus (*spot blotch) was identified from 5 fields, and resulted in minor damage. As found in 2011 (Tekauz et al. 2012), no *Stagonospora* or *Septoria* species causing leaf spots were recovered from winter wheat leaf samples in 2012.

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Table 1. Incidence and isolation frequency of leaf spot pathogens from Manitoba winter wheat in 2012.

Pathogen	**Incidence (% of fields)**	**Frequency (% of isolations)***
Pyrenophora tritici-repentis	61	92
Cochliobolus sativus	13	8

*indicative of the relative foliar damage caused

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

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TITLE / TITRE: DISEASES OF SPRING WHEAT IN CENTRAL AND EASTERN ONTARIO IN 2012

ABSTRACT: Twenty-two spring wheat crops were surveyed in central and eastern Ontario for the presence of diseases. Of the 12 diseases observed, septoria/stagonospora leaf blotch and stagonospora glume blotch were the most common. Slight infections by fusarium head blight (FHB) were observed, with *Fusarium graminearum* identified as the predominant causal species.

INTRODUCTION AND METHODS: A survey for spring wheat diseases was conducted in central and eastern Ontario in the third week of July when plants were at the soft dough stage of development. Twenty-two fields were chosen at random in regions 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 of 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 provided by fluorescent and long wavelength ultraviolet tubes. *Fusarium* species isolated from kernels were identified by microscopic examination using standard taxonomic keys.

RESULTS AND COMMENTS: Twelve diseases or disease complexes were observed (Table 1). Septoria/stagonospora leaf blotch (normally associated with infection by *Septoria tritici* and *Stagonospora* spp.) and stagonospora glume blotch (*Stagonospora nodorum*) were the most common, found in 20 and 19 fields at average severities of 2.7 and 1.7, respectively. A severe level of septoria/stagonospora leaf blotch was detected in one field; severe stagonospora glume blotch was not found. Yield reductions due to the two diseases were estimated to have averaged <5% in affected fields. Leaf rust (*Puccinia triticina)* and stem rust (*Puccinia graminis*) were observed in 12 and 3 fields at average severities of 2.4 and 2.7, respectively. Severe levels of leaf rust were documented in two fields; severe levels of stem rust were not found. Yield reductions by the rusts were likely <5% in affected fields. Other foliar diseases observed included bacterial leaf blight (*Pseudomonas syringae* pv. *syringae*), powdery mildew (*Erysiphe graminis* f.sp. *tritici)*, spot blotch (*Cochliobolus sativus*), and tan spot (*Pyrenophora tritici-repentis*). These were found in 13, 1, 7, and 17 fields at average severities of 1.5, 2.0, 1.1, and 1.6, respectively. No severe levels of these diseases were observed and as such they likely caused little or no reduction of grain yield or quality.

Ergot (*Claviceps purpurea*) and loose smut (*Ustilago tritici*) were observed in 13 and 9 fields at incidence levels of 2.0 and 0.6%, respectively. They likely resulted in minimal damage. Take-all root rot (*Gaeumannomyces graminis var. tritici*) was found in 20 fields at a mean incidence 2.2%; one affected crop was estimated to have 10% take-all incidence. This is the third consecutive year that take-all was commonly observed in spring wheat fields in Ontario (Xue and Chen 2012). Fusarium head blight was observed in all fields at a mean FHB index of 0.38%, (range 0.01 to 3.0%;Table 1). Severe or very severe FHB levels were not found. Therefore, the disease would not have resulted in a significant loss of grain yield or quality. Six *Fusarium* species were isolated from putative fusarium damaged kernels (Table 2). *Fusarium graminearum* predominated and occurred in 56% of fields and on 17.7% of kernels. *Fusarium poae* and *F. sporotrichioides* also were common and found in 56 and 39% of fields and on 3.5 and 2.1% of kernels, respectively. Other species isolated included *F. aucuminatum*, *F. avenaceum,* and *F. equiseti* in 4, 9 and 13% of the fields and on 0.1, 1.5 and 1.5% of kernels, respectively. The number of *Fusarium* species and their frequencies of recovery from kernels in 2012 were similar to those recorded in 2011 (Xue and Chen 2012).

Overall, the incidence and severity of foliar diseases in Ontario spring wheat in 2012 were similar to those found in 2011 (Xue and Chen 2012). Take-all was commonly observed but its average severity (2.2%) in 2012 was less than that in 2011 (3.5%). Fusarium head blight, although observed in all the surveyed fields, occurred at only slight levels and the disease had little impact on grain yield or quality. The high temperatures and low number of rain events in June, July and August in central and eastern Ontario in 2012 were unfavorable for FHB development and were likely responsible for the low disease severity observed.

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Table 1. Prevalence and severity of spring wheat diseases in central and eastern Ontario in 2012.

DISEASE	NO. CROPS AFFECTED (n=22)	DISEASE SEVERITY IN AFFECTED CROPS*	
		MEAN	RANGE
Bacterial blight	13	1.5	1.0-5.0
Leaf rust	12	2.4	1.0-7.0
Powdery mildew	1	2.0	2.0-2.0
Stagonospora glume blotch	19	1.7	0.5-3.0
Septoria/Stagonospora leaf blotch	20	2.7	1.0-6.0
Spot blotch	7	1.1	1.0-2.0
Stem rust	3	2.7	1.0-4.0
Tan spot	17	1.6	1.0-5.0
Ergot (%)	13	2.0	0.5-5.0
Loose smut (%)	9	0.6	0.1-1.0
Take-all (%)	20	2.2	0.1-10.0
Fusarium head blight**	22		
Incidence (%)		3.5	1.0-15.0
Severity (%)		5.7	1.0-10.0
Index (%)		0.38	0.01-3.0

*Foliar disease severity was rated on a scale of 0 (no disease) to 9 (severely diseased); ergot, loose smut, and take-all severity were 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 2012.

***Fusarium* spp.**	**% AFFECTED FIELDS**	**%KERNELS**
Total *Fusarium*	100	26.4
F. acuminatum	4	0.1
F. avenaceum	9	1.5
F. graminearum	56	17.7
F. equiseti	13	1.5
F. poae	56	3.5
F. sporotrichioides	39	2.1

Forages/ Plantes Fourragères

CROP: Alfalfa (*Medicago sativa*)
LOCATION: Saskatchewan

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TITLE: **FOLIAR DISEASE SEVERITY ON ALFALFA IN SASKATCHEWAN, 2012**

ABSTRACT: In a small survey of alfalfa crops in June 2012 in east-central and northwest Saskatchewan the most common pathogens found were *Phoma medicaginis*, *Pseudopeziza medicaginis*, *and Leptotrochila medicaginis*.

INTRODUCTION AND METHODS: Foliar disease severity was assessed in late June in nine fields of alfalfa grown for hay in east-central and northwest Saskatchewan. Plants were collected at several sites along a teardrop-shaped circuit in each field and brought back to the lab for assessment. Disease identification was based on visual symptoms. Severity on each plant was assessed using the 0–11 Horsfall-Barratt scale (1) and ratings were converted to percentage leaf area affected.

RESULTS AND COMMENTS: In 2012, conditions were cool and wet (50–100% above normal rainfall) early in the growing season across the survey area (2,3). However, disease severity was low (Table 1). Spring black stem [*Phoma medicaginis*] was the dominant disease. Common leaf spot [*Pseudopeziza medicaginis*] was slightly less severe, and yellow leaf blotch [*Leptotrochila medicaginis*] occurred only at trace to low levels. Each of the pathogens was present in all fields assessed. Lepto leaf spot [*Leptosphaerulina trifolii*], downy mildew [*Peronospora trifoliorum*] and stemphylium leaf spot [*Stemphylium botryosum*] were found at trace levels in 5, 3, and 2 fields, respectively.

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Table 1. Mean foliar disease severity (range in brackets) in alfalfa grown for hay in Saskatchewan, 2012.

Region & Crop district (3)	No. of fields	Dominant disease*	Leaf area affected (%)	Other diseases
Northwest (CD 9)	3	SBS	5 (trace–12)	CLS, YLB, DM, LLS
	2	CLS	3 (trace–6)	SBS, YLB, DM, LLS
East-central (CD 5)	4	SBS	3 (trace–6)	CLS, YLB, LLS, SLS

* SBS - spring black stem, CLS - common leaf spot, YLB - yellow leaf blotch, DM - downy mildew, LLS - lepto leaf spot, SLS - stemphylium leaf spot.

Oilseeds & Special Crops/Oléagineux et Cultures Spéciales

CROP: Field bean
LOCATION: Manitoba

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TITLE: DISEASES OF FIELD BEAN IN MANITOBA IN 2012

ABSTRACT: A total of 40 and 41 bean crops were surveyed for root and foliar diseases, respectively. Fusarium root rot was the most prevalent root disease and common bacterial blight the most prevalent foliar disease throughout the province. Diseases of minor importance in 2012 included rhizoctonia root rot, halo blight, anthracnose and white mould.

METHODS: Crops of field bean in Manitoba were surveyed for root diseases at 40 different locations and for foliar diseases at 41 locations. The survey for root diseases was conducted in mid- to late July when most plants were at the early bloom stage. During the root disease survey the severity of halo blight (*Pseudomonas syringae* pv. *phaseolicola*) was also assessed. For foliar diseases, the survey was carried out on August 20th and 22nd, 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 organisms 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*), white mould (*Sclerotinia sclerotiorum*) and halo blight (*Pseudomonas syringae* pv. *phaseolicola*) severity were assessed as percentages of infected plant tissue. In each crop with anthracnose symptoms, pod samples were collected for isolation of the causal organism to confirm that they were caused by *C. lindemuthianum*.

RESULTS AND COMMENTS: The 2012 cropping season in Manitoba started with spring moisture and cool conditions, followed by a dry summer and fall (Manitoba Crop Report, 2012), 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 40 crops surveyed for root diseases. It has remained the most prevalent root disease of dry bean for several years (Conner et al. 2011; Henriquez et al. 2012). Crops in which *Fusarium* spp. were isolated had root rot severity ratings that ranged from 0.9 to 6.0 with an average of 3.2. Rhizoctonia root rot (*Rhizoctonia solani*) was detected in 3 of the 40 crops surveyed with severity ratings of 1.7 to 4.2 and an average severity of 2.5. Pythium root rot was not detected in any of the crops surveyed. Ten crops had average root rot severity ratings above 4 (i.e., symptoms were present on 50% of the root system and plants were stunted) and this would have had a detrimental effect on yield. Halo blight was detected in two of the crops surveyed, with a mean disease severity of 30% infected plant tissue.

Three diseases were observed during the survey of foliar diseases (Table 2). Common bacterial blight was the most prevalent foliar disease and symptoms were observed in 37 crops. In four of the 41 crops, the leaves had completely senesced and the incidence and severity of CBB and rust could not be assessed. Overall, the incidence of CBB ranged from 8.3 to 36.7% with an average of 23.2%, while severity ranged from 1.3 to 3.3, with an average of 2.5. Anthracnose was detected in two field bean crops with a mean disease severity of 0.5%. Bean rust was not observed in any of the dry bean crops surveyed. White mould symptoms were detected in four crops with percentages of tissue infection that ranged from 0.3 to 1.3% and with a mean of 0.6%. This represents a decrease in incidence and severity from the two previous years (Conner et al. 2011; Henriquez et al. 2011). Incidences of white mould of 10.0% or higher were not observed in 2012, suggesting that there were no adverse effects of this disease on crop yield.

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Table 1. Prevalence and severity of root diseases and halo blight in 40 crops of field bean in Manitoba in 2012.

Disease	No. crops affected	Disease Severity Mean[1]	Disease Severity Range
Fusarium root rot[2]	40	3.2	0.9-6.0
Rhizoctonia root rot[2]	3	2.5	1.7-4.2
Pythium root rot[2]	0	0.0	0.0
Halo blight (%)	2	30%	30%

[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 37 crops of field bean in Manitoba in 2012.

Disease	No. crops affected	Disease Severity[1] Mean[2]	Disease Severity[1] Range	Incidence of Leaf Infection Mean[2]	Incidence of Leaf Infection
Common bacterial blight[3]	37	2.5	1.3-3.3	23.2%	8.3-36.7%
Anthracnose (%)	2	0.5	0.3-0.7%		
Rust[3] (%)	0	0	0		
White mould (%)	4	0.6	0.3-1.3%		

[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 (50-100% of leaf area diseased).
[2]Means are based on an average of the crops in which the diseases were observed.
[3]Mean of 37 dry bean crops, since all the leaves had senesced in four crops.

