2006

THE CANADIAN PHYTOPATHOLOGICAL SOCIETY

CANADIAN PLANT DISEASE SURVEY

DISEASE HIGHLIGHTS

SOCIÉTÉ CANADIENNE DE PHYTOPATHOLOGIE

INVENTAIRE DES MALADIES DES PLANTES AU CANADA

APERÇU DES MALADIES

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

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

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Inventaire des maladies des plantes au Canada

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Contents: **DISEASE HIGHLIGHTS** - 2005 GROWING SEASON
(+ earlier years for historical significance)

Sections:

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

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

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

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

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FOREST TREES/ ARBRES FORESTIERS

Diagnostic Laboratories / Laboratoires diagnostiques

CROP: Commercial crops - Diagnostic Laboratory Report
LOCATION: British Columbia

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TITLE: DISEASES DIAGNOSED ON COMMERCIAL CROPS SUBMITTED TO THE BCMAL PLANT DIAGNOSTIC LABORATORY IN 2005.

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

RESULTS AND COMMENTS: The year 2005 was a year for fewer disease problems mainly due to drier weather conditions. The weather was very dry during the peak-cropping season and many fungal and bacterial organisms did not establish and cause crop damage. However many drought related problems were observed. Powdery mildew was common on a lot of ornamentals causing significant cosmetic damage. Summaries of the diseases and their causal agents diagnosed on commercial crops are presented in Tables 1-10 by crop category. The total number of submissions for each crop category is listed at the bottom of each table. Problems not listed include: abiotic problems such as nutritional stress, pH imbalance, water stress, drought stress, physiological response to growing conditions and genetic abnormalities; environmental and chemical damage, fruit abortion due to lack of pollination, poor sample, insect-related injury and damage where no conclusive causal factor was identified.

Table 1. Summary of diseases diagnosed on **herbaceous ornamental** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2005.

CROP	***DISEASE***	***CAUSAL/ASSOCIATED ORGANISM***	***NO.***
Clematis	Stem canker	*Ascochyta clematidina*	1
	Stem canker and leaf spot	*Ascochyta clematidina*	1
	Vascular wilt	*Fusarium* sp	4
Cymbopogon citratus	Crown and root rot	*Fusarium* sp.	1
Delphinium	Crown rot	*Fusarium oxysporum* f.sp. *delphinii*	1
Dicentra	Stunting	*Pratylenchus* sp.	1
Gaultheria procumbens	Stem canker and die back	*Colletotrichum gloeosporioides*	1
Helleborus	Leaf spot	*Coniothyrium* sp.	1
Santolina	Foliar blight	*Alternaria* sp.	1
Spirea	Leaf spot	*Phyllosticta* sp.	1
DISEASED SAMPLES			13
ABIOTIC AND OTHER DISORDERS			11
TOTAL SUBMISSIONS			24

Table 2. Summary of diseases diagnosed on **greenhouse floriculture** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2005.

CROP	***DISEASE***	***CAUSAL/ASSOCIATED ORGANISM***	***NO.***
Alyssum	Downy mildew	*Peronospora* sp.	1
	Foliar blight	*Alternaria* sp.	1
	Nematode damage	*Pratylenchus* sp.	1
Dieffenbachia	Stem and root rot	*Fusarium solani*	1
Galium odorata	Leaf spot	*Pseudomonas syringae*	1
Gardenia	Flower bud blight	*Botrytis* sp.	1
Hedera helix	Aerial blight	*Rhizoctonia* sp.	1
	Leaf spot	*Cladosporium* sp.	1
Hibiscus	Leaf spot	*Phoma* sp.	1
Kalanchoe	Stem rot	*Lasiodiplodia* sp.	1
Lilium	Root rot	*Pythium* spp.and *Rhizoctonia* spp.	1
Lobelia	Root rot	Oomycete	1
Matthiola	Tip blight	*Botrytis cinerea*	1
Myosotis	Root rot	*Pratylenchus* sp.	1
Nymphaea odorata	Anthracnose	*Gloeosporium* sp.	1
Oncidium	Anthracnose	*Colletotrichum gloeosporioides*	1
	Root rot	*Pythium* sp.	1
Osteospermum	Grey mold	*Botrytis cinerea.*	1
Pelargonium	Grey mold	*Botrytis cinerea*	1
	Root rot	*Pythium* sp.	1
Petunia	Foliar blight	*Botrytis cinerea*	2
	Leaf Mosaic	Tobacco Mosaic Virus	1
Phlox	Downy mildew	*Peronospora phlogina*	1
Salvia	Bacterial blight	*Pseudomonas syringae*	1
DISEASED SAMPLES			26
ABIOTIC AND OTHER DISORDERS			19
TOTAL SUBMISSIONS			45

Table 3. Summary of diseases diagnosed on **greenhouse vegetable** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2005.

CROP	***DISEASE***	***CAUSAL/ASSOCIATED ORGANISM***	***NO.***
Cucumber	Fusarium wilt	*Fusarium oxysporum*	1
Pepper	Root rot	*Pythium* sp.	1
	Virus	Impatiens Necrotic Spot Virus	1
Tomato	Fruit mosaic	Tobacco Mosaic Virus	1
	Leaf and stem spot	*Stemphylium* spp. and *Alternaria* spp.	1
	Leaf mottling	Tomato Spotted Wilt Virus and Tobacco Mosaic Virus	1
	Leaf spots	Tobacco Mosaic Virus	1
	Stem canker	*Botrytis cinerea*	2
DISEASED SAMPLES			9
ABIOTIC AND OTHER DISORDERS			5
TOTAL SUBMISSIONS			14

Table 4. Summary of diseases diagnosed on **small fruit** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2005.

CROP	***DISEASE***	***CAUSAL/ASSOCIATED ORGANISM***	***NO.***
Blackberry	Nematode damage	*Pratylenchus* sp.	1
Blueberry (highbush)	Bacterial blight	*Pseudomonas syringae*	2
	Blossom blight	*Botrytis cinerea*	1
	Blueberry Scorch Virus	Blueberry Scorch Virus	4
	Foliar blight	Blueberry Shock Virus	2
	Godronia canker	*Godronia cassandrae*	3
	Leaf spot	*Alternaria* sp.	1
	Root rot	Oomycete	1
	Twig die back	*Coniothyrium* sp.	1
Cranberry	Root rot	Oomycete	1
Raspberry	Crown gall	*Agrobacterium tumefaciens*	1
	Leaf and fruit blight	*Botrytis* sp.	1
	Nematode damage	*Pratylenchus* sp.	3
	Nematode damage/abiotic	*Pratylenchus* sp./water stress	1
	Root lesions	*Pratylenchus* sp.	3
	Root rot	Oomycete	6
		Phytophthora sp.	2
		Pratylenchus sp. and Oomycete	1
		Pythium sp.	1
		Pythium ultimum	1
Strawberry	Crown rot	*Rhizoctonia* and *Fusarium* spp.	1
	Fruit rot	*Colletotrichum gloeosporioides*	1
	Leaf blight	*Gnomonia comari* 'Karsten'	1
	Poor growth	*Pratylenchus* sp.	1
	Powdery mildew	*Sphaerotheca macularis* f.sp. *fragariae*	1
	Root rot complex	*Pratylenchus* spp. and *Pythium* spp.	1
		Oomycete and *Rhizoctonia* sp.	1
DISEASED SAMPLES			44
ABIOTIC AND OTHER DISORDERS			49
TOTAL SUBMISSIONS			93

Table 5. Summary of diseases diagnosed on **specialty crop** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2005.

CROP	***DISEASE***	***CAUSAL/ASSOCIATED ORGANISM***	***NO.***
Arugula	Downy mildew	*Peronospora parasitica*	1
	White rust	*Albugo candida*	1
Basil	Foliar blight	*Botrytis cinerea*	1
	Root rot	Oomycete	1
Chard	Root rot	Oomycete	1
Ginseng	Foliar blight	*Alternaria panax*	1
Rosemary, Thyme	Foliage damage	*Fusarium* spp. and *Botrytis* spp.	1
Rosemary	Bacterial blight	*Pseudomonas viridiflava*	1
Wasabi	Root rot	*Pythium sp.*	1
DISEASED SAMPLES			9
ABIOTIC AND OTHER DISORDERS			3
TOTAL SUBMISSIONS			12

Table 6. Summary of diseases diagnosed on **turf grass** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2005.

CROP	***DISEASE***	***CAUSAL/ASSOCIATED ORGANISM***	***NO.***
Green	Anthracnose	*Colletotrichum graminicola*	3
	Brown patch	*Rhizoctonia solani*	2
	Curvularia blight	*Curvularia* sp.	1
	Dollar spot	*Sclerotinia* sp.	1
	Downy mildew	*Sclerophthora* sp.	2
	Foliar blight	*Curvularia* sp.	1
	Fusarium blight	*Fusarium poae*	1
	Leaf spot	*Leptosphaerulina* sp.	1
	Localized dry spot	Basidiomycete	1
	Nematode damage	*Helicotylenchus* sp.	1
		Meloidogyne spp., *Helicotylenchus* spp. and *Hemicycliophora* spp.	1
		Meloidogyne spp.and *Helicotylenchus* spp.	1
		Meloidogyne sp.	4
		Meloidogyne spp. and *Pratylenchus* spp.	1
	Pythium foliar blight	*Pythium* sp.	2
	Root rot	*Pythiium* sp.	2
	Root lesions	*Pratylenchus* spp., *Meloidogyne* spp. and *Tylenchus* spp.	2
	Yellow patch	*Rhizoctonia cerealis*	1
Lawn	Anthracnose	*Colletotrichum graminicola*	3
	Brown patch	*Rhizoctonia solani*	2
	Curvularia blight	*Curvularia* sp.	1
	Downy mildew	*Sclerophthora* sp.	2
	Foliar blight	*Ascochyta* sp.	1
		Drechslera sp.	1
		Leptosphaerulina sp.	1
	Rust	*Puccinia* sp.	1
	Take-all patch	*Gaeumannomyces graminis*	1

DISEASED SAMPLES	44
ABIOTIC AND OTHER DISORDERS	9
TOTAL SUBMISSIONS	53

Table 7. Summary of diseases diagnosed on **tree fruit and grape** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2005.

CROP	***DISEASE***	***CAUSAL/ASSOCIATED ORGANISM***	***NO.***
Apple	Blue mold	*Penicillium* sp.	1
	Dry eye rot	*Botrytis cinerea*	2
	Fire blight	*Erwinia amylovora*	2
	Fruit rot	*Phoma* sp.	1

DISEASED SAMPLES	6
ABIOTIC AND OTHER DISORDERS	4
TOTAL SUBMISSIONS	10

Table 8. Summary of diseases diagnosed on **field vegetable** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2005.

CROP	***DISEASE***	***CAUSAL/ASSOCIATED ORGANISM***	***NO.***
Broccoli	Damping-off	*Pythium* sp.	1
	Root rot	*Pythium* sp.	1
	Wire stem	*Rhizoctonia solani*	1
Cabbage	Sclerotinia rot	*Sclerotinia sclerotiorum*	1
Carrot	Damping-off	Oomycete and *Rhizoctonia* sp.	1
		Rhizoctonia solani	1
	Powdery mildew	*Erysiphe heraclei*	1
Chard	Damping-off	*Fusarium* sp.	1
	Bacterial blight	*Pseudomonas syringae*	1
Cucumber	Nematode damage	*Pratylenchus* spp. */Meloidogyne* spp.	1
	Root rot	Oomycete	1
Eggplant	Verticillium wilt	*Verticillium dahliae*	1
Garlic	Basal plate rot	*Fusarium* sp	2
	Blue mold	*Penicillium* sp.	2
	Bulb rot	*Aphelenchoides* sp.	1
		Botrytis allii	1
	Diplodia stain	*Diplodia* sp.	1
Leek	Rust	*Puccinia porri*	1
Lettuce	Downy mildew	*Bremia lactucae*	1
	Root rot	Oomycete	1
Onion	Leaf rust	*Puccinia porri*	1
Potato	Black scurf	*Rhizoctonia solani*	7
	Brown spot	*Alternaria alternata*	1
	Common scab	*Streptomyces scabies*	1
	Late blight	*Phytophthora infestans*	3
	Pink rot	*Phytophthora erythroseptica*	1
	Powdery scab	*Spongospora* sp.	1
	Pythium leak	*Pythium* sp.	1
	Russet scab	*Streptomyces scabies*	1
	Seed rot	*Fusarium* sp.	1
	Soft rot	*Erwinia carotovora* subsp. *carotovora*	2
	Stem canker	*Rhizoctonia solani*	1
	Stem rot	*Fusarium* sp.	1
Spinach	Downy mildew	*Peronospora farinosa* f. sp. *spinaciae*	1
Squash	Powdery mildew	*Sphaerotheca fuliginea*	1
Su Choy	Downy mildew	*Peronospora parasitica*	2
	White rust	*Albugo candida*	1
Tomato	Bacterial canker	*Clavibacter michiganensis* subsp. *michiganensis*	2
	Grey mold	*Botrytis cinerea*	1
	Late blight	*Phytophthora infestans*	1
	Leaf mold	*Cladosporium fulvum*	1
Watermelon	Root rot	*Pythium* sp.	1
Zucchini	Scab	*Cladosporium cucumerinum*	1
DISEASED SAMPLES			57
ABIOTIC AND OTHER DISORDERS			11
TOTAL SUBMISSIONS			68

Table 9. Summary of diseases diagnosed on **woody ornamental** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2005.