CROP: Canola
LOCATION: Alberta

NAMES AND AGENCIES:
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TITLE: THE OCCURRENCE OF CLUBROOT ON CANOLA IN ALBERTA IN 2012

ABSTRACT: A survey in 390 commercial canola crops in 21 counties in south and central Alberta revealed 64 new records of clubroot. Disease severity was mostly low, although moderate to high levels occurred in 25% of the fields. Independent surveys by county personnel and testing of a galled root revealed another 169 new records, for a grand total of 233 clubroot-infested fields identified in 2012.

METHODS: A survey of commercial canola (*Brassica napus* L.) crops for the incidence and severity of clubroot, caused by the obligate parasite *Plasmodiophora brassicae* Woronin, was conducted in central and southern Alberta in 2012. In total 390 crops were inspected in 21 counties (Table 1) from late August to October, with the crops usually checked after swathing. Most crops (373) were located on fields that had not been previously surveyed for clubroot, while the remainder (17) had been visited once or twice in earlier surveys and had been found to be negative for the disease. 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 was 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). Field inspections were coordinated with the agricultural fieldman in each Alberta municipality.

RESULTS AND COMMENTS: Sixty four of the 390 canola crops surveyed were found to be clubroot-infested, all of which represented new records of the disease in the specific fields (Table 1). Of the 17 crops grown on fields that had previously been surveyed and found to be free of clubroot, six were found to be infested in 2012, suggesting continued dissemination of the disease. Symptoms of clubroot were identified in eight of 21 fields cropped to a resistant canola hybrid, and in 56 of 369 fields cropped to a susceptible hybrid or hybrid of unknown resistance. Clubroot severity was very low in the eight resistant-hybrid crops found to be infected, with ID values ranging from 0.2 to 8.6%. In the susceptible canola crops or crops of unknown resistance, the average ID was below 10% in 40 fields, between 10 and 60% in 14 fields, and above 60% in two fields.

In addition to the 64 new cases of clubroot identified through this survey, another 168 new cases were identified in independent surveys by the counties of Lamont, Leduc, Parkland, Ponoka, Stettler, Strathcona, Westlock and Wetaskiwin. A galled root sample, collected from a volunteer canola plant growing in a field near Oyen, in Special Area 3, also tested positive in conventional (3) and quantitative PCR (4) assays for the presence of *P. brassicae* and therefore represented another record of clubroot. Thus, a grand total of 233 clubroot-infested fields were identified in the 2012 survey, including the first records of clubroot in Athabasca County, Beaver County, the County of Minburn, the County of Stettler, and Special Area 3. These results from 2012 bring the total number of confirmed infestations in Alberta to 1064 cases spread over 24 counties/municipalities and the City of Edmonton. While the outbreak of clubroot remains centered in central Alberta, there appears to be continued dissemination of the pathogen. In 2012, clubroot was identified for the first time in a number of counties northeast, east and southeast of Edmonton. Indeed, all counties between Edmonton and the Saskatchewan border now have at least one confirmed record of clubroot (Fig.1).

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Table 1. Distribution of clubroot-infested canola fields identified in Alberta in 2012

County	Number of fields surveyed	Number of new cases of clubroot-infestation
Athabasca	18	7
Beaver	19	4
Camrose	25	11
Cypress	12	0
Flagstaff	26	7
Forty Mile	12	0
Lacombe	21	0
Lac Ste. Anne	12	3
Lamont	25	2[a]
Lethbridge	12	0
Minburn	23	3
Newell	12	0
Ponoka	18	4[b]
Red Deer	18	2
Stettler	24	0[c]
Stratchona	30	15[d]
Taber	12	0
Thorhild	21	0
Vermilion River	21	0
Warner	12	0
Wetaskiwin	17	6[e]
TOTAL	390	64

[a]An additional clubroot-infested field was identified in a survey conducted by Lamont County, bringing the total new cases in that county to 3; [b]An additional clubroot-infested field was identified in a survey conducted by Ponoka County, bringing the total new cases in that county to 5; [c] Three clubroot-infested fields were identified in a survey conducted by the County of Stettler, in the first records of the disease in that county ; [d]An additional 25 clubroot-infested fields were identified in a survey conducted by Strathcona County, bringing the total new cases in that county to 40; [e] An additional 5 clubroot-infested fields were identified in a survey conducted by Wetaskiwin County, bringing the total new cases in that county to 11.

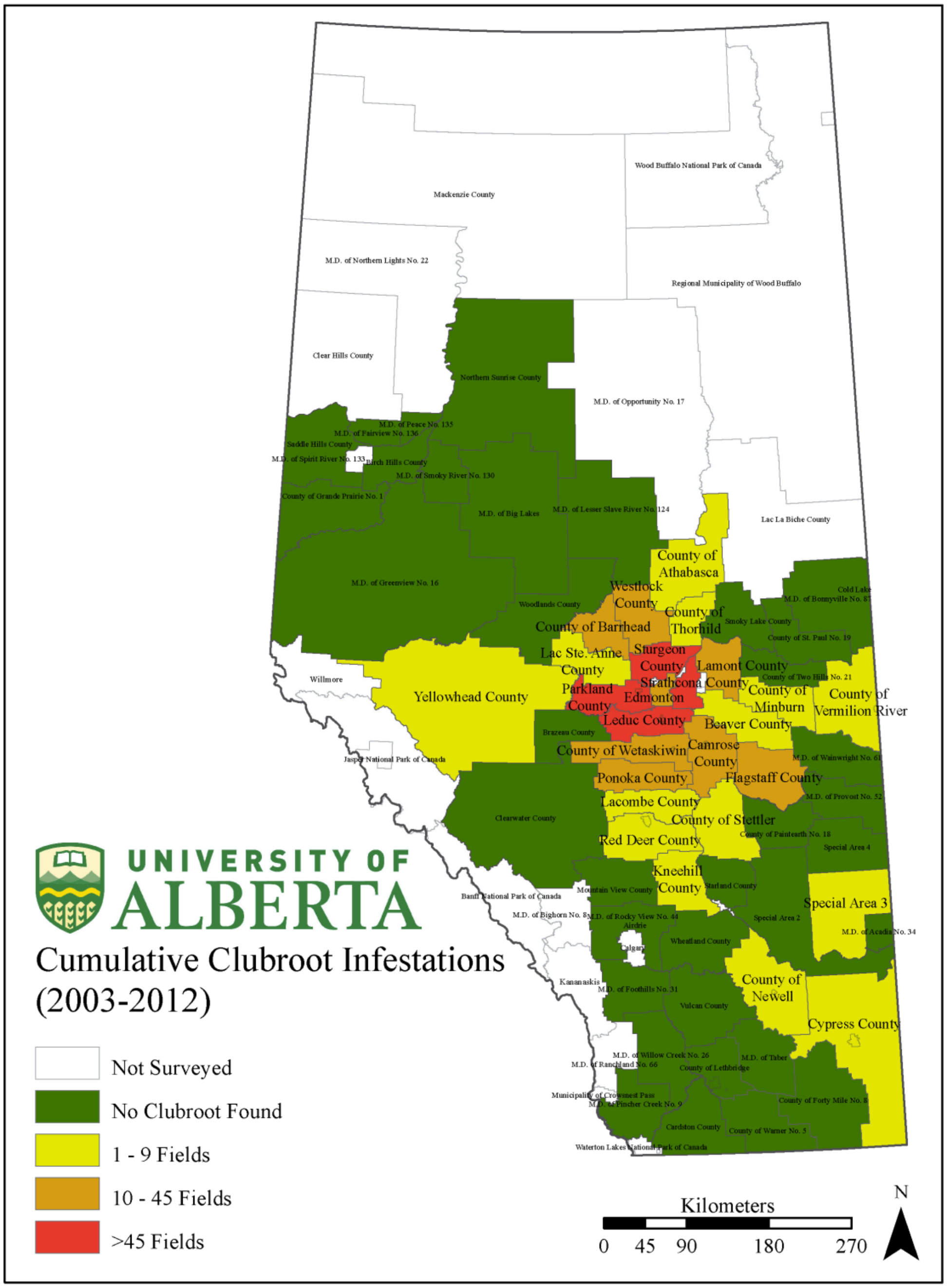

Figure 1. The occurrence of clubroot on canola in Alberta as of November 2012. Since clubroot surveys were initiated in 2003, the disease has been confirmed in a total of 1064 fields representing 24 counties and a rural area of the City of Edmonton.

CROP: Canola
LOCATION: Saskatchewan

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TITLE: SURVEY OF CANOLA DISEASES IN SASKATCHEWAN, 2012

ABSTRACT: The annual survey in Saskatchewan covered 253 fields in six large regions. Aster yellows was the most prominent disease, occurring in 77% of all fields. The highest incidence was 64% and the mean 7.8%, four times higher than previously found. Sclerotinia stem rot, with a prevalence of 91 % and mean incidence ranging from 4 to 29% among regions (overall mean 19%) was also important. Blackleg was mostly at low levels.

METHODS: A total of 253 canola (*Brassica napus*) fields was surveyed between August 7 and September 10 in the major canola production regions of Saskatchewan. The number of fields per region was targeted to be approximately proportionate to the area of canola production in each of the regions, and consisted of northwest (54 fields), northeast (45 fields), west-central (36 fields), east-central (61 fields), southwest (14 fields), and southeast (43 fields). 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 (*Candidatus* Phytoplasma asteris), 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 incidence counted as 0.1%. Mean disease incidence or severity values were calculated for each region. Mean incidence or severity values ≤ 0.1% were reported as “trace”. Soil samples (~1L) were collected from 91 fields and analyzed using the PCR-based diagnostic test of Cao et al. (2007) for the presence of *P. brassicae*.

RESULTS AND COMMENTS: Prairie canola seeded area reached an all-time high in 2012 and approximately 4.5 million ha (11.2 million acres) of canola were seeded in Saskatchewan (Saskatchewan Ministry of Agriculture 2012). Excess precipitation early in the growing season created many challenges for farmers in 2012. Crops were stressed from excess moisture and disease pressure. In most areas, warm summer weather and an extended period of high temperatures at harvest allowed farmers to harvest the crop in a timely fashion. Many crop reporters across the province reported good quality and yields, but varying from region to region. The average yield of 0.56 metric tonnes per ha (24.6 bu/acre) was lower than the 10-year average of 0.63 metric tonnes per ha (27.7 bu/acre) (Saskatchewan Ministry of Agriculture 2012).

Sclerotinia stem rot was observed in 91% of the fields surveyed. Incidence ranged from 0 to 95% and mean severity from 0 to 4.5. Severity was highest in the northwest region (average rating of 2.9), whereas prevalence (100%) and mean incidence (29.3%) were highest in the west-central region. The overall mean incidence for the province was higher in 2012 (19.0%) than in 2011 (9.4%) (Dokken-Bouchard et al. 2012) but similar to previous seasons (1999, 2000, 2004, 2010: 13 to 20%) with greater than normal precipitation. In southeast and east-central Saskatchewan, mean incidence was also higher than the provincial mean. Sclerotinia was at the lowest level in the southwest, with a mean incidence of 4.1% and a mean severity of 2.3. This contrasts with 2011, when sclerotinia levels (10.5%) in that region were above the provincial mean (9.4%); however, moisture levels were not a limiting factor for production in most areas of southwest Saskatchewan in 2011 (Dokken-Bouchard et al. 2012).

Blackleg (stem lesions and/or basal cankers) was observed in 44% of the fields surveyed, with incidence of basal stem cankers ranging from 0 to 81% and mean severity ranging from 0 to 5. Stem lesion incidence ranged from 0 to 61% and was often associated with hail injury. Mean incidence for the province (3.7% basal cankers and 1.7% upper stem lesions) was similar to the range experienced from 2000 to 2011 (1.5 to 5% total blackleg). The mean incidence of basal cankers was highest (8.0%) in the northwest and lowest (0.4%) in the west-central regions; the northwest and southeast regions also had higher incidences (8.0 and 6.1%, respectively) than the provincial average.

Aster yellows was observed in 77% of the fields surveyed, with incidence ranging from 0 to 64%. Mean incidence for the province was 7.8%, which is higher than any of the range experienced from 1999 to 2011 (trace to 2.0%). The previous highest recent mean incidence of aster yellows (2%) occurred in 2007 (Pearse et al. 2008). The incidence of aster yellows in the east-central (11%) and southeast (10%) regions were higher than the provincial mean.

Fusarium wilt was observed in 11.5% of the fields surveyed, with mean incidence at 0.5%; however, no plant samples were taken to confirm the observations. The disease was not observed in the northwest or west-central regions. Foot rot was observed in 13% of the fields surveyed, with a mean incidence of 0.6%. These values are similar to previous years other than in 2009, when it was found in 36% of fields and the mean incidence was 2% (Dokken-Bouchard et al. 2010). Alternaria black spot was observed in 82% of the fields surveyed. Severity ranged from trace to 20%, but the average severity across all regions (trace) was similar to previous years. Brown girdling root rot was not observed in the past 2 years of the survey, whereas in 2010 it was reported at trace levels in some regions (Dokken-Bouchard et al. 2011).