CROP	***DISEASE***	***CAUSAL/ASSOCIATED ORGANISM***	***NO.***
Abies grandis	Sooty mold	*Epipolaeum* sp.	1
Abies sp.	Needle cast	*Hormonema* sp.	1
		Rhizosphaera sp.	1
	Root rot	Oomycete	1
Acer davidii	Bacterial blight	*Pseudomonas syringae*	1
Acer griseum	Plant death	*Phytophthora* sp.	1
Acer japonica	Verticillium wilt	*Verticillium* sp.	1
Acer palmatum	Canker and dieback	*Phomopsis* sp.	1
	Stem dieback	*Phomopsis* sp.	1
Acer palmatum dissectum	Root rot	Oomycete	1
Acer sp.	Crown and root rot	Oomycete	1
	Dieback and canker	*Phomopsis* sp.	1
	Leaf spot	*Phyllosticta* sp.	1
	Twig dieback	*Phomopsis* sp.	1
	Verticillium wilt	*Verticillium* sp.	1
Andromeda buxifolia	Leaf spot	*Colletotrichum* sp.	1
Araucaria araucana	Stem canker	*Phomopsis* sp.	1
Azalea	Leaf blight	*Botrytis* sp.	1
Buddleja davidii	Stem canker	*Phoma* sp.	1
Buddleja sp.	Downy mildew	*Peronospora sordida*	1
Buxus sempervirens	Volutella blight	*Volutella* sp.	1
Buxus sp.	Stem canker	*Volutella* sp.	1
Chamaecyparis ellwoodii	Foliar blight	*Alternaria* spp. and *Phyllosticta* spp.	1
Clematis	Leaf spot	*Ascochyta clematidina*	1
Clematis 'Jackmanii'		*Ascochyta clematidina*	1
Cornus nuttallii	Leaf spot/anthracnose	*Sphaceloma* sp.	1
Cotinus sp.	Powdery mildew	*Erysiphe/Sphaerotheca* spp.	1
Crataegus	Bacterial blight	*Suspect Pseudomonas syringae*	1
Genista pilosa	Root rot complex	*Thielaviopsis* spp., oomycete	1
Hebe	Wilting	*Fusarium* sp.	1
Helleborus orientalis	Grey mold	*Botrytis cinerea*	1
	Downy mildew	*Peronospora pulveracea*	1
Hydrangea macrophylla	Leaf spot	*Phyllosticta* sp.	1
	Leaf spot/stem canker	*Phoma* sp.	1
Ilex aquifolium	Root rot	Oomycete	1
Juglans cinerea	Caner	*Botryosphaeria* sp.	1
	Root rot	*Armillaria* sp.	1
	Twig blight	*Lophodermium* sp.	1
Lilac	Powdery mildew	*Microsphaera syringae*	1
Magnolia sp.	Bacterial blight	*Pseudomonas syringae*	2
Mahonia	Anthracnose	*Colletotrichum* sp.	1
	Leaf spot	*Phyllosticta* spp. and *Phomopsis* spp.	1
		Phyllosticta sp.	1
		Xanthomonas campestris	1
Malus sp.	European canker	*Nectria galligena*	1
Paeonia	Leaf spot	*Alternaria* sp.	1
Picea abies	Tip blight	*Botrytis cinerea*	1
Picea sp.	Botrytis blight	*Botrytis cinerea*	1
Pinus ponderosa	Needle cast	*Elytroderma deformans*	1

Table 9. Summary of disease diagnosed on **woody ornamental** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2005 **(Cont'd)**

CROP	***DISEASE***	***CAUSAL/ASSOCIATED ORGANISM***	***NO.***
Prunus sp.	Wilt	*Fusicoccum* sp.	1
	Stem canker	*Cytospora* sp.	1
Pseudotsuga menziesii	Needle cast and dieback	*Phomopsis lokoyae*	1
	Needle rust	*Melamspora* sp.	1
	Root rot	*Armillaria* sp.	1
	Shoot blight	*Botrytis cinerea*	1
Quercus acutissima	Stem canker	*Phytophthora* sp.	1
Quercus coccinea	Anthracnose	*Discula quercina*	1
Quercus sp.		*Apiognomonia* sp.	2
Rhododendron	Crown gall	*Agrobacterium tumefaciens*	1
	Dieback	*Phomopsis* sp.	1
Rosa	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	1
	Brand canker	*Coniothyrium* sp.	1
	Crown and root rot	*Oomycete*	1
	Root rot	*Rhizoctonia* sp.	1
	Botrytis blight	*Botrytis cinerea*	1
Skimmia japonica	Black root rot	*Thielaviopsis basicola*	1
Spirea	Powdery mildew	*Podosphaera* spp. /*Microsphaera* spp.	1
Syringa	Foliar blight	*Phytophthora* sp.	1
Thuja occidentalis	Foliar blight	*Kabatina thujae*	1
Thuja sp.	Keithia blight	*Didymascella thujina*	1
	Root rot	*Armillaria* sp.	1
		Oomycete	1
Vinca	Canker and dieback	*Phoma exigua* var. *exigua*	1
DISEASED SAMPLES			75
ABIOTIC AND OTHER DISORDERS			95
TOTAL SUBMISSIONS			170

Table 10. Summary of diseases diagnosed on **nut crop** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2005.

CROP	***DISEASE***	***CAUSAL/ASSOCIATED ORGANISM***	***NO.***
Chestnut	Crown rot	*Phytophthora* sp.	1
Hazelnut	Eastern filbert blight	*Anisogramma anomala*	1
DISEASED SAMPLES			2
ABIOTIC AND OTHER DISORDERS			1
TOTAL SUBMISSIONS			3

CROP: Diagnostic Laboratory Report
LOCATION: Saskatchewan

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TITLE: DISEASES DIAGNOSED ON CROP SAMPLES SUBMITTED TO SASKATCHEWAN AGRICULTURE AND FOOD'S CROP PROTECTION LABORATORY IN 2005

METHODS: Saskatchewan Agriculture and Food's (SAF) Crop Protection Laboratory provides diagnostic services and recommendations for crop health problems to the agricultural industry. Services include disease, insect, and weed identification, as well as testing of weed seeds for herbicide resistance. The SAF Crop Protection Laboratory also provides a Dutch elm disease (DED) program to the general public, under which American elms are tested for DED. Samples are submitted to the Crop Protection Laboratory by Saskatchewan Environment, SAF extension personnel, growers, crop insurance, agribusiness and home gardeners. Disease diagnosis is accomplished by microscopic examination, culturing on artificial media, ELISA testing and BIOLOG™.

RESULTS: Between April 1 and November 2, 2005, the Crop Protection Laboratory received a total of 723 samples of which 74% were for disease diagnosis (57% of these were American elms submitted for DED testing). Categories of samples received (excluding DED samples) were: special crops (30%), cereals (30%), oilseeds (21%), fruit (5%) and forages (4%). Vegetables, woody ornamentals, herbaceous ornamentals, and greenhouse crops comprised the remaining 10% of the samples. Summaries of diseases and causal agents diagnosed on crop samples submitted to the Crop Protection Laboratory in 2005 are presented in Tables 1-7 by crop category. There were 301 samples of American elm and 1 of Siberian elm submitted under the DED program (Table 8).

Table 1. Summary of plant diseases diagnosed on **fruit crops** submitted to the SAF Crop Protection Laboratory in 2005.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Apple	Fireblight	*Erwinia amylovora*	1
	Chemical injury		1
	Iron chlorosis		1
Black currant	Verticillium wilt	*Verticillium* sp.	1
Cherry	Root rot	*Fusarium* sp./*Cylindrocladium* sp.	1
Pear	Environmental injury		1
Raspberry	Anthracnose	*Elsinoe veneta*	1
	Spur blight	*Didymella applanata*	1
	Iron chlorosis		1
Saskatoon	Entomosporium leaf spot	*Entomosporium mespili*	1
	Iron chlorosis		1
Strawberry	Root/crown rot	*Phytophthora* sp./*Fusarium* sp./*Pythium* sp./*Cylindrocladium* spp.	1
	Pin nematode	*Paratylenchus* sp.	1
	Stunt nematode	*Tylenchorhynchus* sp.	1

Table 2. Summary of plant diseases diagnosed on **forage crops** submitted to the SAF Crop Protection Laboratory in 2005.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Alfalfa	Sclerotinia stem/pod/seed rot	*Sclerotinia sclerotiorum*	3
	Pedicel/seed rot	*Fusarium* sp.	2
	Spring black stem/leaf spot	*Phoma medicaginis*	1
	Stemphylium leaf spot	*Stemphylium botryosum*	1
	Environmental injury		1
	Physiological		1
Corn	Environmental		1
Rye grass	Root rot	undetermined	1
Timothy	Purple eyespot	*Cladosporium phlei*	2
	Drechslera leaf spot	*Drechslera phlei*	1
	Root rot	*Cochliobolus sativus/Fusarium* sp.	1
	Chemical injury		4

Table 3. Summary of plant diseases diagnosed on **oilseed crops** submitted to the SAF Crop Protection Laboratory in 2005.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Canola	Root rot/seedling blight	*Fusarium* spp.*Pythium* spp./*Rhizoctonia* spp.	5
	Blackleg	*Leptosphaeria maculans*	5
	Alternaria black spot	*Alternaria* sp.	1
	Secondary stem rot	*Phoma* sp.	1
	Chemical injury		17
	Environmental injury		8
	Nutrient deficiency		5
	Physiological stress		1
Flax/linola	Root rot/seedling blight	*Fusarium* spp./*Pythium* spp./*Rhizoctonia* spp.	4
	Pasmo	*Septoria linicola*	1
	Chemical injury		5

Table 4. Summary of plant diseases diagnosed on **greenhouse crops** submitted to the SAF Crop Protection Laboratory in 2005.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Cucumber	Root/stem rot	*Fusarium oxysporum*/*Pythium* sp.	1
Trailing petunia	Black root rot	*Thielaviopsis basicola*	1
Tomato	Grey mold	*Botrytis cinerea*	1
	Root rot	*Fusarium* spp./*Rhizoctonia* spp.	1

Table 5: Summary of plant diseases diagnosed on **cereal crops** submitted to the SAF Crop Protection Laboratory in 2005.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Barley	Common root rot/seedling blight/prematurity blight	*Cochliobolus sativus*/*Fusarium* spp.	4
	Net blotch	*Pyrenophora teres*	5
	Spot blotch	*Cochliobolus sativus*	3
	True loose smut	*Ustilago nuda*	2
	Black (Sooty) mold	*Alternaria* spp /*Cladosporium* spp.	2
	Head blight	*Fusarium* spp.	1
	Scald	*Rhynchosporium secalis*	1
	Powdery mildew	*Erysiphe graminis*	1
	Environmental injury		6
	Nutrient deficiency		6
	Chemical injury		2
	Physiological stress		1
Oat	Bacterial blight	*Pseudomonas syringae*	1
	Common root rot	*Cochliobolus sativus*/*Fusarium* spp.	1
	Environmental injury		6
	Chemical injury		3
	Nutrient deficiency		1
	Physiological stress		1
Rye	Seedling blight	*Fusarium* sp./*Pythium* sp.	1
Wheat	Common root rot/seedling blight/prematurity blight	*Cochliobolus sativus*/*Fusarium* spp.	10
	Tan spot	*Pyrenophora tritici-repentis*	4
	Glume blotch/leaf blotch	*Septoria nodorum*	3
	Black (Sooty) mold	*Alternaria* spp./*Cladosporium* spp./*Cochliobolus* spp./ *Epiccocum* spp.	2
	Leaf rust	*Puccinia triticina*	2
	Stripe rust	*Puccinia striiformis* f.sp. *tritici*	2
	Head blight	*Fusarium* sp.	1
	Seed rot	*Penicillium* sp.	1
	Environmental injury		15
	Chemical injury		11
	Physiological stress		5
	Nutrient deficiency		1

Table 6. Summary of plant diseases diagnosed on **special crops** submitted to the SAF Crop Protection Laboratory in 2005.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Bean	Root rot	*Fusarium* spp/*Rhizoctonia* spp.	2
	Bean rust	*Uromyces appendiculatus*	1
	Ascochyta leaf spot	*Ascochyta phaseolorum*	1
	Secondary leaf rot	*Fusarium* sp.	1
	Environmental injury		6
	Chemical injury		5
	Nutrient deficiency		2
Chickpea	Ascochyta blight	*Ascochyta rabiei*	***3***
	Seedling blight/root rot	*Fusarium* sp.	2
	Environmental injury		2
	Fusarium root rot/wilt	*Fusarium* sp.	1

Table 6 – Cont'd

Fenugreek	Fusarium stem rot	*Fusarium avenaceum*	1
Lentil	Anthracnose	*Colletotrichum truncatum*	14
	Septoria leaf spot	*Septoria* sp.	9
	Ascochyta blight	*Ascochyta lentis*	8
	Root rot/seedling blight	*Fusarium* spp./*Rhizoctonia solani*	*6*
	Stemphylium leaf spot	*Stemphylium botryosum*	6
	Secondary stem rot	*Fusarium* sp.	5
	Pod/stem/root rot	*Botrytis cinerea*	3
	Black (Sooty) mold	*Alternaria* spp.*Cladosporium* spp.	2
	Chemical injury		7
	Environmental injury		6
	Nutrient deficiency		1
Mustard	Seedling blight/root rot	*Rhizoctonia solani*	1
	Aster yellows	Aster yellows phytoplasma	1
	Environmental injury		2
	Chemical injury		1
Pea	Root rot/seedling blight	*Fusarium* spp./*Rhizoctonia solani*	7
	Mycosphaerella blight	*Mycosphaerella pinodes*	*6*
	Powdery mildew	*Erysiphe pisi*	2
	Environmental injury		5
	Nutrient deficiency		*1*

Table 7. Summary of plant diseases diagnosed on **woody ornamental crops** submitted to the SAF Crop Protection Laboratory in 2005.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Ash	Chemical injury		2
	Physiological stress		1
Maple	Anthracnose	*Discula* sp.	1
	Chemical injury		2
Poplar	Leaf/shoot blight	*Venturia populina*	1
	Cytospora canker	*Cytospora* sp.	1
	Septoria leaf spot/canker	*Septoria musiva*	1
Spruce	Root rot	*Fusarium* sp.	1
	Chemical injury		2
	Environmental injury		1
Willow	Cytospora canker	*Cytospora* sp.	1
	Chemical injury		1

Table 8. Summary of plant diseases diagnosed on **American elm** by the SAF Crop Protection Laboratory in 2005. Submissions are submitted under the provincial Dutch elm disease program.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
American elm	Dutch elm disease	*Ophiostoma nova-ulmi*	149*****
	Dothiorella wilt	*Dothiorella ulmi*	42
	Verticillium wilt	*Verticillium* spp.	3

* One of the positive elms was Siberian elm (*Ulmus pumila*). The remaining DED submissions were negative for wilt disease organisms.

CROP: Diagnostic Laboratory Report
LOCATION: Manitoba

NAMES AND AGENCIES:
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TITLE: 2005 MANITOBA CROP DIAGNOSTIC CENTRE LABORATORY SUBMISSIONS

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

RESULTS: Summaries of diseases diagnosed on plants in different crop categories are presented in Tables 1-11 and cover the time period from January 1 to Nov 4, 2005.

Table 1. Summary of diseases diagnosed on **forage legume crops** submitted to the Manitoba Agriculture, Food and Rural Initiatives Crop Diagnostic Centre in 2005.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Alfalfa	Brown root rot	*Phoma sclerotiodes*	2
	Common leaf spot	*Pseudopeziza medicaginis*	3
	Crown rot	*Rhizoctonia solani*	1
	Downy mildew	*Peronospora trifoliorum*	2
	Root rot/crown rot	*Fusarium* spp., *Phoma medicaginis*, *Phytophthora* sp., *Pythium* sp.	7
	Rust	*Uromyces striatus*	2
	Spring black stem and leaf spot	*Phoma medicaginis*	2
	Verticillium wilt	*Verticillium albo-atrum*	1
	Herbicide injury		3
	Nutrient deficiency		1
Sweet clover	Leaf spot	*Cercospora* sp.	1
Birdsfoot trefoil	Anthracnose	*Colletotrichum acutatum*	1
	Blossom blight	*Botrytis cinerea*	1
	Root rot	*Fusarium* sp., *Rhizoctonia solani*	1
	Mechanical injury		1

Table 2. Summary of diseases diagnosed on **cereal crops** submitted to the Manitoba Agriculture, Food and Rural Initiatives Crop Diagnostic Centre in 2005.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Wheat	Bacterial blight	*Pseudomonas syringae*	1
	Black head mould	*Alternaria* sp., *Cladosporium* sp.	2
	Black point	*Alternaria alternata*, *Cochliobolus sativus*	1
	Common root rot	*Fusarium* spp., *Cochliobolus sativus*	4
	Glume blotch	*Stagonospora nodorum*	2
	Head blight	*Fusarium graminearum*	4
	Leaf rust	*Puccinia recondita* f. sp. *tritici*	2
	Septoria leaf spot	*Septoria* spp.	7
	Tan spot	*Pyrenophora tritici-repentis*	10
	Physiological leaf spot	chloride deficiency, etc.	2
	Environmental injury		10
	Herbicide injury		9
	Nutrient deficiency		2
Barley	Black point	*Alternaria alternata*, *Cochliobolus sativus*	1
	Common root rot	*Fusarium* spp., *Cochliobolus sativus*	4
	Leaf rust	*Puccinia hordei*	1
	Net blotch	*Pyrenophora teres*	5
	Seedling blight	*Pythium* spp., *Rhizoctonia solani*	2
	Spot blotch	*Cochliobolus sativus*	7
	Environmental injury		3
	Herbicide injury		3
Fall Rye	Herbicide injury		1
Oat	Bacterial blight	*Pseudomonas syringae*	2
	Crown rust	*Puccinia coronata*	5
	Head blight	*Fusarium graminearum*	1
	Pyrenophora leaf blotch	*Pyrenophora avenae*	2
	Seedling blight	*Pythium* sp.	1
			1
	Environmental injury		9
	Herbicide injury		6

Table 3. Summary of diseases diagnosed on **grasses** submitted to the Manitoba Agriculture, Food and Rural Initiatives Crop Diagnostic Centre in 2005.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Lawn grasses	Anthracnose	*Colletotrichum graminicola*	1
	Melting out	*Drechslera* sp.	1
	Pythium blight	*Pythium* sp.	1
	Snow mould	*Typhula* sp.	1
	Environmental injury		1
Perennial Ryegrass	Crown rust	*Puccinia coronata*	1
	Fusarium head blight	*Fusarium graminearum*, *F. avenaceum*	2
	Glume blotch and leaf spot	*Septoria* sp.	1
	Node discoloration	*Fusarium graminearum*, *F. avenaceum*	1
	Herbicide injury		3
Timothy	Purple eyespot	*Cladosporium phlei*	1
	Root rot	*Fusarium* spp.	1
	Environmental injury		1

Table 4. Summary of diseases diagnosed on **greenhouse crops** submitted to the Manitoba Agriculture, Food and Rural Initiatives Crop Diagnostic Centre in 2005.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Begonia	Powdery mildew	*Erysiphe* sp.	1
Geranium	Flower blight	*Botrytis cinerea*	1
	Root rot	*Pythium* sp.	1
	Root rot	*Rhizoctonia solani*	1
Hosta	Virus	unidentified	1
Petunia	Virus	unidentified	1
	Herbicide injury		1
	Nutritional/soil problems		2
Poinsettia	Root and stem rot	*Pythium* sp.	1
Snapdragon	Herbicide injury		1
Tomato	Environmental injury		1

Table 5. Summary of diseases diagnosed on **vegetable crops** submitted to the Manitoba Agriculture, Food and Rural Initiatives Crop Diagnostic Centre in 2005.

CROP	**SYMPTOM/ DISEASE**	**CAUSAL AGENT**	**NUMBER OF SAMPLES**
Beet, Red	Leaf spot	*Phoma betae*	1
Cabbage	Blackleg	*Leptosphaeria maculans*	2
	Fusarium yellows	*Fusarium oxysporum*	1
	Root rot	*Pythium* sp.	1
	Stem rot	*Phytophthora* sp.	1
Carrot	Crown rot	*Rhizoctonia* sp.	1
	Leaf spot	*Alternaria dauci*	1
	Root rot	*Fusarium solani*	4
Cauliflower	Stem rot	*Sclerotinia sclerotiorum*	1
Corn	Holcus spot	*Pseudomonas syringae*	1
	Root rot	*Fusarium graminearum*	1
Cucumber	Fruit rot	*Pythium* sp., *Fusarium* sp.	1
	Environmental injury		1
Garlic	Basal plate rot	*Fusarium oxysporum*	1
Onion	Downy mildew	*Peronospora destructor*	1
	Fusarium basal plate rot	*Fusarium oxysporum*	1
	Leaf blight	*Stemphylium vesicarium*	1
Pumpkin and Squash	Blue mould fruit rot	*Penicillium* sp.	1
	Fruit rot	*Mucor* sp., *Fusarium* sp.	1
Tomato	Fruit rot	*Botrytis cinerea*	1
	Septoria leaf spot	*Septoria lycopersici*	2
	Environmental injury		1
	Herbicide injury		1

Table 6. Summary of diseases diagnosed on **oilseed crops** submitted to the Manitoba Agriculture, Food and Rural Initiatives Crop Diagnostic Centre in 2005.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Canola	Alternaria black spot	*Alternaria* spp.	2
	Aster yellows	phytoplasma	3
	Blackleg	*Leptosphaeria maculans*	8
	Downy mildew	*Peronospora parasitica*	1
	Fusarium wilt	*Fusarium oxysporum* f. sp. *conglutinans*	2
	Root rots/seedling blight	*Fusarium* spp., *Pythium* spp., *Rhizoctonia solani*	8
	Environmental injury		7
	Herbicide injury		32
	Nutrient deficiency	sulphur deficiency	5
Flax	Brown stem blight	*Alternaria linicola*	3
	Fusarium wilt	*Fusarium oxysporum*	1
	Root rot	*Fusarium* spp., *Pythium* sp., *Rhizoctonia solani*	5
	Environmental injury		4
	Herbicide injury		3
Sunflower	Downy mildew	*Plasmopara halstedii*	5
	Leaf spot	*Alternaria* sp.	1
	Root rot	*Pythium* spp.	4
	Herbicide injury		6

Table 7. Summary of diseases diagnosed on **shelterbelt trees and woody ornamentals** submitted to the Manitoba Agriculture, Food and Rural Initiatives Crop Diagnostic Centre in 2005.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Ash (*Fraxinus* sp.)	Anthracnose	*Gloeosporium aridum*	10
	Canker	unidentified	2
	Leaf spot	*Mycosphaerella fraxinicola*	1
	Environmental injury		3
	Herbicide injury		5
Basswood	Environmental injury		1
	Herbicide injury		1
Birch	Environmental injury		1
Caragana	Powdery mildew	*Erysiphe* sp.	1
	Leaf spot	*Septoria caraganae*	1
	Herbicide injury		3
Chokecherry, Amur (*Prunus maackii*)	Verticillium wilt	*Verticillium dahliae*	1
Cotoneaster	Canker	*Botryosphaeria* sp.	1
	Canker	*Coniothyrium* sp.	1
	Environmental injury		1
Elm, American (*Ulmus americana*)	Black spot	*Gloeosporium* sp.	1
	Canker	*Botryodiplodia* sp.	1
	Dutch elm disease	*Ophiostoma ulmi*	14
	Herbicide injury		1
Elm, Siberian (*Ulmus pumila*)	Dutch elm disease	*Ophiostoma ulmi*	1
Lilac	Bacterial blight	*Pseudomonas syringae*	1
	Environmental injury		2
	Herbicide injury		6
Maple, Amur (*Acer ginnala*)	Tar spot	*Rhytisma* sp.	1
Maple (*Acer negundo*)	Canker	*Sphaeropsis* sp.	1
	Leaf spot	*Septoria aceris*	1
	Environmental injury		2
	Herbicide injury		2
Mountain ash	Apple scab	*Venturia inaequalis*	1
	Canker	*Sphaeropsis* sp.	1
	Leaf spot	*Phyllosticta* sp.	2
Oak	Canker	unidentified	3

Table 7 – Cont'd

Poplar	Bronze leaf disease	*Apioplagiostoma populi*	2
	Canker	*Melanconium* sp.	1
	Ink spot	*Ciborinia* sp.	1
	Marssonina leaf spot	*Marssonina* sp.	2
	Rust	*Melampsora* sp.	1
	Environmental injury		2
	Herbicide injury		3
Rose	Rust	*Phragmidium* sp.	1
Spruce	Brown felt blight	*Herpotrichia juniperi*	1
	Cytospora canker	*Leucostoma kunzei*	8
	Canker	unidentified	5
	Needle blight	*Lirula* sp.	1
	Needle cast	*Rhizosphaera kalkhoffii*	17
	Environmental injury		29
	Herbicide injury		1
Thuja sp.	Canker	*Seiridium* sp.	1
	Environmental injury		2
Willow	Canker	*Fusarium solani*	1
	Canker	unidentified	1
	Scab and black canker	*Venturia saliciperda* and *Glomerella miyabeana*	2
	Environmental injury		1
	Herbicide injury		2

Table 8. Summary of diseases diagnosed on **potato crops** submitted to the Manitoba Agriculture, Food and Rural Initiatives Crop Diagnostic Centre in 2005.

SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Bacterial ring rot	*Clavibacter michiganensis* subsp. *sepedonicus*	4
Bacterial soft rot	*Erwinia carotovora* subsp. *carotovora*	7
Blackleg	*Erwinia carotovora* subsp. *atroseptica*	2
Black dot	*Colletotrichum coccodes*	11
Brown spot	*Alternaria alternata*	15
Early blight	*Alternaria solani*	19
Fusarium dry rot	*Fusarium sambucinum*	5
Fusarium wilt	*Fusarium avenaceum, F. oxysporum*	6
Grey mould	*Botrytis cinerea*	3
Late blight	*Phytophthora infestans*	9
Leak	*Pythium ultimum*	9
Pink rot	*Phytophthora erythroseptica*	7
Rhizoctonia stem and stolon canker	*Rhizoctonia solani*	1
Scab, common	*Streptomyces* sp.	5
Silver scurf	*Helminthosporium solani*	2
Verticillium wilt	*Verticillium dahliae*	10
Physiological disorders		6
Environmental injury		8

Table 9. Summary of diseases diagnosed on **special field crops** submitted to the Manitoba Agriculture, Food and Rural Initiatives Crop Diagnostic Centre in 2005.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Caraway	Blossom blight	*Alternaria alternata*, *Ascochyta* sp., *Fusarium avenaceum*	3
Corn	Root rot	*Fusarium graminearum*	1
	Seed rot/seedling blight	*Fusarium* sp., *Mucor* sp., *Pythium* sp.	2
	Environmental injury		1
	Mechanical injury		1
Fababean	Leaf and pod spot	*Ascochyta fabae*	1
	Root rot	*Fusarium* spp., *Pythium* sp., *Rhizoctonia solani*	5
	Herbicide injury		3
Field bean	Bacterial blight	unspecified	1
	Anthracnose	*Colletotrichum lindemuthianum*	2
Field pea	Anthracnose	*Colletotrichum pisi*	19
	Leaf and pod spot	*Ascochyta pisi*	1
	Mycosphaerella blight	*Mycosphaerella pinodes*	11
	Powdery mildew	*Erysiphe pisi*	1
	Root rot/seed rot	*Fusarium* spp., *Mucor* sp., *Pythium* sp., *Rhizoctonia solani*	18
Grazing turnip	Root rot	*Fusarium* sp.	1
Hemp	Root rot	*Fusarium* sp.	1
	Environmental injury		1
	Genetic abnormality		1
Soybean	Anthracnose	*Colletotrichum coccodes*	1
	Bacterial blight	unspecified	2
	Fusarium wilt	*Fusarium oxysporum*	1
	Root rot	*Fusarium* spp.	4
	Septoria leaf spot	*Septoria glycines*	3

Table 10. Summary of diseases diagnosed on **fruit crops** submitted to the Manitoba Agriculture, Food and Rural Initiatives Crop Diagnostic Centre in 2005.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Apple	Canker	*Nectria cinnabarina*	1
	Canker	unidentified	2
	Fire blight	*Erwinia amylovora*	3
	Frogeye leaf spot	*Botryosphaeria obtusa*	2
	Scab	*Venturia inaequalis*	4
	Silver leaf	*Chondrostereum purpureum*	1
	Environmental injury		3
	Herbicide injury		2
Chokecherry	Shot hole	*Coccomyces lutescens*	2
Grape	Downy mildew	*Plasmopara viticola*	1
Plum	Plum pocket	*Taphrina communis*	2
	Environmental injury		2
Raspberry	Anthracnose	*Elsinoe veneta*	5
	Cane blight	*Leptosphaeria coniothyrium*	1
	Fireblight	*Erwinia amylovora*	1
	Fruit rot	*Botrytis cinerea*	3
	Root rot	*Fusarium* spp.	3
	Spur blight	*Didymella applanata*	5
	Verticillium wilt	*Verticillium* sp.	9
	Yellow rust	*Phragmidium rubi-idaei*	1
	Iron chlorosis	iron deficiency	1
	Herbicide injury		1
Saskatoon	Entomosporium leaf and berry spot	*Entomosporium mespili*	3
	Fruit rot	*Botrytis cinerea*	1
	Environmental injury		1
	Herbicide injury		1
Strawberry	Fruit rot	*Botrytis cinerea*	2
	Leaf spot	*Mycosphaerella fragariae*	1
	Root rot	*Fusarium* sp.	2
	Root rot	*Rhizoctonia solani*	1
	Virus	Strawberry mild yellow edge (SMYEV)	1

Table 11. Summary of diseases diagnosed on **herbaceous ornamentals and interiorscape plants** submitted to the Manitoba Agriculture, Food and Rural Initiatives Crop Diagnostic Centre in 2005.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Lily	Bulb rot	*Penicillium* sp.	1
	Herbicide injury		1
Rudbeckia	Storage mould (on nursery stock)	*Botrytis cinerea*	1

CROP: Diagnostic Laboratory Report
LOCATION: Ontario

NAME AND AGENCY:
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TITLE: 2005 PEST DIAGNOSTIC CLINIC SUBMISSIONS IN ONTARIO

METHODS: The Pest Diagnostic Clinic provides diagnostic services for the identification of plant diseases of agricultural crops and ornamentals. In addition it also provides nematode and verticillium counts from soil and plant and insect identifications. Ontario Ministry of Agriculture, Food and Rural Affairs crop specialists, farmers, consultants, agri-business, landscape industry and the general public submit samples. Diagnosis is based on visual examination, microscopy, transmission electron microscopy, culturing on artificial semi-selective and selective media, ELISA testing, Biolog® and MIDI® microbial identification systems, and some identification through molecular sequencing.

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

Note: No pathogen detected/Requested test negative indicates samples where no plant-parasitic organisms were detected after selected diagnostic tests were completed. It also includes results with samples where only tests requested by the client were completed and the results were negative, for instance virus tests using ELISA kits.

Table 1. Summary of diseases diagnosed on **cereal crops** submitted to the Pest Diagnostic Clinic in 2005.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Barley	Spot blotch	*Bipolaris sorokiniana*	1
	Spot blotch	*Cochliobolus sativus*	1
Sorghum	Grain mold	Unidentified fungi	1
Wheat	Spot blotch	*Bipolaris sorokiniana*	1
	Common root rot	*Bipolaris sorokiniana*	1
	Sooty mold	Saprophytic fungi	2
	Leaf spot	*Ascochyta* sp.	1
	Barley yellow dwarf	Barley Yellow Dwarf Virus	3
	Barley yellow dwarf	Barley Yellow Dwarf Virus – PAV	4
	Barley yellow dwarf	Barley Yellow Dwarf Virus - RPV	4
	Wheat mosaic	Soil-borne Wheat Mosaic Virus	3
	Wheat streak mosaic	Wheat Streak Mosaic Virus	1
	No pathogen detected/Requested test negative		6

Table 2. Summary of diseases diagnosed on **forage and field crops** submitted to the Pest Diagnostic Clinic in 2005.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Alfalfa	Fusarium wilt	*Fusarium oxysporum*	1
	Root rot	*Fusarium* sp.	1
Canola	Root rot	*Phytophthora* sp.	1
Clover	Dieback	Physiological	1
	Powdery mildew	*Erysiphe polygoni*	1
	Rust	*Uromyces* sp.	1
Corn	No pathogen detected/Requested test negative		1

Table 3. Summary of diseases diagnosed on **fruit crops** submitted to the Pest Diagnostic Clinic in 2005.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Apple	Bitter rot	*Colletotrichum gloeosporioides*	1
	Stem canker	Physiological	1
	Canker	Physiological	1
Blueberry	Dieback	Physiological dieback	1
	Root rot	*Phytophthora* sp.	1
	No pathogen detected/Requested test negative		3
Cherry	Crown rot	*Phytophthora* sp.	1
	No pathogen detected/Requested test negative		1
Grape	No pathogen detected/Requested test negative		1
Peach	Leucostoma canker	*Leucostoma* sp.	1
	Canker	Physiological	1
	No pathogen detected/Requested test negative		1
Pear	Nectria twig blight	*Nectria cinnabarina*	1
	Phomopsis canker	*Phomopsis mali*	1
	Dieback	Physiological	3
	Fruit deformity	Physiological	1
	No pathogen detected/Requested test negative		2
Raspberry	Tomato ringspot	Tomato Ringspot Virus	3
	Raspberry bushy dwarf	Raspberry Bushy Dwarf Virus	1
	Verticillium wilt	*Verticillium dahliae*	1
	No pathogen detected/Requested test negative		1
Rhubarb	Root rot	Physiological	1
Strawberry	Anthracnose	*Colletotrichum* sp.	1
	Phomopsis leaf blight	*Phomopsis obscurans*	3
	Root knot	Root-knot nematode (*Meloidogyne* sp)	1

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Strawberry (continued)	Root lesion	Root-lesion nematode	1
	Crown rot	*Phytophthora cactorum*	1
	Grey mold	Botrytis cinerea	1
	No pathogen detected/Requested test negative		9

Table 4. Summary of diseases diagnosed on **vegetable field crops** submitted to the Pest Diagnostic Clinic in 2005.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Bok choy	No pathogen detected/Requested test negative		1
Brussels sprout	Stem canker	*Fusarium* sp.	1
Cabbage	Black leaf spot	*Alternaria brassicicola*	1
	Rot	*Fusarium* sp.	1
	No pathogen detected/Requested test negative		1
Carrot	No pathogen detected/Requested test negative		1
Cauliflower	No pathogen detected/Requested test negative		1
Chicory	No pathogen detected/Requested test negative		1
Lettuce	No pathogen detected/Requested test negative		1
Pumpkin	No pathogen detected/Requested test negative		2
Radish	No pathogen detected/Requested test negative		1
Rutabaga	Black rot	*Xanthomonas campestris pv. campestris*	1
Squash	No pathogen detected/Requested test negative		1

Table 5. Summary of diseases diagnosed on **bean crops** submitted to the Pest Diagnostic Clinic in 2005.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Adzuki bean	Anthracnose	*Colletotrichum lindemuthianum*	1
	Crown rot	*Fusarium* sp.	2
	Leaf spot	*Ascochyta* sp.	1
	Stem rot	*Fusarium* sp.	1
	White mold	*Sclerotinia sclerotiorum*	1
	No pathogen detected/Requested test negative		1
Field bean	Anthracnose	*Colletotrichum lindemuthianum*	5
	Fusarium root rot	*Fusarium solani*	1
	Virus infection	Potyvirus	1
	Fusarium root rot	*Fusarium solani* f.sp. *phaseoli*	1
	No pathogen detected/Requested test negative		7

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Soybean	Anthracnose	*Colletotrichum* sp.	1
	Anthracnose	*Colletotrichum truncatum*	2
	Anthracnose	*Colletotrichum lindemuthianum*	2
	Leaf spot	*Alternaria* sp.	1
	Brown spot	*Septoria glycines*	2
	Downy mildew	*Peronospora manshurica*	2
	Fusarium root rot	*Fusarium solani*	1
	Leaf spot	*Alternaria* sp.	1
	Northern stem canker	*Diaporthe phaseolorum*	2
	Phyllosticta leaf spot	*Phyllosticta sojicola*	1
	Pod and stem blight	*Diaporthe phaseolorum* var. *sojae*	3
	Pod and stem blight	*Phomopsis phaseoli*	3
	Root and crown rot	*Fusarium* sp.	2
	Stem canker	*Fusarium* sp.	1
	Virus infection	Potyvirus	1
	No pathogen detected/Requested test negative		10

Table 6. Summary of diseases diagnosed on **trees and woody ornamentals** submitted to the Pest Diagnostic Clinic in 2005.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Ash	Ash anthracnose	*Apiognomonia errabunda*	1
	Leaf spot	Unidentified fungus	1
Beech	Dieback	Physiological	1
	No pathogen detected/Requested test negative		3
Catalpa	Dieback	Physiological	1
Cedar	Tip blight	*Pestalotiopsis funerea*	3
	Dieback	Physiological	1
	Tip scorch	Physiological	1
	No pathogen detected/Requested test negative		1
Elm	No pathogen detected/Requested test negative		1
Euonymus	Anthracnose	*Colletotrichum gloeosporioides*	2
	Dieback	Physiological	2
	Powdery mildew	*Microsphaera penicillata*	2
	Nectria canker	*Nectria cinnabarina*	1
	No pathogen detected/Requested test negative		2
False cypress	Tip blight	*Pestalotiopsis* sp.	1
Filbert	Eastern filbert blight	*Anisogramma anomala*	1
Forsythia	Dieback	Physiological	1
Hebe	Anthracnose	*Colletotrichum gloeosporioides*	1
	Root rot	*Pythium* sp.	1
	Fusarium stem rot	*Fusarium oxysporum*	1