Clubroot symptoms were not observed in any of the 253 surveyed fields. Of the 91 soil samples collected from various locations in Saskatchewan and analyzed for the presence of clubroot, one sample from the west-central region was positive in both the PCR test and a susceptible-plant bioassay.

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Table 1. Sclerotinia rating scale (Kutcher and Wolf 2006)

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 to 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 2012

REGION[1] (NO. OF FIELDS)	Sclerotinia		Blackleg		
	Incidence	Severity[2]	Upper Stem Lesions	Basal Cankers	Basal Canker Severity[3]
Northwest (54)	16.5	2.9	0.6	8.0	0.9
Northeast (45)	13.6	2.3	2.2	2.2	0.6
West-central (36)	29.3	2.3	1.2	0.4	Trace
East-central (61)	20.4	2.5	1.5	1.7	0.5
Southwest (14)	4.1	2.3	1.7	2.4	0.4
Southeast (43)	21.7	2.7	3.0	6.1	0.5
Overall mean (253)	19.0	2.5	1.7	3.7	0.5

[1] Fields were surveyed in major canola production regions in the following rural municipalities of Saskatchewan: Northwest = 405, 406, 435 to 437, 439, 440, 442, 463, 464, 466 to 471, 493, 494, 496 to 499, 501, 502, 561, 588, 622; Northeast = 370, 371, 394, 397 to 402, 426 to 431, 456 to 460, 486, 488; East-central = 181, 183, 185, 186, 189, 190, 211, 215, 218 to 221, 241, 243, 244, 246, 250, 251, 273, 274, 279, 280, 304, 309, 313, 335 to 337, 339, 340, 343, 366, 367; West-central = 254, 260, 261, 283, 284, 287, 290, 292, 318, 320, 344 to 347, 350, 351, 379, 382, 410; Southwest = 49, 73, 74, 111, 137, 138, 141, 257, 167, 194, 224, 228; Southeast = 3, 4, 33 to 38, 64, 65, 67, 93 to 95, 97, 99, 100, 124, 125, 128 to 131, 155, 156, 158 to 162.
[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 2012

REGION[1] (NO. OF FIELDS)	Alternaria Black Spot	Aster Yellows	Foot Rot	Fusarium Wilt
Northwest (54)	16.2	7.3	Trace	0
Northeast (45)	7.1	7.3	0.4	Trace
West-central (36)	4.4	3.5	0.3	0
East-central (61)	33.6	10.8	Trace	1.1
Southwest (14)	0.3	1.9	Trace	2.0
Southeast (43)	43.4	10.2	2.8	Trace
Overall mean (253)	20.9	7.8	0.6	0.4

[1] See footnote for Table 3.

CORRIGENDUM

Manitoba canola disease survey, 2011

An unfortunate error occurred in the publication of Volume 92 (2012) of the Canadian Plant Disease Survey (CPDS). The fourth page of the article by D. McLaren et al. (2012) on the 2011 Manitoba canola disease survey, consisting of two important tables, was accidentally deleted in compilation and final publication. The CPDS national coordinator and compiler apologize to the author and coauthors for this error and oversight. The missing information is presented below and should be considered as on page 132b of CPDS 92 (2012).

Table 2. Mean prevalence and incidence or severity of alternaria pod spot, aster yellows, fusarium wilt and foot rot in Manitoba in 2011.

Crop Region	Alternaria pod spot		Aster yellows			Fusarium wilt					Foot rot		
(No. of crops)	P	Sev.[3]	P	Inc.[2]	Inc.[3]	P[1]	Inc.[2]	Inc.[3]	Sev.[2]	Sev.[3]	P[1]	Inc.[2]	Inc.[3]
Central (23)	35	0.7	13	0.1	1.0	13	0.4	3.3	1.2	2.1	9	0.3	3.5
East./Inter. (36)	19	1.0	28	1.2	3.9	3	0.4	13.0	1.1	3.0	0	0	0
Northwest (38)	16	1.9	18	0.3	1.6	18	1.9	10.7	1.7	4.5	5	0.1	1
Southwest (24)	17	0.6	8	0.1	1.5	0	0	0	0	0	0	0	0
All regions (121)	21	1.1	18	0.5	2.6	9	0.8	8.9	1.3	3.7	3	0.1	2.3

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

Table 3. Distribution of incidence (sclerotinia, blackleg, aster yellows, fusarium wilt and foot rot) and severity (alternaria pod spot) classes in 121 crops of *Brassica napus* in Manitoba in 2011.

	Percentage of crops with						
Incidence range	**Sclerotinia stem rot**	**Blackleg basal cankers**	**Blackleg stem lesions**	**Aster yellows**	**Fusarium wilt**	**Foot rot**	**Alternaria pod spot**
0%	55	31	36	82	91	96	79
1-5%	26	31	33	16	3	3	21
6-10%	4	12	13	2	4	1	0
11-20%	4	11	8	0	2	0	0
21-50%	9	12	8	0	0	0	0
>50%	2	3	2	0	0	0	0

CROP: Canola
LOCATION: Manitoba

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TITLE: SURVEY OF CANOLA DISEASES IN MANITOBA IN 2012

ABSTRACT: A total of 142 canola crops were surveyed in Manitoba for the prevalence and incidence or severity of sclerotinia stem rot, blackleg, fusarium wilt, alternaria pod spot, aster yellows, foot rot and clubroot. Aster yellows, blackleg and sclerotinia stem rot were the most prevalent diseases throughout the province. No clubroot symptoms were observed in any of the crops surveyed in 2012.

METHODS: A total of 142 canola crops were surveyed in the southwest (42), northwest (36), eastern/interlake (23) and central (41) regions of Manitoba from July 16 to mid-August. 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 (*Candidatus* Phytoplasma asteris), 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 also 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 of 0 to 5 based on area of diseased tissue in the stem cross-section where 0 = no diseased tissue visible in the cross section and 5 = diseased tissue occupying 100% of cross section and 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, soil samples were collected from 112 canola and 1 rutabaga field in Manitoba 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 2012. No clubroot spores were detected in soil samples from 60 and 79 Manitoba canola fields targeted for DNA analysis in 2009 and 2010, respectively. Analysis of 69 soil samples collected from canola fields in 2011 indicated that two were positive for DNA of *P. brassicae.* However, bioassays of these soils were negative for clubroot symptoms. Derksen et al. (2013) provide further information on monitoring of these two and adjacent fields in 2012.

Aster yellows, blackleg and sclerotinia stem rot were the most prevalent diseases throughout the province in 2012 (Tables 1 and 2). Aster yellows was observed in 95% of canola fields in Manitoba with a mean incidence of 9.9% in diseased crops. The mean prevalences of aster yellows in crops surveyed in 2011 and 2010 was much lower at 18% and 14%, respectively. Drought in the midwestern United States, the early arrival of aster leafhoppers and the higher than normal percentage of infected leafhoppers in the population may have been contributed to the record high level of aster yellows in all regions of Manitoba in 2012. Although a 10% infection rate can result in 3 to 7% missing or misshapen seeds (Canola Council of Canada, 2012), some plants can produce pods that look normal but have significant losses due to poor seed formation. Aster yellows had not previously been considered to be of economic importance in canola.

The prevalence of sclerotinia-infested crops ranged from a high of 75% in the northwest region to 51% in the central region with a provincial mean of 65%. Mean disease incidence averaged across all crops was 8.6% and ranged from 10.3% in the northwest region to 6.9% in the central region. For infested crops only, mean disease incidence was 13.2%. Throughout the province, mean severity of sclerotinia stem rot was low at <2.0. In 2012, both the prevalence and incidence of sclerotinia stem rot were higher than in 2011.

Blackleg basal cankers occurred in 77% of the crops surveyed in 2012, with the prevalence ranging from 90% in the central region to 61% in the eastern/interlake region. The mean disease incidence of basal cankers averaged across all crops was 12%, while the incidence in infested crops was 15.7%. In 2011, basal cankers were found in 69% of crops surveyed with a mean disease incidence of 9%. The severity of blackleg basal cankers was similar in both years, with average ratings of 2 or less. A value of 2 indicates diseased tissue occupies 26-50% of the basal stem cross section.

The mean prevalence of blackleg stem lesions in 2012 was 68%. In previous years, 65%, 54%, 56%, 66% and 64% of crops had stem lesions in 2007, 2008, 2009, 2010 and 2011, respectively (McLaren et al. 2010; 2011; 2012). Mean incidence of blackleg stem lesions was 13.1% in infested and 8.9% in all crops.

The mean prevalence of alternaria pod spot in 2012 was 15%, 39%, 19% and 14% 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 ≤3%.

Fusarium wilt was observed in 4% of canola crops surveyed in Manitoba, with a mean incidence of 4.5% in these fields. No fusarium wilt was observed in the southwest and central regions (Table 1). This disease was found in 21%, 18%, 15%, 9%, 4% and 3% of fields from 2005 through 2010, respectively, illustrating a reduction in disease prevalence likely due to the use of wilt-resistant canola cultivars.

Foot rot occurred in 11% of canola crops surveyed with a provincial mean of <1%. No foot rot was observed in the southwest region. White rust (*Albugo candida*) was confirmed in one field of *B. napus* in 2011, but was not observed in any of the crops surveyed in 2012.

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Table 1. Mean prevalence, incidence and severity of sclerotinia stem rot and blackleg in Manitoba in 2012.

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	51	6.9	13.5	1.2	2.3	90	20.4	22.6	1.5	1.7	80	14.3	17.7
(41)													
East./Inter.	65	8.6	13.2	1.2	1.8	61	9.7	16.0	1.0	1.6	43	3.1	7.1
(23)													
Northwest	75	10.3	13.7	2.2	2.9	75	8.6	11.4	1.2	1.6	58	4.9	8.4
(36)													
Southwest	69	8.7	12.6	2.1	3.1	74	8.1	10.9	1.2	1.7	79	10.4	13.2
(42)													
All regions	65	8.6	13.2	1.7	2.6	77	12.0	15.7	1.3	1.6	68	8.9	13.1
(142)													

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

Table 2. Mean prevalence and incidence or severity of alternaria pod spot, aster yellows, fusarium wilt and foot rot in Manitoba in 2012.

Crop Region	Alternaria pod spot		Aster yellows			Fusarium wilt					Foot rot		
(No. of crops)	P	Sev.[3]	P	Inc.[2]	Inc.[3]	P[1]	Inc.[2]	Inc.[3]	Sev.[2]	Sev.[3]	P[1]	Inc.[2]	Inc.[3]
Central	15	1.9	95	8.4	8.9	0	0	0	0	0	27	2.6	9.8
(41)													
East./Inter.	39	2.0	91	10.9	12.0	9	0.5	6.0	1.1	2.3	4	0.1	2.0
(23)													
Northwest	14	3.0	97	12.6	12.9	11	0.4	3.8	1.2	3.0	11	0.1	1.3
(36)													
Southwest	19	1.5	95	8.4	8.8	0	0	0	0	0	0	0	0
(42)													
All regions	20	2.0	95	9.9	10.4	4	0.2	4.5	1.1	2.7	11	0.8	7.2
(142)													

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

Table 3. Distribution of incidence (sclerotinia, blackleg, aster yellows, fusarium wilt and foot rot) and severity (alternaria pod spot) classes in 142 crops of *Brassica napus* in Manitoba in 2012.

	Percentage of crops with						
Incidence range	**Sclerotinia stem rot**	**Blackleg basal cankers**	**Blackleg stem lesions**	**Aster yellows**	**Fusarium wilt**	**Foot rot**	**Alternaria pod spot**
0%	35	23	32	5	96	89	80
1-5%	30	28	29	27	3	7	19
6-10%	9	17	12	32	1	2	1
11-20%	14	14	14	29	0	1	0
21-50%	10	14	10	7	0	1	0
>50%	2	4	3	0	0	0	0

CROP: Canola
LOCATION: Manitoba

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TITLE: DETECTION OF *PLASMODIOPHORA BRASSICAE* IN MANITOBA, 2011

ABSTRACT: As part of the 2011 Manitoba Canola Disease Survey soil samples were collected from 69 fields and tested for presence of *Plasmodiophora brassicae*. Two samples were positive for DNA of *P. brassicae*, but plant bioassays in the soils were negative for clubroot symptoms. The two fields and surrounding fields were further sampled in 2012 and tested negative for *P. brassicae* DNA.