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Hydrangea	Crown rot	*Fusarium* sp.	1
	No pathogen detected/Requested test negative		1
Juniper	Tip scorch	Physiological	1
	Tip dieback	Physiological	1
	Lophodermium needle cast	*Lophodermium juniperi*	1
Larch	Root rot	*Pythium* sp.	1
Lilac	Stem canker	Physiological	1
	No pathogen detected/Requested test negative		1
Maple	Maple anthracnose	*Aureobasidium apocryptum*	1
	Anthracnose	*Kabatiella apocrypta*	3
	Anthracnose	*Discula* sp.	1
	Dieback	Physiological	3
	Wilt	Physiological	1
	Leaf scorch	Physiological	1
	Stem canker	Physiological	1
	Powdery mildew	Fungal	1
	Winter injury	Physiological	1
Ninebark	Powdery mildew	Fungal	1
Oak	Leaf scorch	Physiological	1
	Oak anthracnose	*Apiognomonia quercina*	3
	Leaf blister	*Taphrina caerulescens*	1
	Armillaria root rot	*Armillaria mellea*	1
	Leaf scorch	Physiological	1
	Leaf spot	Physiological	2
Pine	Dieback	Physiological	1
	Tip dieback	Physiological	1
	Tip blight	*Pestalotiopsis* sp.	1
	Sphaeropsis tip blight	*Sphaeropsis sapinea*	1
	No pathogen detected/Requested test negative		3
Poplar	No pathogen detected/Requested test negative		1
Spruce	Leaf scorch	Physiological	1
	No pathogen detected/Requested test negative		4
	Root rot	*Pythium* sp.	3
	Rhizosphaera needle cast	*Rhizosphaera kalkhoffii*	6
	Dieback	Physiological	3
	Needle scorch	Physiological	4
	Swiss needle cast	*Phaeocryptopus gaeumanni*	1
	Tip scorch	Physiological	1
	Canker	Physiological	1
Yew	Tip scorch	Physiological	1
	No pathogen detected/Requested test negative		4

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Willow	Rust	*Melampsora* sp.	1
	No pathogen detected/Requested test negative		1

Table 7. Summary of diseases diagnosed on **greenhouse vegetable crops** submitted to the Pest Diagnostic Clinic in 2005.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Cucumber	Gummy stem blight	*Didymella bryoniae*	1
	Bacterial wilt	*Erwinia tracheiphila*	1
	Root rot	*Fusarium* sp.	1
	Root rot	*Pythium* sp.	4
	Leaf spot	Physiological	1
	Melon necrotic spot	Melon necrotic spot virus	1
	Cucumber Mosaic	Cucumber mosaic virus	1
	Virus infection	Potyvirus	1
	No pathogen detected/Requested test negative		3
Pepper	Cucumber Mosaic	Cucumber Mosaic Virus	1
	Canker	*Fusarium* sp.	1
	Fruit rot	Physiological	1
	Myrothecium canker	*Myrothecium roridum*	1
	Bacterial stem rot	*Pectobacterium carotovora* subsp. *carotovora*	1
	Pepper mild mottle	Pepper Mild Mottle Virus	1
	Stem rot	*Fusarium* sp.	2
	No pathogen detected/Requested test negative		9
Tomato	Bacterial spot	*Xanthomonas campestris* pv. *vesicatoria*	2
	Corky root rot	*Pyrenochaeta lycopersici*	2
	Pepino mosaic	Pepino Mosaic Virus	13
	Bacterial canker	*Clavibacter michiganensis* subsp. *michiganensis*	11
	Powdery mildew	*Oidium neolycopersici*	3
	Root rot	*Pythium* sp.	4
	Stem rot	*Pectobacterium carotovora* subsp. *carotovora*	1
	Virus infection	Potyvirus	2
	Grey mold	*Botrytis cinerea*	1
	Leaf spot	Physiological	1
	Wilt	Physiological	1
	No pathogen detected/Requested test negative		22

Table 8. Summary of diseases diagnosed on **greenhouse floriculture crops** submitted to the Pest Diagnostic Clinic in 2005.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Actinidia	Root and crown rot	*Phytophthora* sp.	1
	Root rot	*Pythium* sp.	1
Ajuga	Alfalfa Mosaic	Alfalfa Mosaic Virus	1

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Alstroemeria	Root rot	*Phytophthora* sp.	1
	Virus infection	Potyvirus	4
	Virus infection	Virus particles detected	2
	No pathogen detected/Requested test negative		2
Anemone	Leaf mosaic	Foliar nematode (*Aphelenchoides* sp)	1
	No pathogen detected/Requested test negative		2
Arabidopsis	Root rot	*Pythium* sp.	1
	Impatiens necrotic spot	Impatiens Necrotic Spot Virus	1
Begonia	Crown rot	*Fusarium* sp.	1
	Impatiens necrotic spot	Impatiens Necrotic Spot Virus	1
	Stem rot	*Fusarium* sp.	1
	No pathogen detected/Requested test negative		2
Bellflower	No pathogen detected/Requested test negative		1
Cactus	Stem rot	Unidentified fungus	1
	Drechslera stem rot	*Drechslera cactivora*	1
	Stem rot	*Fusarium* sp.	1
Calibrachoa	White mold	*Sclerotinia* sp.	1
Chrysanthemum	Crown rot	*Fusarium* sp.	1
	Root and crown rot	*Pythium* sp.	1
	Root rot	*Pythium* sp.	1
	Fusarium wilt	*Fusarium oxysporum*	1
	Stem rot	*Sclerotinia sclerotiorum*	1
	No pathogen detected/Requested test negative		1
Clematis	Clematis wilt	*Ascochyta clematidina*	1
	Tip scorch	Physiological	1
	No pathogen detected/Requested test negative		1
Columnea	Myrothecium canker	*Myrothecium roridum*	1
Coreopsis	Leaf spot	Physiological	1
Desert rose	Fusarium stem rot	*Fusarium solani*	1
Dianthus	Fusarium stem rot	*Fusarium oxysporum*	1
	Root rot	*Pythium* sp.	1
Dieffenbachia	Anthracnose	*Colletotrichum gloeosporioides*	1
	No pathogen detected/Requested test negative		1
Fuchsia	Scorch	Physiological	1
Geranium (*Pelargonium* sp.)	Oedema	Physiological	2
	No pathogen detected/Requested test negative		1

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Geranium	Downy mildew	*Plasmopara* sp.	1
(*Geranium* sp.)	Grey mold	*Botrytis cinerea*	1
	Oedema	Physiological	1
	No pathogen detected/Requested test negative		2
Gerbera	Fusarium crown rot	*Fusarium oxysporum*	1
	Crown rot	*Fusarium* sp.	1
	Phytophthora crown rot	*Phytophthora cryptogea*	1
	Phytophthora root rot	*Phytophthora cryptogea*	1
	Root and crown rot	*Pythium* sp.	1
	Root rot	*Pythium* sp.	1
	Leaf spot	Physiological	1
	No pathogen detected/Requested test negative		1
Haworthia	No pathogen detected/Requested test negative		1
Helleborus	Root rot	*Pythium* sp.	1
Heuchera	Root rot	*Pythium* sp.	1
	Grey mold	*Botrytis cinerea*	1
Impatiens	Impatiens necrotic spot	Impatiens Necrotic Spot Virus	3
	No pathogen detected/Requested test negative		1
Ivy	Root rot	*Pythium* sp.	1
Kalanchoe	Impatiens necrotic spot	Impatiens Necrotic Spot Virus	2
	Grey mold	*Botrytis cinerea*	2
	Root rot	*Phytophthora* sp.	1
	Root rot	*Pythium* sp.	1
	No pathogen detected/Requested test negative		3
Lily	Fusarium stem rot	*Fusarium oxysporum*	1
	Root rot	*Pythium* sp.	2
	Leaf scorch	Physiological	1
	No pathogen detected/Requested test negative		1
Limonium	Leaf spot	Physiological	1
Lipstick plant	Powdery mildew	*Oidium* sp.	1
	Root rot	*Pythium* sp.	1
Mandevilla	Virus testing	No virus particles detected	1
Orchid	Bacterial soft rot	Unidentified bacterium	1
Osteospermum	No pathogen detected/Requested test negative		1
Passionflower	Virus infection	Potyvirus	1
	Virus infection	Virus particles detected	3
Peony	No pathogen detected/Requested test negative		1
Periwinkle	Botrytis blight	*Botrytis cinerea*	1

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Petunia	Alfalfa mosaic	Alfalfa Mosaic Virus	1
	Tobacco etch	Tobacco Etch Virus	1
	Thielaviopsis root rot	*Thielaviopsis basicola*	1
	No pathogen detected/Requested test negative		5
Phlox	No pathogen detected/Requested test negative		1
Poinsettia	Poinsettia mosaic	Poinsettia Mosaic Virus	4
Rose	Crown canker	*Cylindrocladium scoparium*	1
	Crown rot	*Phytophthora* sp.	1
	Root and crown rot	*Pythium* sp.	1
	No pathogen detected/Requested test negative		1
Scaveola	No pathogen detected/Requested test negative		1
Snapdragon	Botrytis blight	*Botrytis cinerea*	1
	Grey mold	*Botrytis cinerea*	1
	Rhizoctonia stem rot	*Rhizoctonia solani*	1
	Rhizopus blight	*Rhizopus* sp.	1
	Root rot	*Pythium* sp.	2
	Verticillium wilt	*Verticillium dahliae*	1
	No pathogen detected/Requested test negative		1
Streptocarpus	Dieback	Physiological	1
Weigela	No pathogen detected/Requested test negative		1

Table 9. Summary of diseases diagnosed on **specialty field crops** submitted to the Pest Diagnostic Clinic in 2005.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Dill	No pathogen detected/Requested test negative		1
Garlic	Bulb rot	Bulb & stem nematode (*Ditylenchus dipsaci*)	5
	No pathogen detected/Requested test negative		3
Ginseng	Grey mold	*Botrytis cinerea*	1
	Root rot	*Fusarium* sp.	1
	No pathogen detected/Requested test negative		2
Lemon verbena	No pathogen detected/Requested test negative		1
Mint	Leaf spot	Physiological	1
	No pathogen detected/	Requested test negative	1
Niger	No pathogen detected/Requested test negative		1
Oregano	Root rot	*Pythium* sp.	1
	Root and crown rot	*Pythium* sp.	1

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Parsley	Damping-off	*Pythium* sp.	1
	Damping-off	*Phytophthora* sp.	1
	Dieback	Physiological	1
	No pathogen detected/Requested test negative		1
Rosemary	No pathogen detected/Requested test negative		1
Sage	Canker	*Botrytis cinerea*	1
	Downy mildew	*Peronospora* sp.	1
	No pathogen detected/Requested test negative		3
Savory	No pathogen detected/Requested test negative		1
Sweet potato	Virus infection	Potyvirus	1
Tarragon	No pathogen detected/Requested test negative		3
Tobacco	Tobacco mosaic	Tobacco Mosaic Virus	1
	Tobacco ringspot	Tobacco Ringspot Virus	1
	No pathogen detected/Requested test negative		1

Table 10. Summary of diseases diagnosed on **herbaceous ornamentals and interiorscape plants** submitted to the Pest Diagnostic Clinic in 2005.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Aster	Fusarium wilt	*Fusarium oxysporum*	1
Coneflower	Anthracnose	*Colletotrichum gloeosporioides*	1
	Fusarium root rot	*Fusarium solani*	1
	Root rot	*Pythium* sp.	1
	White rust	*Albugo tragopogonis*	1
Ficus	Phomopsis dieback	*Phomopsis cinerescens*	1
Gaillardia	White smut	*Entyloma compositarum*	1
Honeysuckle	Root rot	*Pythium* sp.	1
Heather	No pathogen detected/Requested test negative		1
Hosta	Fusarium crown rot	*Fusarium oxysporum*	1
	Crown rot	*Fusarium* sp.	1
	Leaf spot/scorch	Physiological	2
	Hosta virus	Hosta Virus X	5
	Root nodules	Root-knot nematode (*Meloidogyne* sp.)	1
	No pathogen detected/Requested test negative		8
Marigold	No pathogen detected/Requested test negative		1
Tulip	No pathogen detected/Requested test negative		1

Cereals / Céréales

CROP / CULTURE: Barley
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: SURVEY FOR FUSARIUM HEAD BLIGHT OF BARLEY IN MANITOBA IN 2005

INTRODUCTION AND METHODS: A total of 24 barley fields (12 two-row, 12 six-row) in southern Manitoba were surveyed for the presence of fusarium head blight (FHB) between July 28 and August 12, 2005, when crops were at the early milk to hard dough stage of growth (ZGS 71-87). The fields were selected randomly along the survey routes. FHB incidence (the percentage of heads with typical symptoms) was assessed in each field by sampling 80-100 spikes at 3 locations for disease. The average symptomatic spike proportion infected (SPI) was estimated visually on location. These values were used to calculate the FHB Index (%) or overall FHB severity, according to the formula (% incidence x proportion (%) of the spike infected / 100). Several infected spikes were collected at each field site and stored in paper envelopes. A total of 50 discoloured and putatively infected kernels, or those of normal appearance to make up the remainder, were removed from five heads per location. The kernels were surface sterilized in 0.3% NaOCl (Javex brand) and plated onto potato dextrose agar to quantify and identify *Fusarium* spp. on kernels.