METHODS: Between July 27 and mid-September, 2011 soil samples (~1 L) were obtained from 69 of the 121 canola fields surveyed during the 2011 canola disease survey (McLaren et al. 2012). Soil samples were analysed for the presence of *Plasmodiophora brassicae* Woronin using the PCR based diagnostic test of Cao et al. (2007) and an adaptation of the quantitative PCR (qPCR) protocol of Rennie et al. (2011). For any soil sample that tested positive for *P. brassicae* using PCR, a bioassay was conducted under controlled conditions using susceptible *Brassica* spp . Plants were grown for 6 weeks under greenhouse conditions and assessed for clubroot severity as described by Strelkov et al. (2006).

RESULTS AND COMMENTS: Clubroot symptoms were not visible in any of the 121 fields surveyed in 2011. However, analysis of the 69 soil samples by PCR resulted in two samples positive for *P. brassicae*. The concentrations of *P. brassicae* within these samples were below the quantifiable range determined through qPCR. In addition, the bioassays performed on these soils were negative for clubroot symptoms.

In April, 2012 additional soil samples from the identified fields were collected, as well as soil samples from all adjacent fields and all other fields which were planted to canola in 2011 by the producers affected. In total, 18 samples were submitted to the University of Alberta and tested using PCR (Cao et al. 2007) to determine presence of the pathogen. The results indicated the absence of *P. brassicae* DNA in all 18 soil samples. The PCR assays were independently repeated with two 150 mg sub-samples taken from each original soil sample. Both repetitions of the test yielded consistent results. Since the conventional PCR assays were negative, the samples were not tested further using qPCR or bioassays.

Manitoba Agriculture, Food and Rural Initiatives has classified the fields as ‘non-symptomatic fields of concern’ and personnel continue to work with the affected producers in monitoring these sites.

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

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TITLE: **ASCOCHYTA BLIGHT ON CHICKPEA IN SASKATCHEWAN, 2012.**

ABSTRACT: Ascochyta blight levels were lower in southern than central areas of Saskatchewan in 2012.

METHODS: A survey of nine chickpea fields in south-west, west-central, and central Saskatchewan was conducted on September 18, 2012 (pod stage to maturity) to assess the incidence and severity of ascochyta blight (*Didymella rabiei*, anamorph *Ascochyta rabiei*). Severity was rated on 10 plants per site at each of 10 sites along a teardrop-shaped circuit in each field using the 0–11 Horsfall-Barratt scale (1). Ratings were converted to percent area affected. Infected plants were collected at each site and the identity of the pathogen was confirmed by isolation onto standard growth media.

RESULTS AND COMMENTS: Ascochyta blight severity, particularly on pods, was generally low in chickpea fields in southern Saskatchewan (3) in 2012, where rainfall was near-normal early in the growing season but very limited in late July and August (Table 1). In some of the fields, it was hard to find symptoms of blight. Crops stands were very good to excellent. In contrast, severity was generally higher in the northern portion of the survey area, where rainfall was above-normal throughout the growing season (2). Higher levels of disease occurred even though most of the fields had been sprayed repeatedly (up to four times) with a fungicide. The frequent or timely application of foliar fungicides may explain why incidence was high but severity was low to moderate in several fields. Root rot and trace levels of sclerotinia stem rot (*Sclerotinia sclerotiorum*) were also observed in some fields.

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Table 1. Mean incidence and severity (range in brackets) of ascochyta blight at maturity in nine commercial chickpea fields in Saskatchewan in 2012.

Region & Crop district (3)	No. of fields	Incidence (%)	Severity (%)
Southwest (3A)	3	32 (20–50)	2 (0–6)
(3B)	3	58 (30–95)	3 (0–6)
Central (6B)	2	70 (50–90)	31 (3–75)
West-central (7A)	1	30	2

CROP: Flax
LOCATION: Manitoba/Saskatchewan

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TITLE: DISEASES OF FLAX IN MANITOBA AND SASKATCHEWAN IN 2012

ABSTRACT: A survey of 40 flax crops revealed that pasmo was the most prevalent disease present in 98% of crops surveyed, followed by fusarium wilt in 53% and powdery mildew in 28%. Aster yellows was observed more frequently than in previous years and in most crops. Rust and sclerotinia stem infections were absent.

METHODS: A total of 40 flax crops were surveyed in 2012, 17 in southern Manitoba, and 23 in southern and eastern Saskatchewan. In August four crops were surveyed in the 1st week, five in the 2nd week and 31 in the 3rd week. Eighty percent of the crops were brown seed-colour linseed flax, and only twenty percent 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 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 (*Candidatus* Phytoplasma asteris) 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, 42 samples of flax plants were submitted for analysis to the Crop Diagnostic Centre of Manitoba Agriculture, Food and Rural Initiatives by agricultural representatives and growers.

RESULTS AND COMMENTS: Ninety-three percent of the flax crops surveyed in 2012 had excellent stands and the remaining 3% were good to fair. Eighty-eight percent of the crops surveyed in Manitoba and 48% of those in Saskatchewan were maturing early and 50% of the crops in both provinces had excellent to good vigour. The other 50% had poor vigour and were expected to mature late. The 2012 growing season started with normal growing conditions in Manitoba. However, high soil moisture in Saskatchewan resulted in delayed seeding. Total flax area was ~400,000 ha, mostly in Saskatchewan, according to Statistics Canada. Above normal temperatures and below normal precipitation in July-August no doubt contributed to early maturity and low yield in some crops. The 2012 survey showed only minor differences between Manitoba and Saskatchewan in the incidence and severity of the major diseases; pasmo, aster yellows, and powdery mildew were similar in both provinces, fusarium wilt and alternaria leaf blight were more prevalent in Manitoba (59% of crops for both diseases in MB in comparison with 48% crops with wilt and 30% with alternaria blight in SK). Lodging was at record low levels with only traces to 5% in both provinces.

Pasmo, the most prevalent disease in 2012, was observed in 100% of the crops surveyed in Saskatchewan and 94% in Manitoba (Table 1). The prevalence and severity on stems were generally lower than in previous years (1, 2, 3, 4), due perhaps to the above normal dry and warm weather in July-August. Pasmo severity ranged from trace to 20% of the stem area affected in most crops but covered >40% in 25% of the crops (Table 1).

Root infections and fusarium wilt were observed in 53% of flax crops in 2012. Incidence was very low (trace to 5%) in most crops (Table 1). Prevalence of these diseases in 2012 was slightly higher than in 2011 but similar to previous years probably due to the abnormally dry and warm summer which favours fusarium wilt disease development (1, 2, 3, 4).

Powdery mildew was present in 28% of the crops surveyed in the two provinces in 2012 (Table 1); severity ranged from trace to 5% leaf area affected in most crops. Powdery mildew infections started late, and severity was at a record low due to the abnormally dry conditions in July-August (1, 2, 3, 4).

Rust was not observed in any of the crops surveyed in 2012, 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 was widespread in 2012 in both provinces; it was observed in 60% 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 43% of the flax crops surveyed (59% in Manitoba and 30% in Saskatchewan) with a severity range from trace to 5% leaf area affected. No sclerotinia stem infections were evident in any of the crops surveyed in 2012.

Of 42 samples submitted to MAFRI Crop Diagnostic Centre in 2012, 13 were affected by fusarium wilt-root rot, 11 by aster yellows, one each by *Colletotrichum* sp. and by *Septoria linicola*, and 16 by herbicide and environmental injury. However, reports of aster yellows were also received by the Centre.

ACKNOWLEDGEMENTS: The technical assistance of Tricia Cabernel, Maurice Penner, and Suzanne Enns is gratefully acknowledged.

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Table 1. Incidence and severity of fusarium wilt, pasmo, and powdery mildew in 40 crops of flax in Manitoba and Saskatchewan in 2012

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%	19	47	0%	0%	1	2	0%	0%	29	72
1-5%	1-5%	21	53	1-10%	1-5%	11	28	1-10%	1-5%	9	23
5-20%	5-10%	0	0	10-30%	5-10%	11	28	10-30%	5-10%	2	5
2-40%	10-20%	0	0	30-60%	10-20%	14	35	30-60%	10-20%	0	0
>40%	10-40%	0	0	>60%	20-50%	3	7	>60%	20-50%	0	0

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

CROPS: Pea and lentil
LOCATION: Saskatchewan

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TITLE: FIRST REPORT OF APHANOMYCES EUTEICHES IN SASKATCHEWAN

ABSTRACT: *Aphanomyces euteiches* was identified in samples from three diverse Saskatchewan locations using probe-based quantitative PCR. Wet conditions in several areas in 2012 and in preceding seasons have favored root rot and exacerbated symptom development. *Aphanomyces euteiches* is probably widespread and has been present for a long time, with recent conditions enabling its detection.

INTRODUCTION AND METHODS: Since 1948 there have been regular reports in the Canadian Plant Disease Survey (e.g. Vol.28 pp. 45; Vol. 34 pp. 69; Vol. 42 pp. 97; Vol. 56 pp. 23; Vol. 78. pp.12, 98; Vol.79, pp. 70) and elsewhere (Tu, 1985) of *Aphanomyces euteiches* or of "black root" diseases on pea and other legumes. These reports come from seven of Canada's ten provinces. Although it appears that *A. euteiches* is widespread in Canada and it is known to cause severe damage to pea crops in the U.S.A. and France, the pathogen has never been identified in Saskatchewan, even though pea has become a major crop across the Prairie Provinces. *Aphanomyces euteiches* infects several other legume species, such as lentil, alfalfa, dry bean, common vetch, and susceptible cultivars of red clover and faba bean whereas chickpea has a high level of partial resistance, and lupin is immune to infection (Moussard *et al*., 2012).

In mid-July 2012 severe root rot symptoms were evident in commercial pea crops in Saskatchewan near Medstead in the north west and Swift Current in the south west. Samples were collected in several fields in both areas. In the Assiniboia (south central) area, three lentil crops with severe root rot symptoms were sampled in late June 2012. Detailed microscopic examinations of pea samples from the Medstead area were made. Pea root samples from the Medstead and Swift Current areas were plated on tap water agar to isolate the causal agent(s). These samples were also suspended in sterile water in petri dishes and germinating pea seeds were used as bait for zoospores of *A. euteiches*. All of the pea and lentil samples were analyzed using molecular diagnostic techniques. Species-specific primers for *A. euteiches* were used to enrich target DNA in the sample and then the PCR products were subjected to probe-based real time quantitative PCR (qPCR) as described by Vandemark and Barker (2003).

RESULTS AND COMMENTS: Visual inspection of pea samples from Medstead at the Saskatchewan Crop Protection Laboratory revealed extensive chlorosis from the lower leaves upward. Roots of infected plants were poorly developed and tissues were sloughed off in the severely infected (4 out of 6) samples. Sections of severely infected roots showed brownish to tan wet rot in the cortex. Microscopic observation of infected root samples showed hyaline to golden brown oospores attached to the root surface. The oospores were visible only when the root samples had been incubated on water agar for 3-4 days, not when they were incubated on nutrient-rich media such as potato dextrose agar. Several of these symptoms are characteristic of infection with *A. euteiches*.

Various species of *Fusarium*, a species of *Pythium*, *Rhizoctonia solani*, and a range of saprophytic fungi were isolated from pea roots, but we were unable to isolate *A. euteiches* by conventional plating or by baiting with germinating pea seeds. Real time qPCR was used to demonstrate the presence of *A. euteiches* in three samples of pea roots (2 from Medstead, 1 from Swift Current) and one lentil root sample from Assiniboia. The need for enrichment before using qPCR was supported by visual observations and isolation attempts that suggested the presence of the pathogen in some root samples, although at a very low level.

DISCUSSION: Late season pea disease surveys were conducted in 2009 and 2010 in Saskatchewan, and root rots were recorded for 38 and 29%, respectively, of the fields surveyed. In many cases root rot symptoms were identified in areas that had been flooded. No identification of the causal organisms was initiated (Dokken-Bouchard *et al*., 2010, 2011). Positive identification of the pathogen *A. euteiches* in three diverse locations of Saskatchewan indicates that it is likely widespread and has been present for a long time. As a water mould, *Aphanomyces* thrives in conditions of high soil water potential. Saskatchewan Crop District 9AW, which includes the area around Medstead experienced exceptionally high spring precipitation in 2010, 2011 and 2012 causing widespread flooding. Well above average spring rains were also experienced in Crop Districts 3BN (Swift Current) and 3ASW (Assiniboia) in 2010 and 2012. Probably the population of *Aphanomyces* has substantially increased as a result of these conditions. However, it is unclear how much of the yield losses experienced in the crops sampled could be directly attributed to *Aphanomyces.* Other pathogens were also isolated from the roots of diseased plants, and flooding alone can cause yellowing, early leaf senescence, stunting and yield loss in pea (Cannell *et al.*, 1979).

ACKNOWLEDGEMENTS: The authors thank the producers for their cooperation with crop sampling.

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CROP: Field pea
LOCATION: Manitoba

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TITLE: FIELD PEA DISEASES IN MANITOBA IN 2012

ABSTRACT: A total of 33 pea crops were surveyed in Manitoba for root and foliar diseases. Fusarium root rot was the most prevalent root disease and mycosphaerella blight the most prevalent foliar disease throughout the province. Diseases less frequently observed in 2012 included rhizoctonia root rot, sclerotinia stem rot, anthracnose and downy mildew.

METHODS: Field pea crops were surveyed for root and foliar diseases at 33 different locations in Manitoba. The crops surveyed were randomly chosen from regions in south-central and southwest Manitoba, where field pea is commonly grown. The area seeded to field pea in Manitoba increased by over 50% from 2011, with growers attempting to maximize the planting area and return to pre-flood levels (McLaren et al. 2012).

The survey for root diseases was conducted during the first two weeks 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) and Punja et al. (2007). Foliar diseases were assessed in late July, when most plants were at the round pod stage. A minimum of 30 plants (10 plants at each of 3 sites) was assessed in each field. Foliar diseases were identified by symptoms. The severity of mycosphaerella blight, sclerotinia stem rot and anthracnose 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 in the survey for root diseases (Table 1). Fusarium root rot was the most prevalent and was observed in all crops surveyed, as in previous years (McLaren et al. 2011, 2012). *Fusarium avenaceum* was more frequently isolated from symptomatic roots than *F. solani* during 2009-2012. Rhizoctonia root rot (*Rhizoctonia solani*) was detected in one crop. In 2011, wet soils and cool conditions early in the season favoured root rot development, but similar conditions were not as prevalent in 2012, resulting in a lower mean root rot disease severity. Twelve pea crops had average root rot severity ratings above 4 (i.e., symptoms were present on 50% of the root system) and this would have had a detrimental effect on crop yield. *Fusarium oxysporum,* an efficient root colonizer known to cause wilt of pea, was also detected in 23 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. 2011, 2012), and was present in all crops surveyed. Sclerotinia stem and pod rot (*Sclerotinia sclerotiorum*) was detected in 12 crops. The prevalence of sclerotinia-infested crops was 88% in 2010 (McLaren et al. 2011) compared with 26% and 36% in 2011 and 2012, respectively. Warm, dry weather generally prevailed in July and August of 2011 and 2012, which reduced the risk of development of stem and pod rot. Downy mildew (*Peronospora viciae*) was detected in seven crops surveyed with a mean disease severity of 0.1. Anthracnose (*Colletotrichum pisi*) was found in two crops with a mean severity rating of 0.2. Powdery mildew (*Erysiphe pisi*) was not observed in any of the surveyed crops. Because all newly registered pea cultivars are required to have resistance to powdery mildew, the absence of this disease could be mainly attributed 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 in which powdery mildew developed after the time of the 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 33 crops of field pea in Manitoba in 2012.

		Disease severity (0-9)[1]	
Disease	**No. crops affected**	**Mean**	**Range**
Fusarium root rot	33	3.0	0.6-6.3
Rhizoctonia root rot	1	1.2	1.2
Fusarium oxysporum	23	3.3	0.6-6.3

[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 33 crops of field pea in Manitoba in 2012.**

		Disease severity (0-9 or % leaf area infected)[1]	
Disease	**No. crops affected**	**Mean**	**Range**
Mycosphaerella blight	33	4.2	1.7-8.1
Sclerotinia stem rot	12	0.2	<0.1-1.0
Powdery mildew	0	0	0
Downy mildew	7	0.1%	<0.1-0.1%
Anthracnose	2	0.2	<0.1-0.2

[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: Pulse crops (Lentil, Pea, Chickpea)
LOCATION: Saskatchewan

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TITLE: SEED-BORNE PATHOGENS OF PULSE CROPS IN SASKATCHEWAN IN 2012

ABSTRACT: In a summary of commercial plate tests for seed-borne pathogens of lentil, field pea and chickpea the only pathogens at higher than normal levels were those causing ascochyta blights of pea. Mean levels of *Ascochyta* spp. on lentil and chickpea, *Botrytis* spp. on all three crops, and *Colletotrichum truncatum* on lentil were all at low levels.

METHODS: Results were summarized from commercial agar plate tests for pathogens in samples of lentil, field pea, and chickpea seed from Saskatchewan. The tests were conducted by three companies between September and mid-December 2012 and the seed samples were assumed to be predominantly from the 2012 crop. Tests were for the following pathogens:

(a) *Didymella* [*Ascochyta*] *lentis,* the cause of ascochyta blight in lentil; *Mycosphaerella* [*A.*] *pinodes*, *Didymella* [*A.*] *pisi* and *Phoma medicaginis* var. *pinodella* [= *A. pinodella*], the causes of ascochyta blights in field pea; and *Didymella* [*A.*] *rabiei*, the cause of ascochyta blight in chickpea.
(b) *Botrytis* spp., the cause of botrytis stem and pod rot (grey mould) and seedling blight in lentil, chickpea and field pea.
(c) *Colletotrichum truncatum*, the cause of anthracnose in lentil.

All samples were tested for ascochyta blight pathogens and slightly fewer for *Colletotrichum* or *Botrytis* spp. For all diseases mean % seed infection with the relevant pathogen(s) were calculated for each crop district [CD] in Saskatchewan (12) and for the whole province. In addition, for each pathogen the percentage of total provincial samples free of infection was calculated. Seed samples were not classified according to cultivar or whether the crops had been treated with seed treatments or foliar fungicides. However, most lentil growers in Saskatchewan now plant ascochyta-resistant cultivars. In addition, the use of foliar fungicides, especially strobilurin products, is commonplace among pulse crop growers. Usage includes making multiple applications to control ascochyta blight on chickpea.

RESULTS AND COMMENTS: The 2012 growing season in Saskatchewan was characterized by above average moisture levels in May and June throughout the arable area of the province. This was followed by dry weather in the south west and extreme south-central regions, but continued frequent precipitation and high humidity in the north, central and south east regions. Warm dry weather everywhere in September led to fairly timely completion of the harvest. The 2012 season in central and northern CDs was in many respects similar to the exceptionally wet 2010 season (7), but drier weather in September 2012 was an important difference. Pulse crop yields and quality were average or better except in field pea in which yields were 6% below the 10-year average (12). This was probably due to high levels of root rots and ascochyta blight in many crops in central and northern crop districts (R.A.A.Morrall, personal observations).

During the period covered by this report 475 lentil, 474 pea and 96 chickpea samples were processed. These were 17% fewer for lentil and 57% more for pea than reported for a similar time period in 2011 (9,10). No comparative numbers for chickpea were reported in 2011, but chickpea production in Saskatchewan is always much less than that of lentil or pea and mainly restricted to southern or southwestern CDs.

Lentil – Mean levels of seed-borne *Ascochyta* were low in all crop districts (Table 1). The overall provincial mean (≤ 0.1%) was equal to 2003 (11) and the lowest level reported in annual Canadian Plant Disease Survey (CPDS) articles over the past 10 years. The overall percent *Ascochyta*-free samples was above 90%, as in 2009 and 2003 (6,11). The provincial mean *Botrytis* level was 0.5%, one of the lowest levels in 10 years, and the percent *Botrytis*-free samples was 52%. The mean anthracnose level in seed samples was 0.3%, similar to low values over the past 10 years. However, only 71% of the lentil samples were anthracnose-free, fewer than in any previous report in the 10-year period. In summary, seed-borne pathogens were not a significant problem on lentil in 2012, probably due to cultivar resistance to *Ascochyta lentis*, widespread use of fungicides to control foliar diseases, and favorable harvest weather. However, low levels of *Botrytis* occurred in almost half the samples, probably due to the rank crop growth caused by abundant rainfall in much of the growing season (1).

Pea –The percent *Ascochyta* spp. infection of pea samples was generally higher in CDs 5-9 (central and northern) than in CDs 1-4 in the south (Table 1) and the provincial mean (6.1%) was analogous to high levels reported for 2010, 2005 and 2004. (8,5,4). The provincial mean % *Ascochyta*-free samples was 19%, similar to 2011 (10) and many of the previous 10 years, and was greatly influenced by the small numbers of disease-free samples in central and northern CDs. The provincial mean % infection with *Botrytis* spp. was 0.1% and 82% of the samples were *Botrytis*-free. Over the last 10 years *Botrytis* spp. have rarely caused significant problems in pea seed.

Chickpea – Because of the small area of chickpea production in Saskatchewan, low numbers of seed samples tested, and inconsistent reporting over the last 10 years, comparisons of crop districts or annual levels are of limited value. The mean provincial levels of seed infection in 2012 were 0.4% for *Ascochyta* and 0.2% for *Botrytis*; mean % disease-free samples were 63% for *Ascochyta* and 78% for *Botrytis*. It may be noteworthy that 63% is the highest reported level of *Ascochyta*-free seed in records for seven of the last 10 years (7,2,3,11). Chickpea production has been a challenge for Saskatchewan farmers, among other reasons because of ascochyta blight. Seed must have no more than 0.3% ascochyta infection for farmers to be eligible for provincial crop insurance. The high % *Ascochyta*-free seed produced in 2012 may indicate that the art of growing chickpea has improved.

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Table 1. Numbers of lentil, pea and chickpea seed samples tested from September to mid-December, 2012 and levels of infection with Ascochyta spp., *Colletotrichum truncatum*, or *Botrytis cinerea* in relation to Saskatchewan Crop Districts

	Lentil				**Field Pea**			**Chickpea**		
Crop District	**No. tests**	**Mean % Ascl***	**Mean % Bot***	**Mean % Anth***	**No. tests**	**Mean % Ascp***	**Mean % Bot***	**No. tests**	**Mean % Ascr***	**Mean % Bot***
1A	1	0.3	0	0	10	0.1	nr**	1	2.8	nr**
1B	1	0	0	0	5	0	nr**	-	-	nr**
2A	50	≤0.1	0.9	0.3	3	1.0	nr**	3	0.8	nr**
2B	119	0.1	0.2	0.2	39	0.3	nr**	36	0.3	nr**
3AN	18	0	0.4	0.2	2	0.8	nr**	13	0.2	nr**
3AS	43	≤0.1	0.1	≤0.1	33	0.3	nr**	21	0.6	nr**
3BN	66	≤0.1	0.2	0.2	21	5.7	nr**	2	1.6	nr**
3BS	7	0	0.1	0	4	0.1	nr**	3	0.1	nr**
4A	1	1.8	0	0	2	0.8	nr**	2	0.1	nr**
4B	2	0	0	0	2	0	nr**	-	-	nr**
5A	11	0.6	1.6	1.4	17	1.9	nr**	-	-	nr**
5B	1	0	1.5	0	8	1.6	nr**	-	-	nr**
6A	25	≤0.1	1.3	≤0.1	32	5.6	nr**	4	0	nr**
6B	61	≤0.1	0.5	0.4	82	7.9	nr**	6	≤0.1	nr**
7A	61	0.2	0.5	0.8	22	5.9	nr**	5	0.9	nr**
7B	6	0	1.9	0.1	69	12.3	nr**	-	-	nr**
8A	1	0	0.8	0	17	5.0	nr**	-	-	nr**
8B	2	0	6.5	0	16	4.2	nr**	-	-	nr**
9A	-	-	-	-	45	6.9	nr**	-	-	nr**
9B	-	-	-	-	45	9.7	nr**	-	-	nr**
Total	**475**	**≤0.1**	**0.5**	**0.3**	**474**	**6.1**	**0.1**	**96**	**0.4**	**0.2**
%PFS+		**94%**	**52%**	**71%**		**19%**	**82%**		**63%**	**78%**

* Ascl = *Ascochyta lentis*; Ascp = *Ascochyta pinodes, A. pisi,* or *A. pinodella;* Ascr = *Ascochyta rabiei*; Bot = *Botrytis cinerea* or *B. fabae*; Anth = Anthracnose caused by *Colletotrichum truncatum*.
** not reported for individual crop districts
+pathogen-free samples as % of total samples for all crop districts combined

CROP: Soybean (*Glycine max* L.)
LOCATION: Southern Alberta

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TITLE: OCCURRENCE OF SOYBEAN ROOT ROT IN SOUTHERN ALBERTA, CANADA IN 2011 AND 2012

ABSTRACT: Soybean production is expanding in southern Alberta. Surveys for the incidence and severity of soybean root rot were conducted in 2011 and 2012. Root rot was very severe in low-lying areas in some fields in both years, suggesting that it may reduce quality and yield in southern Alberta.