RESULTS AND COMMENTS: Conditions in spring and early summer (late April to early July) 2005 were abnormally wet and cool in southern Manitoba. Due to excessive rainfall, many fields were planted late, not planted at all, or were damaged by subsequent flooding. During spike emergence, flowering, and kernel filling of most spring crops warmer, drier conditions prevailed. Cool conditions and generally low levels of FHB in 2004 (Tekauz et al. 2005) likely reduced the amount of inoculum available in overwintered straw and stubble in farm fields, leading to less infection than might otherwise have occurred.

Fusarium head blight was observed in all barley fields surveyed. Average incidence of FHB in two-row crops was 15.9% (range 2.4 - 31.3%), while SPI averaged 9.7% (range 3.0 - 22.0%); in six-row crops incidence was 34.3% (range 21.9 - 54.4%) and SPI 17.8% (range 7.0 - 40.0%). The resulting average FHB Index for 2-row barley was 1.9% (range 0.1 - 5.2%), and that for 6-row barley 6.2% (range 1.7 - 12.1%); for all barley it was 4.0% (range of 0.1 to 12.1%) and would have resulted in an estimated yield loss from FHB of about 2%. The higher severity of FHB in 6-row barley than 2-row is typical in this crop, reflecting the generally higher susceptibility attributed to 6-row cultivars. The levels of FHB in barley in 2005 were considerably higher than in 2004 (Tekauz et al. 2005) but similar to those in 2001 and 2002, which may be described as ‘normal’ for southern Manitoba (Tekauz et al. 2003, 2002). Despite the normal levels of FHB, levels of deoxynivalenol (DON) in grain were below normal in 2005 (A.Tekauz, unpublished data). This may have been because lower than normal cumulative temperatures throughout the growing season curtailed DON synthesis in infected grain.

The incidence of *Fusarium* in fields, and the relative proportion of species isolated from kernels are shown in Table 1. As for the past several years, *F. graminearum* was the most common pathogenic species on kernels (~70%), followed by *F. avenaceum* (~15%), and *F. sporotrichioides* (~10%). The level of *F. poae* on kernels was abnormally low in 2005.

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Tekauz, A., J. Gilbert, E. Mueller, M. Stulzer, R. Kaethler, and E. Nedohin. 2002. Fusarium head blight of barley in Manitoba in 2001. Can. Plant Dis. Surv. 82: 57-58. (http://www.cps-scp.ca/cpds.htm)

Table 1. *Fusarium* spp. isolated from barley in Manitoba in 2005.

***Fusarium* spp.**	***Percent of fields***	***Percent of kernels***
F. avenaceum	71	15.3
F. culmorum	0	0
F. equiseti	13	1.0
F. graminearum	88	69.7
F. poae	46	3.8
F. sporotrichioides	58	10.3

CROP / CULTURE: Barley
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: 2005 SURVEY FOR LEAF SPOT DISEASES OF BARLEY IN MANITOBA

INTRODUCTION AND METHODS: Foliar diseases of barley in Manitoba were assessed by surveying 24 farm fields (12 two-row, 12 six-row) from July 27 to August 20 when most crops were at the late milk to soft dough stage of growth (ZGS 77-85). Fields were sampled at regular intervals along the survey routes, depending on availability. Disease incidence and severity were recorded by averaging their occurrence on approximately 10 plants along a diamond-shaped transect of about 50 m per side, beginning near the field edge. Disease ratings were taken on both the upper (flag and penultimate leaves) and lower leaf canopies, using a six-category scale: 0 or nil (no visible symptoms); trace (<1% leaf area affected); very slight (1-5%); slight (6-15%); moderate (16-40%); and severe (41-100%). Infected leaves with typical symptoms were collected at each site, dried, and stored in paper envelopes. Subsequently, surface-sterilized pieces of infected leaf tissue were placed in moist chambers for 3-5 days to identify the causal agent(s) and determine the disease(s) present.

RESULTS AND COMMENTS: Conditions in spring and early summer (late April to early July) 2005 were abnormally wet and cool in southern Manitoba. Due to excessive rainfall, many fields were planted late, not planted at all, or were damaged by subsequent flooding. Warmer, drier conditions prevailed during spike emergence and the kernel filling stage of most spring crops. The lower than normal accumulation of growing degree days throughout the 2005 growing season (Anon 2005) was expected to influence the development and damage caused by the various barley leaf spot pathogens.

Leaf spots were observed in the upper and/or lower leaf canopies in all 24 barley fields surveyed. Disease levels in the upper canopy were nil, trace or very slight in 12% of fields, slight in 46%, moderate in 29%, and severe in 13%. Respective severity categories in the lower canopy were tabulated as 4%, 25%, 29%, 21%, with 21% being senescent. On the basis of ~40% of fields having moderate to severe leaf spotting in the upper canopy and ~60% with trace to slight levels, foliar diseases in barley would have caused some damage in 2005; on average, grain yield losses likely were in the range of 3-4%. This loss is higher than that estimated for the previous three years (Tekauz et al. 2005, 2004, 2003).

Cochliobolus sativus (causal agent of spot blotch) was the most prevalent and frequently isolated species and was estimated to have caused >50% of the damage observed (Table 1). This was surprising as *C. sativus* normally is not favoured by cooler conditions. *Pyrenophora teres* (net blotch) incidence was high but this pathogen was proportionately less damaging than in 2004 (Tekauz et al. 2005). The other pathogens identified caused relatively little damage to barley in 2005.

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Table 1. Incidence and isolation frequency of leaf spot pathogens of barley in Manitoba in 2005

Pathogen	Incidence (% of fields)	Frequency (% of isolations)*
Cochliobolus sativus	100	54.5
Pyrenophora teres	83	23.7
Septoria passerinii	54	11.6
Septoria avenae f.sp. *triticea*	58	10.2

* indicative of the relative foliar damage caused

CROP / CULTURE: Barley
LOCATION / RÉGION: Ontario

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TITLE / TITRE: DISEASES OF BARLEY IN CENTRAL AND EASTERN ONTARIO IN 2005

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

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

RESULTS AND COMMENTS: Of the 23 fields surveyed, five contained 2-row and 18 contained 6-row barley. Eleven diseases or disease complexes were observed in the fields sampled (Table 1). Spot blotch (*Cochliobolus sativus*) was the most prevalent foliar disease, observed in 22 fields, at a mean disease severity of 2.9, ranging from 1.0-5.6. Severe infection from spot blotch was not observed but moderate levels of infection were recorded in nine of the affected fields. Yield reductions due to spot blotch were estimated to average at least 5% in the surveyed fields.

Net blotch (*Pyrenophora teres*) and leaf rust (*Puccinia hordei*) were observed in 17 and 19 fields at mean severities of 1.6 and 1.3, respectively. A moderate level of net blotch was found in two fields, while levels of leaf rust in all affected fields were trace to slight. The septoria complex [including speckled leaf blotch (*Septoria avenae* f. sp. *triticea),* leaf blotch (*S. passerinii*), and glume blotch (*S. nodorum*)], powdery mildew (*Erysiphe graminis* f. sp. *hordei*), and scald (*Rhynchosporium secalis*), were observed in 10, 8, and 3 fields, at mean severities of 0.6, 1.1, and 0.1, respectively. Except for a moderate level of powdery mildew found in one field, all affected fields had only trace to slight infections. None of these diseases caused significant damage.

Barley leaf stripe (*Pyrenophora graminea*), ergot (*Claviceps purpurea*), loose smut (*Ustilago nuda*), and take-all (*Gaeumannomyces graminis*) were observed in 1, 2, 3, and 6 fields, at mean incidence levels of 0.3, 0.2, 0.1, and 0.7%, respectively. These diseases resulted in minimal damage.

Fusarium head blight was observed in 11 fields, at a mean incidence of 11.2%, ranging from 3.3-23.3%. Severity on infected spikes averaged 11.5%, ranging from 6.7-16.7%. The FHB index ranged from 0.3-3.9%, with a mean of 1.4%. All affected fields had only slight infection.

Four *Fusarium* species were isolated from infected kernels (Table 1). *Fusarium poae* and *F. sporotrichioides* were the predominant species, with *F. graminearum* and *F. avenaceum* found only infrequently.

The relative prevalence and severity of foliar diseases in 2005 was similar to that found in 2004 (Xue et al. 2005), except for spot blotch, which was the most prevalent disease in 2005 but was insignificant in 2004. Although FHB was observed in approximately 50% of the surveyed fields, the average disease impact (FHB Index) was only 1.4%, which is the lowest in recent memory. *Fusarium poae* and *F. sporotrichioides* were the major causal agents of FHB in 2005, and this is different from 2004 when *F. graminearum* was the predominant species. Total precipitation was lower and mean temperatures were higher across Ontario in June and July compared to 2004 or the long-term average. The hot and dry weather in June and July was likely responsible for the lower FHB severity and the shift in *Fusarium* species, and the different foliar disease prevalence in 2005.

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Table 1. Frequency of *Fusarium* species isolated from discoloured kernels of barley in central and eastern Ontario in 2005.

***FUSARIUM* SPP.**	**% FIELDS**	**% KERNELS**
F. avenaceum	4.3	0.4
F. graminearum	17.4	4.4
F. poae	56.5	12.7
F. sporotrichioides	60.9	10.5

CROPS / CULTURES: Barley and Wheat
LOCATION / RÉGION: Central Alberta

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: 2005 CEREAL DISEASE SURVEY IN CENTRAL ALBERTA

INTRODUCTION AND METHODS: A survey of diseases of barley and wheat was conducted from July 27 to 29 in central Alberta. Growers were contacted for permission to evaluate their fields, which were traversed in an inverted V, with visual analysis of five plants taking place at three locations. Leaf diseases were scored on a 0-9 scale, with a '4 rating' equal to one percent of leaf area diseased (PLAD) in the upper leaf canopy, 5-10 PLAD in the middle canopy and 10-25 PLAD in the lower canopy. Common root rot (CRR) was assessed on subcrown internodes using a 0-4 scale where 1=trace and 4=severe. Other diseases were rated as a percentage of the plants affected. After the survey was completed, a representative sub-sample of the diseased material collected was cultured in the laboratory for pathogen identification.

RESULTS AND COMMENTS: Results are presented in Table 1. General growing conditions in central Alberta were better in 2005 than they had been for some years. A dry May was followed by a cool damp June and a warm, showery July. Twenty-two barley fields were examined, only three of which contained 6-row crops. Barley leaf disease levels were similar to those found in 2004 (Orr and Turkington, 2005), with scald (*Rhynchosporium secalis*) more common in the northern half of the region and net blotch (*Pyrenophora teres* f. *teres*) more common in the south. Barley leaf 'spots', which were either the spot form of net blotch (*P. teres* f. *maculata*) alone or in combination with *Alternaria* and *Cladosporium* species, also were more severe in the south than in the north. Septoria/Stagnospora leaf blotch (*Septoria tritici, Stagonospora nodorum*) levels in the three fields of wheat examined were similar to those found in 2004. Common root rot of barley (*Cochliobolus sativus* and *Fusarium* spp.) occurred at a slightly higher severity than in 2004, while wheat common root rot ratings were lower than in 2004 (Orr and Turkington, 2005). The latter observation was probably related to the intermediate (MR-MS) disease rating of the cv. 'Superb', which was planted in two of the three fields examined. Loose and covered smuts of cereals were rarely encountered. Stripe rust (*Puccinia striiformis)* was noted in only two wheat fields at trace levels at the time (early) of this survey. Additional information on stripe rust in Alberta is reported by McCallum et al. (2006).

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Table 1. Disease incidence and severity in 22 barley and 3 wheat fields in central Alberta, 2005.

		Disease rating and range	
Barley **Disease (scale)**	**% Fields Affected**	**Mean**	**Range**
Scald (0-9)	77	3.7	2-7
Net blotch (0-9)	73	4.5	3-8
Spot form of net blotch with or without *Alternaria* and *Cladosporium* (0-9)	68	4.3	3-6
Common rot (0-4)	68	1.8	0-4
Wheat **Disease (scale)**			
Septoria leaf complex (0-9)	100	3.7	3-5
Common root rot (0-4)	67	0.5	0-1
Stripe rust (%)	67	trace	trace

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

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TITLE / TITRE: FUSARIUM HEAD BLIGHT IN BARLEY AND OAT IN SASKATCHEWAN IN 2005

INTRODUCTION AND METHODS: Fusarium head blight (FHB) incidence and severity were assessed in a total of 48 barley crops (41 2-row; 7 6-row) and 16 oat crops in Saskatchewan between July 21 and August 23. Fields were grouped according to soil zones (Zone 1 = brown; Zone 2 = dark brown; Zone 3 = black/grey soils), and fields under irrigation were grouped separately and are referred to as in the irrigation zone (located along the South Saskatchewan River in west-central and central regions of the province).