INTRODUCTION AND METHODS: Many soybean cultivars or lines with superior agronomic traits, such as early maturity, excellent growth response to long day length, ideal plant height for harvesting, herbicide resistance, and high yield have become available in recent years (1). Consequently soybean production has gradually expanded into southern Alberta and Saskatchewan. Limited information is available on possible disease threats to this crop in central and western areas of the Prairies, but root rot is a constraint in other areas of Canada where soybean production is well established (5). A survey was conducted in 2011 and 2012 to determine if root rot is becoming a problem in southern Alberta.

A total of 348 root rot samples were randomly collected in early September, 2011 from low-lying areas in fields of four commercial crops of soybean near Brooks and Tilley, Alberta (Table 1). One experimental field of soybean near Bow Island was also checked for root rot during the same period. Plant height, pod and seed number, and seed weight per plant were recorded from diseased and healthy plants. Soil samples were collected at a depth of 0-15 cm from the same areas where diseased plants were collected in these fields. The soil samples were air-dried and their pH and electrical conductivity (EC) values were measured at 20°C using a pH/EC/TDS meter (HI 9813-6; Hanna Instruments Inc., Quebec, Canada). In 2012, 14 fields at seven locations in southern Alberta were surveyed for root diseases in mid-August, when plants were at the early flowering to early pod filling growth stages (Table 3). Twenty plants were randomly collected at each of five equally spaced sites along the arms of a “W” sampling pattern in these fields. The roots were then washed and assessed for disease severity and degree of nodulation. Disease severity was scored on a scale of 0 to 4 as described by Chang et al. (2). Nodulation in the root samples was rated using a 0 to 4 scale, where 0 = no nodules, 1 ≤5 nodules/plant, 2 ≤10 nodules/plant, 3 ≤20 nodules/plant and 4>20 nodules/plant. In 2011, a total of 275 diseased roots were processed using the method of Chang et al. (3) to determine the causal agents.

In 2011, microorganisms isolated from diseased root tissues were identified according to cultural characteristics observed on Petri plates containing potato dextrose agar and to spore morphology as observed microscopically. In 2012, root pieces collected from diseased samples were air-dried and stored at 4˚C. Pathogen isolation is planned for early 2013.

RESULTS AND COMMENTS: In 2011, severe root rot was observed in soybean that had been growing in low-lying and flooded areas of fields located near Brooks and Tilley, although the seed had been treated with the fungicide Cruiser Maxx (thiamethoxam, 22.6% + mefenoxam, 1.7% + fludioxonil, 1.1%)

before seeding in early June. Diseased plants showed stunting and yellowing and were easily pulled from the soil. Some affected plants were already dead when the root samples were collected. Roots of diseased plants had few or no nodules, while nodulation was prolific on healthy plants. At the Bow Island experimental site, all cultivars appeared healthy. Wheel line irrigation and flood irrigation systems were used in the fields at Tilley and Brooks, respectively, which resulted in high water and salt accumulation in the soil in low areas of the fields. These practices reduced plant height, pod number and yield in diseased plants, particularly in the field at Brooks (Table 1). Soil samples collected from diseased areas in the fields had very high pH and salinity (EC values), but the EC values were normal in the areas with healthy plants. Soils with high pH and EC values are not ideally suited for soybean growth and may predispose soybean roots to attack by soil-borne pathogens.

Fusarium spp. were the microorganisms most frequently isolated from roots (100%) of infected plants, followed by *Rhizoctonia solani* (23.1%) and *Pythium* spp. (2.1%) (Table 2). An incidence of root rot infection as high as 19.3% was observed in which both *Fusarium* spp. and *R. solani* were isolated, indicating that *R. solani* is also an important root rot pathogen of soybean, as observed by Datnoff and Sinclair (4).

In 2012, root rot was observed in 12 out of 14 soybean fields at seven locations (Table 3). However, disease severity (DS) was generally low at all locations, except for one field at Brooks (DS = 1.1) and one at Tilley (DS = 1.6). Severe root rot commonly appeared in low-lying and flooded areas of the fields, as in 2011. Nodulation values on the soybean roots ranged from 0.4 to 1.6 in the surveyed fields. The highest level of nodulation was observed in a field near Taber (1.6). While the number of nodules varied in the root systems of soybean plants, severely infected roots either did not show any nodulation or the infected nodules were non-functional.

Overall, root rot of soybean was very severe in low-lying areas of some fields in both 2011 and 2012. This disease may reduce soybean quality and yield in southern Alberta. More research on methods of controlling this disease, the role of other soil-borne pathogens, and the effect of soil pH and salinity on root rot development should be conducted in the near future.

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Table 1. Effect of root rot and soil conditions on plant height, pod number, seed number and seed weight of soybean crops growing in southern Alberta in 2011.

Field location	Soybean variety	Plant status	No. plants tested	Plant height (cm)	No. pods /plant	No. seeds /plant	Seed wt (g /plant)	Soil pH	EC (mS/ cm)
Brooks	LS005R22	H[X]	64	48	19.2	44.5	6.01	8.0	1.1
Brooks	LS005R22	D[Y]	156	18	2.2	4.3	0.30	8.2	7.0
Tilley	LS0065RR	D	73	15	0.4	0.5	0.02	7.9	4.4
Tilley	3R2Y2004	D	42	12	0.2	0.4	0.03	7.8	4.6
Tilley	29002RR	D	77	15	N/A[Z]	N/A	N/A	7.9	4.4

[X]H = Healthy plants; [Y]D = Diseased plants with root rot; [Z]N/A = Data not available.

Table 2. Frequency of fungi isolated from diseased roots collected from four soybean fields in southern Alberta in 2011.

Field location	No. diseased roots sampled	Microorganisms isolated (%)				
		***Fusarium* spp.**	***Rhizoctonia solani***	***Fusarium* spp. + *R. solani***	***Pythium* spp.**	**Others[x]**
Brooks	141	100	16	11	0	9
Tilley	54	100	39	35	6	19
Tilley	35	100	20	14	3	17
Tilley	45	100	18	18	0	4
Total	275					
Average (%)		**100**	**23**	**19**	**2**	**12**

[x] Including *Cladosporium* spp., *Penicillium* spp., and *Alternaria* spp., etc.

Table 3. Root rot incidence and severity and root nodulation levels on soybean crops at seven locations in southern Alberta in 2012.

Location	No. fields surveyed	Root rot incidence (%)		Root rot severity (0-4)		Root nodulation (0-4)	
		Range	Mean	Range	Mean	Range	Mean
Brooks	6	0-100	21	0-3.8	0.5	0-4	1.1
Duchess	2	15-65	35	0.2-1.4	0.6	0-4	1.3
Grassy Lake	1	0-20	8	0-0.2	0.1	0-3	1.3
Lethbridge	1	0-30	18	0-0.3	0.2	0-3	0.6
Taber	1	0-15	7	0-0.2	0.1	0-4	1.6
Tilley	2	0-100	48	0-4.0	0.9	0-3	0.7
Vauxhall	1	0-20	4	0-0.2	0.1	0-3	0.4

CROP: Sunflower
LOCATION: Manitoba

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TITLE: DISEASES OF SUNFLOWER IN MANITOBA IN 2012

ABSTRACT: A survey of 33 sunflower crops in Manitoba in 2012 revealed that sclerotinia wilt /basal stem rot was the most prevalent disease in 82% of the crops, followed by verticillium wilt in 67%, rust in 55%, sclerotinia head rot in 24%, and downy mildew in 20%. Disease severity ranged from low to moderate with no severe epidemics.

METHODS: A total of 33 sunflower crops were surveyed in 2012 in Manitoba. Eight crops were surveyed in the 1st week, six in the 2nd week, four in the 3rd week and 15 in the 4th week of August. 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. and *Phomopsis* spp.) were estimated as percent leaf or stem area infected. A disease index was calculated for each disease in every crop based on disease incidence or disease severity (Table 1). Stand establishment, vigour, and maturity were rated on a scale of 1 to 5 (I = very good/early, and 5 = very poor/very late).

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

RESULTS AND COMMENTS: Ninety-four percent of the sunflower crops surveyed in 2012 had excellent to good stands, while only 49% had good vigour. The rest had fair to poor stands and vigour. Fifty-two percent of the crops were maturing early, and the remaining 48% late to very late (Table 1). The crops were split 50%:50% between confectionery and oilseed hybrids, a sharp increase in the oilseed acreage in 2012 in comparison with previous years (1, 2, 3). The 2012 growing season started with close to normal soil moisture and temperature conditions, and this contributed to the sharp increase in sunflower-seeded area in Manitoba (~40,000 ha in 2012 in comparison with 15,000 ha in 2011, according to Statistics Canada). However the growing conditions turned to above-normally dry and hot in July-August, which resulted in low disease incidence and severity in 2012 compared with previous years (1, 2, 3). These abnormal conditions in July-August probably contributed to early maturity and low yield in some crops in spite of a low incidence and severity of the various sunflower diseases.

Sclerotinia wilt was present in 82% of the crops surveyed in 2012, mostly at trace levels but ranging from 1% to 10% in a few crops and up to 40% in one crop near Elgin, Manitoba (Table 1). Sclerotinia head rot and mid-stem infection, caused by ascospore infections, were observed at trace levels in 24% of the crops especially in those surveyed in the last week of August. The prevalence and incidence of head rot in 2012 were at a record low compared with the 10 previous years (1, 2, 3, 4).

Rust was present in 55% of the crops surveyed, with severity ranging from trace to 10% leaf area affected (Table 1). Preliminary analysis of the rust isolates collected indicates the prevalence of races 776, 736, and 726 of *P. helianthi*, which are virulent on most commercial sunflower hybrids. Rust infections started relatively late in 2012 and did not develop rapidly in most of the crops surveyed. Rust incidence and severity in 2012 were also at a record low in comparison with previous years (1, 2, 3), probably due to late onset of infection and the above-normal temperatures and dry weather in July-August.

Verticillium wilt was present in 67% of the crops surveyed, with traces in most affected crops but up to 20-60% infected plants in several (Table 1). Incidence was similar in 2011 and most previous years (1, 2, 3).

Downy mildew was at a record low in 2012 and observed in only 20% of crops with incidence ranging from trace to 3% (Table 1). Preliminary analysis of isolates collected indicates the predominance of races 730, 720, 700, and 330. Eighty percent of the downy mildew isolates collected in 2012 are either insensitive or partially insensitive to metalaxyl seed treatment. Downy mildew was less prevalent in 2012 than in the previous years due perhaps to normal soil moisture at the seedling stage but above-normal dryness for the rest of the growing season (1, 2, 3).

Traces to 5% leaf area infected by *Septoria helianthi* were observed in 63% of the crops as well as some *Alternaria* spp. in a few crops (Table 1). These are higher severity and prevalence values than in previous years (1, 2, 3). Traces of stem lesions caused by *Phoma* and *Phomopsis* spp. were present in several crops in 2012 but considerably fewer than those observed in previous years (1, 2, 3, 4) .

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 27% of the crops. Traces of infestation with grasshoppers were observed in 17% of the crops.

Of 14 samples received by the MAFRI Crop Diagnostic Centre in 2012, two were identified with downy mildew, 2 with fusarium root rot, one each with phoma stem canker and alternaria leaf spots, and eight with herbicide and environmental injury.

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

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Table 1. Prevalence and index of diseases in 33 crops of sunflower in Manitoba in 2012.

Disease	Crops Affected		Disease Index[1]	
	No. of crops	% of crops	Mean	Range
Sclerotinia wilt	27	2%	0.9	T – 4
Sclerotinia head rot/stem rot	8	24%	0.6	T - 1
Verticillium wilt	22	67%	1.8	T – 5
Downy mildew	6	20%	0.6	T – 1
Rust	18	55%	1.0	T – 2
Leaf spots (*Septoria* & *Alternaria*)	19	63%	0.6	T – 3
Stem lesions (*Phoma* & *Phomopsis*)	9	27%	0.5	T
Lateness[2]	16	53%	2.6	1 – 5
Stand	2	7%	1.4	1 – 5
Vigour	17	57%	2.8	1 – 5

[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: Ontario

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TITLE: FUSARIUM ROOT ROT OF CARROT IN CENTRAL AND SOUTHWESTERN ONTARIO IN 2012

ABSTRACT: A survey of 20 commercial carrot fields in Ontario was conducted to determine the presence of carrot root rot caused by *Fusarium* spp. One hundred carrots were randomly collected from each field and assessed for fusarium root rot. Fusarium root rot occurred in 15% of the surveyed fields.