Samples were collected in the field by crop adjustors with Saskatchewan Crop Insurance Corporation (SCIC) and by irrigation agrologists with Saskatchewan Agriculture and Food. Fifty spikes were randomly collected from each crop at the milk to dough stages. The 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 glumes and/or kernels within those spikes were recorded. A FHB disease severity rating, also know as the FHB index, was determined for each barley crop (FHB index = % heads affected x mean proportion (%) of the spike infected / 100). Mean FHB severity ratings were calculated for each soil/irrigation zone and for the whole province. Glumes and/or kernels with visible FHB symptoms were surface sterilized in 0.6% NaOCl solution for 1 min. and cultured on potato dextrose agar and carnation leaf agar for subsequent identification of *Fusarium* species.

RESULTS AND DISCUSSION: In 2005 spring and early summer conditions were moist and predicted to be ideal for crop establishment, abundant foliage growth and spore (inoculum) development of *Fusarium* spp. However, most regions experienced dry and hot conditions during cereal flowering and the risk of FHB was reduced. Hence, the overall fusarium infection levels for 2005 were very low. There was also late development of secondary moulds (including *Fusarium* spp.) due to rains during harvest in central and northern regions (Morrall et al. 2006), but that damage is not reflected in this survey.

In 2005, FHB occurred in 58% of barley crops surveyed (56% of 2-row; 71% of 6-row) (Table 1). Mean disease severities ranged from 0 to 0.4% in all zones, and the overall mean severity for the province was 0.4% for 2-row and 0.1% for 6-row barley. These low severity values are similar to those of the past four years; FHB severities have not been >1% for barley since the 2001 survey (Pearse et al. 2005). In 2005, the highest severity in a single field was 7.2%, found in 2-row barley in Zone 3 in the southeast region of the province; this was caused by *F. poae*.

In 2005 the most commonly isolated *Fusarium* species was *F. poae*, accounting for 60% of total *Fusarium* isolations, followed by *F. sporotrichioides* (22%), *F. avenaceum* (13%), and *F. graminearum* (5%). *Fusarium graminearum* was found in only two barley crops, both under irrigation in the south-central region of the province. *Pyrenophora* spp. were isolated from approximately 60% of the samples; C*ochliobolus sativus* and *Claviceps purpurea* were observed infrequently.

Fusarium head blight was found in only 3 of the 16 oat crops surveyed in 2005. All three infected oat crops were sampled from Zone 3 and had ≤0.1% severities. *Fusarium avenaceum* was the most commonly isolated species, accounting for 60% of total *Fusarium* isolations, followed by *F. poae* (20%) and *F. acuminatum* (20%). No *F. graminearum* was isolated from the oat kernels/glumes.

ACKNOWLEDGEMENT:
We gratefully acknowledge the participation of the crop insurance adjustors with Saskatchewan Crop Insurance Corporation and the irrigation agrologists with Saskatchewan Agriculture and Food for the collection of head samples for this survey.

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Table 1. Prevalence and severity of fusarium head blight (FHB) in barley crops grouped by soil or irrigation zones in Saskatchewan, 2005.

Soil Zone	No. affected crops / total crops (% of crops infected)		Mean FHB Index[1] (range of severity)	
	2-row	6-row	2-row	6-row
Zone 1 Brown	0 / 3 (0%)	0 / 1 (0%)	0	0
Zone 2 Dark Brown	9 / 12 (75%)	0 / 1 (0%)	0.2% (0 - 1.3%)	0
Zone 3 Black/Grey	11 / 23 (48%)	2 / 2 (100%)	0.4% (0 - 7.2%)	0.1% (T[2] - 0.2%)
Irrigation Zone	3 / 3 (100%)	3 / 3 (100%)	0.2% (0 - 0.4%)	0.2% (T - 0.3%)
Overall Mean	23 / 41 (56%)	5 / 7 (71%)	0.4%	0.1%

[1] FHB Index = % heads affected x mean % severity of infection / 100
[2] T = Trace values of FHB (<0.1%)

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

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
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TITLE /TITRE: SEED-BORNE FUSARIUM ON CEREALS IN SASKATCHEWAN IN 2005.

METHODS: The results of agar plate tests on cereal seed samples provided by five Saskatchewan companies were summarized. The tests were conducted between early September 2005 and either mid-December 2005 or mid-January 2006. It was assumed that the majority of samples were from the 2005 crop. The tests were conducted to detect all species of *Fusarium*, but data were tabulated only for *F. graminearum* and for all species combined (total *Fusarium*). Values for mean percent seed infection with *F. graminearum* and with total *Fusarium* were calculated for each crop district [CD] in Saskatchewan (1). In addition, the percent samples in which *F. graminearum* was not detected was calculated for each CD.

The tests were performed on random samples of seed, with no attempt to select fusarium-damaged kernels. Plating techniques varied between companies. All tests were done using potato dextrose agar and the petri dishes in which seed was plated were incubated from 5 to 7 days. Illumination was with either fluorescent or a mixture of fluorescent and near UV (black) light. The dishes were arranged either singly or in stacked pairs under the light source, or stacked 10-high with the light sources at the side. The number of seeds tested per sample varied; the majority of tests were done with 200 or 400 seeds, but some with only 100. Thus, the probability of obtaining false negative results varied among tests.

RESULTS AND COMMENTS: In Saskatchewan in 2005 the growing season was marked in May by normal rainfall and timely completion of spring seeding; in June by high to excessive rainfall causing some flooding damage; in July by below normal rainfall in the south and normal rainfall in central and northern regions; in August by above normal rainfall, especially in the latter half of the month; and in September by low rainfall in the south, but excessive rainfall in central and northern regions. Fusarium head blight was not a conspicuous problem in most regions in July and August (4, 5).

The cereal harvest was delayed slightly by rainfall in August and September in the southernmost regions of the province. However, in central and northern regions fall rains continued to cause long delays and crop damage from weathering. These conditions were conducive to saprophytic spread of *Fusarium* spp. in the ripened floral tissues, which could lead to high levels of *Fusarium* infection in harvested grain.

The data compiled were based on 726 samples (41% wheat [winter and spring combined], 39% durum, 18% barley, 2% oat). Mean levels of *Fusarium graminearum* and of total *Fusarium* varied widely among CDs (Table 1). *Fusarium graminearum* was found in all except four districts, although levels of infection were generally low. More than 50% of samples from CDs 1A, 1B, 2A, 3AS, 5A and 8B contained *F. graminearum*, but the only districts in which the mean level of infection with *F. graminearum* was more than 2.0% were CDs 1A, 2A, and 3BN. Thus, *F. graminearum* was most common in regions close to Manitoba and North Dakota, but it also occurred at a relatively high level in CD 3BN, a district with a substantial area under irrigation (5). The two samples with the highest *F. graminearum* percentages were from an irrigated wheat crop in CD 2B (28.5%) and from a winter wheat crop in CD 5B (22.5%).

More than 99% of total *Fusarium* isolates in the tests were either *F. graminearum*, *F. avenaceum*, *F. acuminatum*, *F. equiseti*, *F. culmorum*, *F. poae* or *F. sporotrichioides. Fusarium avenaceum* was generally the most common species, especially on wheat, but *F. poae* and *F. sporotrichioides* were also commonly found on barley and oat. Low mean levels of total *Fusarium* were recorded in only seven of 20 CDs: 1B, 3AN, 3AS, 3BS, 4A, 4B and 7A (Table 1). These districts are mostly in the south-central or western part of Saskatchewan (1), where much of the harvest was not delayed by rainfall. Mean total *Fusarium* levels were especially high in CD 8, where many crops were harvested very late. The highest total *Fusarium* levels in samples of different crop types were 27.5% for durum (from CD 9B), 27.25% for barley (from CD 8B), 48.5% for wheat (from CD 2B), and 19.0% for oat (from CD 6B).

Although a comparable data set sorted by CD has not been published before, the results of this survey confirm previous studies of the distribution and frequency of *Fusarium* spp. on cereal grains (1, 2, 3, 6). *Fusarium graminearum* occurs on harvested grain over a wide area in Saskatchewan, although in most regions at a low frequency, at least in non-irrigated crops. The present study provides more detail about its distribution than a recent study by Clear et al. (1) in which Saskatchewan crop districts were represented by single composite samples for each crop type in each year. Clear and co-workers demonstrated mostly low infection levels per CD over the three years of their study. However, in our study in six of 20 crop districts at least half of the test samples contained some *F. graminearum*. This demonstrates a wider distribution in the CDs than might be inferred from mean infection percentages. Moreover, we identified a number of samples with high levels of infection from region far from Manitoba or North Dakota, particularly from irrigated areas in central Saskatchewan.

The high levels of total *Fusarium* infection for the province are similar to those in Saskatchewan in some regions in 2000 (6) as well as in most regions in 2002 (2) and 2004 (R.A.A.Morrall, unpublished data). In all of these cases the majority of infection is believed to be due to saprophytic invasion of the grain in late summer and fall. With the possible exception of some irrigated crops and winter wheat crops, conditions were not favorable to head blight infection during anthesis in 2005. Winter wheat crops were at anthesis earlier, during the June rainy period.

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Table 1. Number of cereal seed samples tested from September, 2005 to mid-December, 2005 or mid January by five commercial companies, and levels of infection with *Fusarium graminearum* or total *Fusarium* spp. in relation to Saskatchewan Crop Districts.

Crop District	***Fusarium graminearum***			**Total *Fusarium***
	No. of samples tested	Mean % infection	Samples with no infection detected	Mean % infection
1A	25	3.7	8%	8.1
1B	9	0.9	44%	3.0
2A	89	2.1	22%	7.7
2B	86	0.9	65%	4.4
3AN	12	0.5	75%	3.1
3AS	58	1.1	48%	2.8
3BN	23	2.3	65%	4.7
3BS	8	0	100%	1.3
4A	2	1.5	50%	2.1
4B	12	<0.1	92%	1.5
5A	38	1.2	47%	6.5
5B	48	1.4	60%	8.1
6A	50	<0.1	90%	5.2
6B	51	0.1	80%	10.0
7A	32	<0.1	97%	2.1
7B	17	0	100%	7.9
8A	62	0.2	68%	12.3
8B	53	1.2	36%	17.3
9A	25	0	100%	5.4
9B	27	0	100%	8.3
TOTAL	726	1.0	62%	7.3

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

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TITLE / TITRE: STRIPE RUST OF WHEAT AND BARLEY IN MANITOBA, SASKATCHEWAN, AND ALBERTA IN 2005

INTRODUCTION AND METHODS: Trap nurseries and commercial fields of wheat in Manitoba, Saskatchewan and Alberta were surveyed for the incidence and severity of stripe rust (*Puccinia striiformis* Westend. f.sp. *tritici*) during July and August 2005. Stands of wild barley and commercial fields of barley also were surveyed for leaf (*Puccinia hordei*) and stripe (*Puccinia striiformis* f. sp. *hordei*) rust in Manitoba and Saskatchewan in August 2005. In central Alberta, observations were made in commercial fields and at cereal breeding sites, in late July and August 2005.

RESULTS AND COMMENTS: Wheat stripe rust was observed only sporadically in wheat fields surveyed throughout southern Manitoba and eastern Saskatchewan during 2005. The disease was not detected in most fields that were surveyed. In later-seeded wheat nurseries in Manitoba, stripe rust was observed at higher levels in late August and early September. Stripe rust was also observed in a number of wheat fields in central Alberta. Stripe rust was severe in naturally infected breeding plots of winter wheat, some spring wheat and triticale at Lacombe and Olds, Alberta, where severity was 100% based on a Cobb's scale. Significant levels of stripe rust on wheat heads were observed in the region and resulted in premature ripening of portions of the heads and prolific production of urediniospores between kernels and glumes.

Barley stripe rust was first found near Yorkton (eastern Saskatchewan) on 20 August at trace levels on wild barley. However, stripe rust on barley was at high levels in western Saskatchewan and Alberta in 2005. Barley was severely affected by stripe rust at an Edmonton barley nursery site. A trace level of stripe rust on barley was found in other nurseries and commercial fields, although in some commercial fields low to moderate levels of disease were observed. This disease continues to increase in incidence in central Alberta compared with previous years.

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

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TITLE / TITRE: STEM RUSTS OF CEREALS IN WESTERN CANADA IN 2005

INTRODUCTION AND METHODS: In July, August, and September 2005 surveys were conducted of 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.). Infected stem tissue samples were collected from both fields and nurseries. Urediniospores were obtained from collections and evaluated for virulence specialization on appropriate sets of host differential lines.