INTRODUCTION AND METHODS: Fusarium root rot and crown rot caused by *Fusarium* species was first identified on carrot in the field in Ontario in 2008. The disease affects the crown and the root of carrots. Isolates from infected carrots were identified as *F. coeruleum* Lib. ex Sacc. This disease may be an emerging issue for the carrot industry, since it has not traditionally been identified as a field disease. Overall, the extent of this problem across Ontario is unknown. A survey was conducted from September 26 to October 10, 2012 to determine the presence of *Fusarium* spp. associated with carrot root rot in major carrot-growing regions of southwestern Ontario. A total of 20 commercial carrot fields in Chatham-Kent, Essex, Middlesex, Norfolk, Simcoe and York counties of Ontario were surveyed. One hundred carrots were randomly collected from five sites (20 per site) in each of the fields surveyed. Tops were removed and the carrot roots were immediately placed in a cold storage facility (0^oC; 95% relative humidity) and left for 5-7 weeks prior to evaluation. Carrot roots were washed and assessed visually for fusarium root rot symptoms in November 2012. Tissue sub-samples from carrots with fusarium root rot symptoms were surface sterilized and cultured on potato dextrose agar and 1.5% water agar amended with streptomycin sulfate. Plates were incubated in the dark at room temperature for 10 days. The morphological characteristics of 10-day-old fungal colonies were examined by light microscopy.

RESULTS AND COMMENTS: Fusarium root rot was observed in 15% of the surveyed fields (Table 1). The fields with the disease present are located in Simcoe and York Counties. Of the fields surveyed in Simcoe and York Counties, three had plants with fusarium root rot at incidences ranging from 1 to 3%. Fungal growths from the samples plated on agar media were confirmed as *Fusarium* spp. Further identification will be conducted to identify the species of *Fusarium* isolated. This is the first survey that assessed the incidence of root rot caused by *Fusarium* spp. in carrot fields in Ontario.

Table 1. Fusarium root rot incidence in commercial carrot in main growing regions of Ontario in 2012.

County	Number of fields surveyed	Percent fields with fusarium root rot	Percent carrots with fusarium root rot
Chatham-Kent	4	0	0.0
Essex	1	0	0.0
Middlesex	3	0	0.0
Norfolk	2	0	0.0
Simcoe	2	50	0.5
York	8	25	0.6

ACKNOWLEDGEMENTS: We would like to thank the Fresh Vegetable Growers of Ontario for financial support and all growers who participated in the survey.

CROP: Garlic
LOCATION: Ontario

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TITLE: STEM AND BULB NEMATODE IN ONTARIO-GROWN GARLIC

ABSTRACT: Garlic samples were collected across Ontario in 2011 and tested for the presence of stem and bulb nematode (*Ditylenchus dipsaci* (Kühn 1857) Filipjev). Seventy three percent of the samples tested positive. Although stem and bulb nematode was found in garlic from across Ontario, the infestation appears to be clustered in two regions, southwestern Ontario and eastern Ontario.

INTRODUCTION AND METHODS: Stem and bulb nematode (*Ditylenchus dipsaci* (Kühn 1857) Filipjev) is a serious pest of garlic, onion, leek and many other crops. It was first reported in Ontario in 1957 in onion crops grown in an onion-growing marsh in Essex County in southwestern Ontario (4). A survey of the onion growing regions in Ontario in 1957-58 did not find it in any of the other onion-growing areas (6), although it continued to be reported in Essex County (5). In 1972 it was confirmed in a second Ontario onion-growing marsh in Chatham-Kent County east of the original region (3). Three years later it was found in both onion and garlic grown in Simcoe County close to the Bradford Marsh in central Ontario (2). The assumed method of spread was with infested onion sets (3). No surveys have been reported since that time.

METHODS: Garlic samples, each consisting of 10 bulbs, were contributed by growers or collected by researchers across Ontario in June and July, 2011. The bulbs were rated for visual damage on a scale of 1-4 (1=no damage; 4=extensive damage) by the research team. The bulb samples were then analyzed at the University of Guelph Laboratory Services (Agriculture and Food Lab, Guelph, ON N1H 8J7). Nematodes were extracted using the Baermann-funnel method (1). The bulbs were rinsed with water and placed in a screen-lined funnel in a mist chamber for 24 hours with 1 minute of misting every 10 minutes. The populations of *Ditylenchus* were identified to the genus morphologically and counted under a stereomicroscope at magnifications up to 184X. The results were expressed per gram of dry bulb. The species identities were established and reconfirmed with molecular methods in the nematology lab at the Agriculture and Agri-Food Canada Eastern Cereal and Oilseed Research Centre in Ottawa. Positive samples were retained for random amplified polymorphic DNA (RAPD) analysis.

RESULTS AND DISCUSSION: A total of 123 garlic samples from 79 growers in 33 counties/districts from across Ontario were analyzed (Fig. 1). The main cultivar of garlic tested was 'Music' (59%), but there were 38 other cultivars/types of garlic tested including six unknown samples.

Stem and bulb nematodes were found in garlic from across the province with 73% of the samples testing positive (Fig. 2). We assume this distribution is due to infested garlic cloves used as seed transferred between growers. Eighty two percent of the samples of cv.'Music' had stem and bulb nematode, while 54% of the other cultivars were infested. 'Music' is the most popular and most widely traded garlic type in Ontario.

The counts of *Ditylenchus* ranged from less than one to greater than 3,000 per gram. There was no correlation between the visual ratings for stem and bulb damage and the nematode counts. This confirms that a number of other pathogens, some of which may be secondary to stem and bulb nematode infection, cause similar bulb breakdown (results not shown). Stem and bulb nematodes were not found in 5 of the 33 counties/districts sampled, namely Algoma and Nipissing districts in northern Ontario, and Hastings, Lennox and Addington, and Northumberland Counties in eastern Ontario. However, relatively few samples were collected from these five areas (Fig.1). Although stem and bulb nematode was found in garlic samples from across Ontario, the infestation appears to be clustered in two regions of the province, southwestern Ontario and eastern Ontario.

ACKNOWLEDGEMENTS:

We would like to thank Margaret Appleby, Ontario Ministry of Agriculture and Food and John Zandstra, University of Guelph for their help in collecting and submitting samples. Financial support by the Garlic Growers Association of Ontario and by Growing Forward, a federal-provincial-territorial initiative, is gratefully acknowledged.

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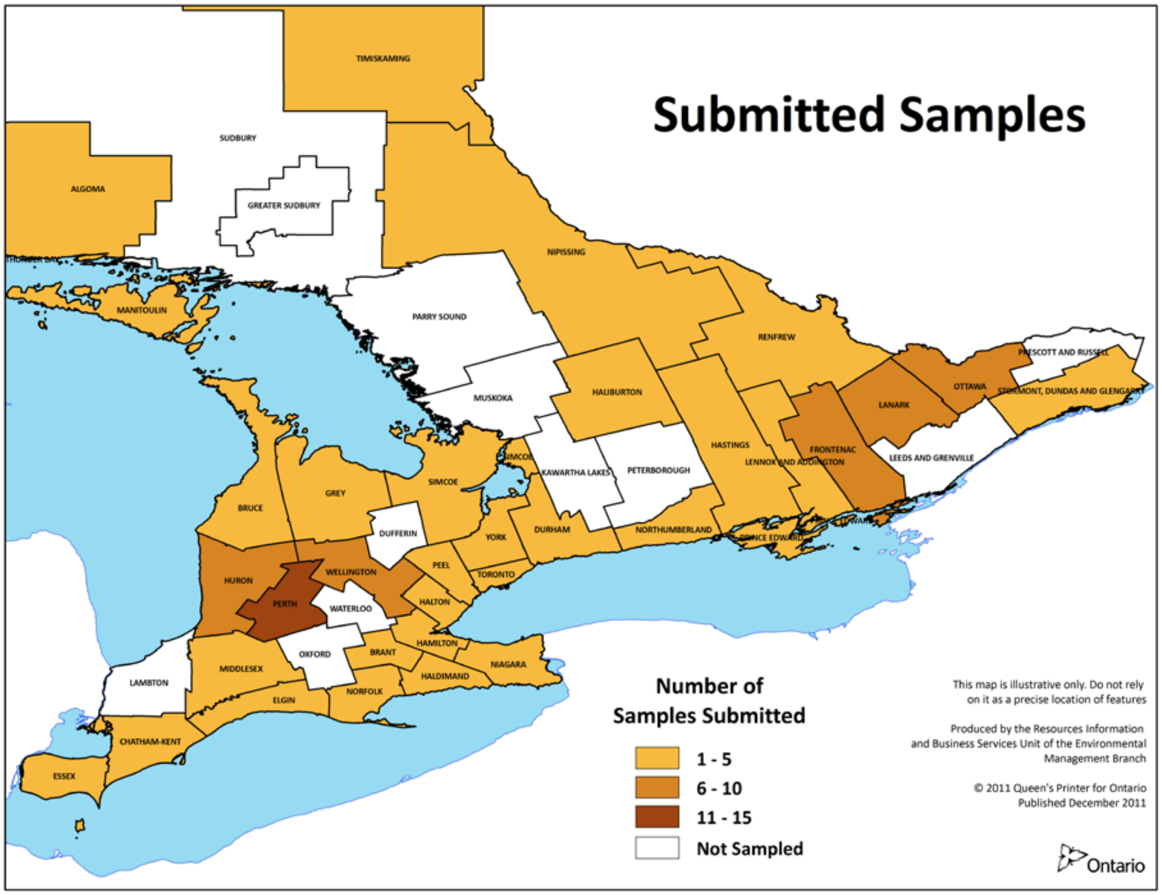

Figure 1. The number of garlic bulb samples submitted per county or district in Ontario in 2011 for stem and bulb nematode testing. (Reprinted with permission of Ontario Ministry of Agriculture and Food)

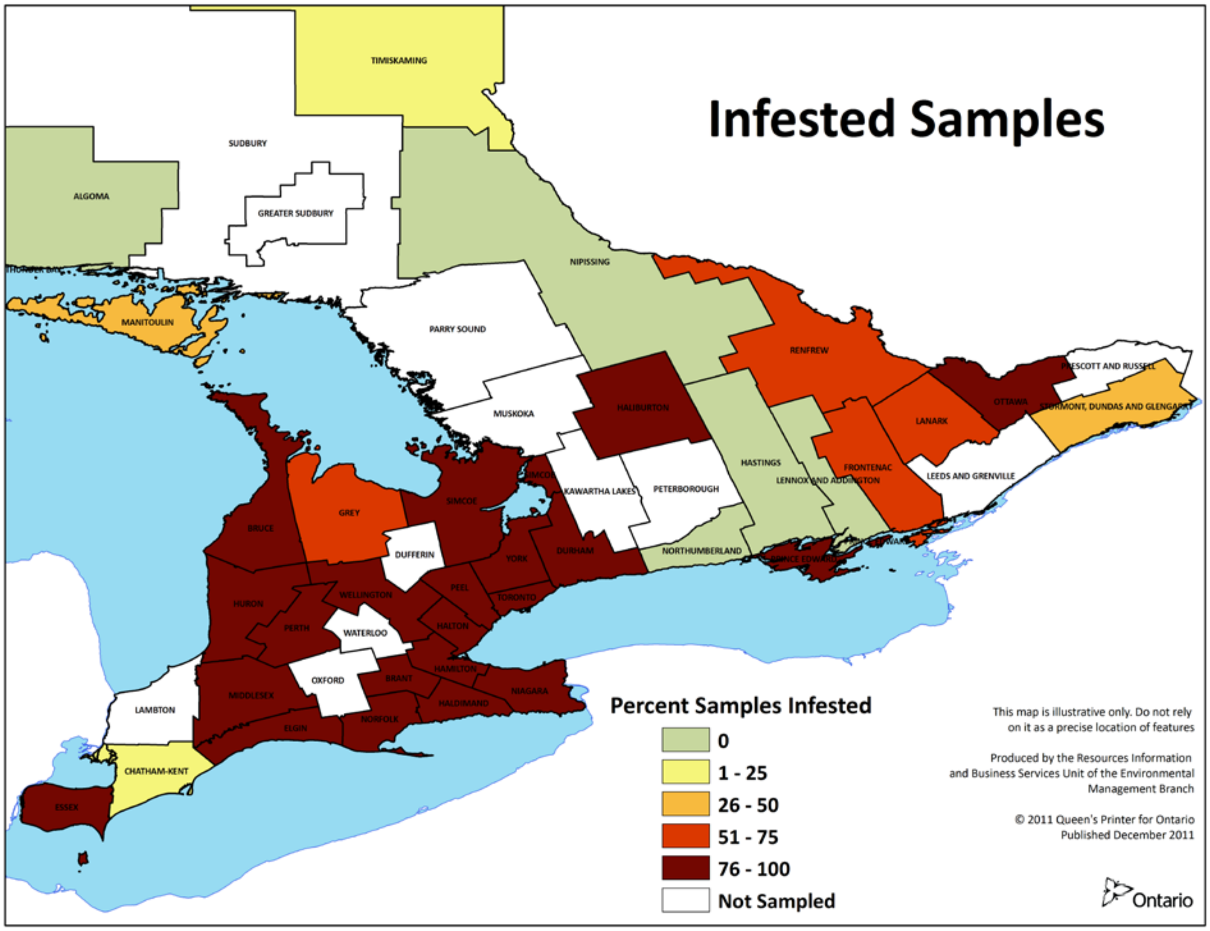

Figure 2. Percent of the garlic bulb samples from each county or district found to contain stem and bulb nematode. (Reprinted with permission of Ontario Ministry of Agriculture and Food)

CROP: Onion
LOCATION: Ontario

NAMES AND AGENCIES:
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TITLE: INCIDENCE OF STEMPHYLIUM LEAF BLIGHT AND PURPLE BLOTCH ON ONION IN CENTRAL AND SOUTHWESTERN ONTARIO, 2012

ABSTRACT: Twenty commercial onion fields in southwest and central Ontario were assessed in 2012 to determine the presence and severity of stemphylium leaf blight and purple blotch. Five plant samples with symptoms were collected from each field to confirm the presence of their pathogens. All crops assessed had stemphylium leaf blight and 70% had purple blotch. Eighty-eight percent of the samples tested positive for stemphylium leaf blight, 33% positive for purple blotch and 26% positive for both pathogens.

INTRODUCTION AND METHODS: Stemphylium leaf blight is a foliar disease of onion (*Allium cepa* L.) and garlic (*Allium sativum*) caused by the fungus *Stemphylium vesicarium* Wallr. Symptoms start as small yellow to tan, water-soaked lesions that develop into elongated spots and turn dark olive brown to black when spores develop. Leaves may be completely blighted as the lesions coalesce. The symptoms of stemphylium leaf blight can be confused with purple blotch, which is caused by *Alternaria porri* Ell.; however, both diseases are managed similarly. In Simcoe County and York Region (Holland/Bradford Marsh), stemphylium leaf blight was first observed in localized areas in 2008. In 2010, the disease was confirmed in 25 commercial onion fields (Tesfaendrias and McDonald, 2011).

A survey of foliar diseases of onion was conducted in the main onion-producing areas in Ontario from July 23 to August 10, 2012. A total of 20 commercial dry bulb onion fields in Chatham-Kent, Lambton, Simcoe, York, Niagara, Waterloo and Durham Regions/Counties located across southwest and central Ontario were assessed for stemphylium blight and purple blotch. The fields were traversed in a diamond shape pattern starting at least 10 m from the edge and with five sampling spots in each field. Five randomly selected onions were pulled at each of the five locations and visually assessed for the presence of stemphylium leaf blight and purple blotch. The diseases were scored as the percent leaf areas diseased by either stemphylium leaf blight or purple blotch. Following the survey, a representative sub-sample of diseased tissue collected at each location was cultured in the laboratory for pathogen isolation and identification.

Some diseased leaves were put in a moist chamber for 48 hours at room temperature to induce sporulation before examining the spores microscopically. In other cases lesions were surface sterilized with 1.2% NaOCl for 2 min. prior to placing on potato dextrose agar (PDA) or Synthetischer Nährstoffarmer Agar (SNA) at either the Muck Crops Research Station, University of Guelph (Kettleby, ON) or at the Pest Diagnostic Clinic, Laboratory Services Division, University of Guelph, Guelph, ON. Conidia that formed on colonies that grew out of lesions incubated on PDA or SNA were examined microscopically and identified.

RESULTS AND COMMENTS: Both stemphylium leaf blight and purple blotch were detected in this survey (Table 1). Stemphylium leaf blight symptoms were confirmed in all the onion fields assessed with 98.4% of the plants showing symptoms. *Stemphylium vesicarium* was confirmed on 88% of the onion plants assessed in the lab. Purple blotch symptoms were observed in 70% of the fields assessed and 50% of the crops had symptoms of purple blotch, which were confirmed in the lab to have *A. porri*.

However, 20% of the crops had purple blotch symptoms, but the pathogen was not isolated from samples from these fields. In the remaining 30% of the fields purple blotch was not observed by visual field assessments, but spores of *A. porri* were isolated in the lab.

Alternaria porri was observed in 11.6% of the plants assessed and confirmed in 33% of the onion plant samples in the lab. Symptoms of *A. porri* and *S. vesicarium* infections can be easily confused. According to Miller and Lacy (2008), purple blotch lesions may be invaded by *Stemphylium vesicarium* and turn black due to sporulation by *S. vesicarium*. Thus purple blotch symptoms may be masked by later infection by *S. vesicarium*, which may explain why purple blotch was misdiagnosed or missed during visual field assessments.

Seventy percent of the crops and 10.8% of the plants assessed had visual symptoms of both stemphylium leaf blight and purple blotch. Fifty percent of the crops and 26% of the onion plants sampled were confirmed to be infected with both *S. vesicarium* and *A. porri*. There were only four fields in which *S. vesicarium* was the only fungus isolated from plant samples. Across all fields sampled, the mean percent leaf areas with symptoms of stemphylium leaf blight and purple blotch were 12.6% and 0.6 %, respectively.

This is the first survey in southwest and central Ontario to validate the occurrence of stemphylium leaf blight in onion fields. Given the extent of occurrence across the major onion-growing regions, further research on management of stemphylium leaf blight is warranted. Although similar management techniques are used to control stemphylium leaf blight and purple blotch, there have been reports from other regions that suggest stemphylium is more challenging to manage than purple blotch (Hausbeck et al. 2010).

ACKNOWLEDGEMENTS:
We would like to thank the Fresh Vegetable Growers of Ontario for financial support and all growers that participated in the survey.

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Table 1. Percent crops with symptoms, % crops confirmed to be infected, % plants with symptoms, % plants confirmed infected and mean % leaf area with symptoms of stemphylium leaf blight and purple blotch assessed in commercial onion fields in central and southwestern Ontario, 2012.

Disease	% crops with symptoms (n = 20)	% crops confirmed to be infected[1] (n = 20)	% plants assessed with symptoms (n = 500)	% plants confirmed to be infected (n = 100)	mean % leaf area with symptoms (n = 500)
Stemphylium leaf blight	100.0	100.0	98.4	88.0	12.6
Purple blotch	70.0	50.0	11.6	33.0	0.6
Both diseases	70.0	50.0	10.8	26.0	--

[1]Crops that had symptoms according to visual field assessments that were confirmed through plating and microscopic identification of fungal spores in the laboratory.

Forest Trees/Arbres forestiers

CROP/CULTURE: Jack pine
LOCATION/RÉGION: Ontario

NAMES AND AGENCIES/NOMS ET ÉTABLISSEMENTS :
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TITLE: *PINUS BANKSIANA*, A NEW PRIMARY HOST OF THE PATHOGEN *HETEROBASIDION IRREGULARE* IN EASTERN CANADA.

ABSTRACT: The pathogen *Heterobasidion irregulare* has been killing mainly *Pinus resinosa* in eastern Canada. Other pine species could be affected by the disease. Our trials show that *Pinus banksiana*, the most widely distributed pine in Canada, is a primary host for *H. irregulare*.

INTRODUCTION: *Heterobasidion irregulare* nom. nov is the new scientific name for the North American fungus that has been known for a long time as *Fomes annosus* (Fr.) Bref. (7). Jorgensen (5) first discovered *H. irregulare* on red pine (*Pinus resinosa* Ait.) in the St. Williams nursery in Ontario. By 1967 the pathogen had spread to the Simcoe, Lindsay, and Lake Erie districts (12). This pathogen was found on the Quebec side of the Ottawa valley in 1989 (6) and new infection centres have since become established in several regions of Quebec.

Heterobasidion irregulare is a basidiomycete which causes root and butt decay and creates mortality pockets in red pine plantations. Infection of regenerating conifers in the pockets is not restricted to red pine; mortality of white pine (*Pinus strobus* L.) and balsam fir (*Abies balsamea* (L.) P. Mill.) has also been observed (6) (M. Dumas, unpublished data). Primary infection occurs when basidiospores land on freshly cut stumps after a stand is thinned.

Heterobasidion irregulare has many hosts, but to date infection centers have been found only in red pine plantations. Jack pine (P*inus banksiana* Lamb.) can be a host for this pathogen but this is a rare occurrence (1), and disease pockets have never been identified. As the pathogen is unaffected by cold climates, and in view of its recent northward progression, there is a high probability that it could become established in stands of jack pine, the most widely distributed pine in Canada.

METHODS: To confirm this hypothesis that jack pine is a primary host for *H. irregulare*, inoculation trials were conducted at Larose Forest (45^{o} 20'N;75 ^{o}15'W) and in Limerick County plantations (44^{o} 50'N;75 ^{o}38'W) in southern Ontario. The isolates of *H. irregulare* used originated from these two areas. Conidial suspensions of both strains were prepared in 0.6M sucrose at 1000 viable spores/ml. Freshly cut stumps of jack and red pine, 50 cm high, and of variable diameters, were inoculated with the respective strain within 5 minutes after felling. A 1 ml suspension was placed within a 60mm diameter circle traced with a wax pencil on the sapwood region in order to identify the inoculated region. Two areas were treated for each stump. The viability of the spore suspensions was checked after the inoculations by spreading samples on 3% malt agar plates containing 5 µg/ml MBCP (methyl-1-benzamidazole carbamate phosphate (Lignasan®). Inoculations were done at Larose Forest on September 21, 2010 and in Limerick County on September 22, 2010. Stumps were collected 8 weeks later and isolations made to retrieve the respective strains. Somatic compatibility tests were used to confirm that the isolated strains were the same as those inoculated.

RESULTS AND COMMENTS: The results confirm that jack pine is very susceptible to *H. irregulare* over a wide range of trunk diameters (Table 1); with one exception, all stumps were colonized with the isolates of *H. irregulare* used for inoculation. None of the control stumps on 19 red pines and 15 jack pines at the two sites were colonized by *H. irregulare*. Viability tests of spores used for inoculation were positive.

As regenerating jack pine stands are undergoing pre-commercial and commercial thinning there is a very high possibility that this pathogen could spread into these areas. Current spore trapping trials have been unsuccessful in finding spores in jack pine areas of northeastern Ontario but given their close proximity to areas with infected red pine, the probability for invasion is high**.** This is very significant in Québec because the most northern extension of the disease in red pine plantations is at Saint-Jean-de-Matha (46°14'N; 73°32'W), which is about 50 km from natural *P. banksiana* stands.

The pioneering work by Rishbeth (10) of treating freshly cut stumps with a protectant demonstrated the feasibility of this method to control this disease. A large variety of chemicals have been tested but most emphasis has been placed on urea and borax (8). The latter has been extensively used for control in Ontario. Due to environmental concerns control methods now concentrate on biological agents, and in particular *Phlebiopsis gigantea* (Fr.:Fr.) Jülich .This saprophytic wood decay fungus is widely distributed throughout coniferous forests and is capable of competing with *H. irregulare* for resources (4). *Phlebiopsis gigantea* can be grown very easily on culture media and produces oidia which are used as inocula for stump treatment. It has been used for half a century in Europe and is approved as a commercial product to control *Heterobasidion* in several European countries (9).

In Canada work is currently being done to register *P. gigantea* as a control measure. The authors have obtained positive results in an efficacy trial of *P. gigantea* on red pine stumps (3). In a trial using logs, Roy *et al*. (11) also demonstrated the effectiveness of *P. gigantea*. Dumas (2) found that the germination and growth of oidia was enhanced when formulated in an ammonium lignosulfonate solution and this was beneficial for the rapid establishment of the control agent under field conditions. Registration of a *P. gigantea* formulation in Canada will help to stop the progress of the disease into new areas.

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Table 1: Diameter range in cm of inoculated and control pines and infection rates of *H. irregulare* on red pine and jack pine 8 weeks after inoculation of fresh stumps.

Location	**Diameter Range (cm)**		**% Infection Frequency (Number of stumps)**	
	Red Pine	**Jack Pine**	**Red Pine**	**Jack Pine**
Larose Forest	14.5-22.5	12.4-36.3	100 (5)	100 (10)
Limerick A	9.5-21.4	17-32.5	100 (2)	85.7 (7)
Limerick B	7.9-28.2	10.8-20.4	100 (3)	100 (6)
Control (All locations)	7.9-28.3	10.8-32.1	0 (19)	0 (15)

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