RESULTS AND COMMENTS: Low to average temperatures and above average precipitation occurred across the Prairie region during the 2005 growing season. Environmental conditions were somewhat unfavorable for stem rust infection, but the low incidence of stem rust observed was most likely due to lack of inoculum arriving from the USA. Stem rust infection on susceptible lines in trap nurseries and in commercial oat and barley fields was at trace levels across western Canada.

All spring wheat cultivars recommended for production in Manitoba and Saskatchewan have excellent resistance to stem rust, and no stem rust infection was observed in any commercial wheat fields. Stem rust was detected at trace levels on susceptible wheat lines in trap nurseries and on wild barley (*Hordeum jubatum*) in 2005. Stem rust in cultivated barley was absent or at trace levels in Manitoba. The dominant race found across western Canada was QFCSR. Rye stem rust (*P*. *graminis* f. sp. *secalis*) also was identified from several wild barley samples.

Stem rust in cultivated and wild oat was absent or at trace levels in western Canada in 2005. Low stem rust inoculum pressure from the USA, combined with extremely high oat crown rust (*P. coronata*) pressure, led to severe crown rust infection and left little leaf and stem tissue available for stem rust infection. All oat cultivars recommended for production in Canada are susceptible to stem rust races NA67 and NA76. Race NA67 has been predominant in Manitoba since 2001, but declined to 25% of samples from wild oat and 55% from cultivated oat. The predominant race from wild oat was NA27 (42%), along with NA29 (17%) and NA30 (10%). These races are not virulent on most commercial Canadian cultivars grown in Manitoba or Saskatchewan. However, the potential for substantial economic damage to oat crops in the rust area of western Canada remains high due to the presence of NA67 and the establishment of this race in the overwintering area of Texas in the USA.

Oat lines with effective stem rust resistance (*Pg16*, *Pg-a*) to NA67 are in advanced agronomic trials in breeding programs at the Cereal Research Centre of Agriculture and Agri-Food Canada. However, virulence to the *Pg-a*+*Pg13* combination was reported in Texas in 2004 and 2005 (race TTN, Y. Jin, USDA, unpublished), and was found in Manitoba for the first time in 2005. In addition, another new race (NA67 virulence + *Pg16*) was detected for the first time in Manitoba in 2005. It appears that virulence in *P. graminis* f. sp. *avenae* is accumulating, resulting in strains with higher virulence than previously seen. This is most likely occurring by mutation of races from an asexual population because of the single-step accumulation of virulence that has been observed.

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

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TITLE / TITRE: CEREAL VIRUS DISEASE SITUATION IN MANITOBA IN 2005

INTRODUCTION AND METHODS: Virus diseases on cereals in Manitoba monitored in 2005 were barley yellow dwarf (BYD), wheat streak mosaic (WSM) and flame chlorosis (FC). Collaborators identified and collected samples from mid May to early September in cereal crops in Manitoba and parts of eastern Saskatchewan. The proportion of plants with (suspected) virus symptoms in surveyed fields was estimated and specimens with and without symptoms collected for testing. Infection with BYDV and WSMV was confirmed by transmission to indicator hosts. In addition to confirming identity of viruses, transmission to indicator host plants was used to assess virulence against historical benchmarks. For WSMV, transmission was by mechanical inoculation to a range of susceptible spring bread and durum wheat hosts; for BYDV, transmission was by cereal aphids to sets of seedlings of a susceptible oat host.

RESULTS AND COMMENTS:
Barley Yellow Dwarf (BYD) - The trend of recent years continued in 2005 in that the early portion of the growing season in the eastern Prairies was characterized by cool northerly airflows, without sustained periods of strong southerly winds from mid May to the end of July (Haber and Kurtz 2004, 2003). Cereal aphid populations carrying BYDV were not detected in Manitoba until the third week of July, and numbers were low, resulting in scattered, trace-level natural incidence of the disease. Again continuing the trend of recent years, most of the small number of earliest-arriving cereal aphids were oat bird-cherry (*Rhopalosiphum padi*), the most efficient vector of the predominant BYDV strain, PAV. All virus isolates obtained from small grains were of the PAV strain (non-specifically transmitted by the oat bird-cherry aphid). Losses in commercial fields were at trace levels. Although there were barley crops in western and west-central Manitoba that were seeded in a timely fashion, much of the oat and barley acreage was seeded late to very late, predisposing crops to increased risk of disease. Disease levels were nonetheless generally very low as there was little inoculum.

Wheat Streak Mosaic (WSM) - The secular increase in the incidence of WSM continued in 2005 and, as in 2004, WSM was detected in many fields of spring wheat that were not adjacent to or near winter wheat fields. As in 2004, disease severity, however, was generally at lower levels due to cooler weather and less bright sunlight, particularly in the early part of the growing season. The continuing trend to expanded winter wheat cultivation in regions where it has not traditionally been grown (such as the Interlake or south-central Manitoba) was reflected in the detection of WSMV in spring wheat at trace levels in almost all fields examined

Flame Chlorosis (FC) - FC was not observed in Manitoba in 2005. Since the incidence of this soil-transmitted disease has declined to the point that in recent years it has been observed at only a few sites or, as in 1999, and from 2002 onwards, not at all, surveys for FC will no longer be conducted.

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

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TITLE / TITRE: CEREAL SMUT SURVEYS, 2005

INTRODUCTION AND METHODS: In July 2005, cereal crops in Manitoba and Saskatchewan were surveyed for the presence of smut diseases caused by *Ustilago hordei, U. nigra, U. nuda, U. tritici, U. avenae* and *U. kolleri*. The area was covered by the route Winnipeg - Estevan - Moose Jaw - Saskatoon - Prince Albert - Melfort - Yorkton - Roblin - Swan River - Dauphin - Neepawa - Winnipeg, as well as one-day trips around Winnipeg, MB in the Red River valley and Manitoba's Interlake region. Fields were selected at random at approximately 10 - 15 km intervals, depending on the frequency of the crops in the area. An estimate of the percentage of infected plants (i.e., plants with sori) was made while walking an ovoid path of approximately 100 m in each field. Levels of smut greater than trace (<0.1%) were estimated by counting plants in a $1m^2$ area at a minimum of two sites on the path.

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

RESULTS AND COMMENTS: Loose smut (*Ustilago tritici*) was found in 12 (22%) of the 55 fields of common wheat surveyed. One field of common wheat had a 1% incidence of infection, while the remainder had trace levels. In durum wheat, loose smut was found in 9 (44%) of the 17 fields surveyed. One field of durum had a 0.5% level of infection, in the others it was a trace. In awned wheats (likely of the CPS wheat class), loose smut was detected in 7 (44%) of the 16 fields surveyed. One field had a 0.5% incidence of infection and in the remainder it was at trace levels.

One (7%) of 15 fields of oat surveyed had smutted plants at a trace level of infection. The oat smut species present was identified as *Ustilago avenae*.

A high incidence of loose smut was found in 6-row barley with 8 (57%) of 14 fields surveyed containing infected plants. In most fields this was at trace levels, but one field had a 0.5% infection level and another 1%. In 2-row barley, 4 (11%) of 36 fields were affected at trace levels of smutted plants only. False loose smut (*Ustilago nigra*) and covered smut (*U. hordei*) were not found in any barley fields surveyed in 2005.

Five isolates of *U. tritici* and two of *U. nuda* germinated and grew on the medium amended with carboxin. Four of the *U. tritici* isolates were collected near Wadena, SK and one near Grandview, MB. The two isolates of *U. nuda* were collected near Wadena and Smuts, SK. The results suggest that the isolates may be resistant to carboxin, but further study must be done to confirm these preliminary findings.

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

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TITRE / TITLE: APERÇU DES MALADIES DES CÉRÉALES AU QUÉBEC EN 2004 ET 2005

INTRODUCTION et MÉTHODES: Pour chacune des espèces de céréales de printemps visées par l'étude, soit l'avoine, le blé et l'orge, huit essais d'évaluation, menés en parcelles expérimentales, ont été visités une fois pendant les étés 2004 et 2005, afin d'y noter les symptômes des maladies du feuillage et des épis. Ces essais réalisés par le réseau d'enregistrement et de recommandation du Québec sont répartis dans les trois zones agroclimatiques du Québec : zone 1, la plaine de Montréal; zone 2, zone intermédiaire; et zone 3, zone périphérique (CRAAQ-CÉROM 2005). Le stade de développement de la céréale lors des visites se situait entre laiteux moyen et pâteux moyen. Les maladies ont été identifiées sur la base des symptômes visuels seulement. Le nom des agents pathogènes normalement associés à ces maladies est mentionné dans le texte à titre indicatif. Les symptômes des maladies foliaires ont été notés selon une échelle de 0 à 9 (0 = plante saine; 9 = feuille étendard présentant des symptômes sur plus de 50 % de sa surface), de même que ceux des maladies de l'épi chez le blé (0 = absence de symptôme; 9 = 90 % des épillets atteints par la maladie). L'intensité des symptômes est considérée faible pour les cotes situées entre 0 et 4; moyenne pour les cotes de 4 à 6; et élevée pour les cotes de 6 à 9. Des champs de blé et d'orge de différentes localités au Québec ont aussi été visités afin d'y déceler des maladies de racines.

RÉSULTATS et COMMENTAIRES: Les conditions climatiques du printemps 2004 ont été pluvieuses et fraîches pour toutes les régions, ce qui a retardé les semis d'une à plusieurs semaines. C'est la région du Bas-Saint-Laurent située dans la zone périphérique qui a subi le plus de retard avec des semis qui n'ont débuté que dans la deuxième semaine de juin. Les pluies sont demeurées fréquentes jusqu'à la mi-juillet, contribuant sans doute aux dommages causés par les pourritures pythiennes (*Pythium* spp.) et l'excès d'eau dans le sol. Ces dommages ont été observés un peu partout au Québec. Quant aux températures, elles se sont maintenues relativement fraîches pendant tout l'été.

En 2005, le printemps a également été pluvieux, mais les semis ont pu se faire à temps dans la plupart des régions. Par la suite, les précipitations ont été moins fréquentes et les températures plus chaudes que les normales de saison, surtout pour les mois de juillet et d'août. La région la plus touchée par la faible fréquence des pluies a été le Saguenay-Lac-Saint-Jean (zone 3).

Chez l'avoine, la maladie des taches ovoïdes (*Stagonospora avenae*) a été observée dans toutes les régions visitées. L'intensité des symptômes a été moyenne en 2004 et légèrement plus faible en 2005. La rouille couronnée (*Puccinica coronata*) a été assez grave en 2004 à Sainte-Anne-de-Bellevue (zone 1) pour la grande majorité des lignées à l'essai. Elle s'est aussi manifestée à La Pocatière (zone 3) pendant les 2 années avec une intensité moyenne, et à Saint-Simon (zone 1), Sainte-Rosalie (zone 1) et Pintendre (zone 2) en 2005 avec une intensité faible. La jaunisse nanisante de l'orge (VJNO) a été observée seulement en 2004 dans la zone 3 et son incidence a été faible.

Chez le blé, c'est la présence de *Cochliobolus sativus* parmi les agents habituels des taches foliaires (*Drechslera tritici-repentis* et *Stagonospora nodorum*) qui a été remarquée en 2004 dans tous les essais. L'intensité des symptômes de toutes ces taches foliaires confondues se situait dans la catégorie moyenne. En 2005, l'intensité des symptômes dus à ces maladies a aussi été moyenne. La rouille des feuilles (*Puccinia triticina*) a été, en 2004 et 2005, assez répandue en zones 1 et 2, mais elle a eu peu d'incidence. L'oïdium (*Blumeria graminis* f. sp. *tritici*, syn. *Erysiphe graminis*) a été observé en 2004 à Pintendre (zone 2) et à Princeville (zone 2), et en 2005 à Princeville seulement. L'intensité des symptômes variait de nulle à moyenne. Les symptômes de fusariose de l'épi (*Fusarium* spp.) ont été surtout observés dans la zone intermédiaire en 2004, alors qu'en 2005 c'est la plaine de Montréal qui a été la zone la plus touchée. Les taches des glumes (*Stagonospora nodorum*) ont été notées seulement dans l'essai de Saint-Augustin (zone 2) en 2004. L'échelle de symptômes variait beaucoup d'une lignée à l'autre, allant de la catégorie faible à élevée. La jaunisse nanisante a été très peu présente chez le blé autant en 2004 qu'en 2005. Des pourritures du collet, que l'on soupçonne être associées à des dommages causés par la mouche de Hesse, ont été observées en 2005.

Chez l'orge, la tache helminthosporienne (*Cochliobolus sativus*) a été la tache foliaire dominante un peu partout au Québec en 2004 tout comme ce fut le cas chez le blé, alors qu'en 2005 c'est la rayure réticulée (*Drechslera teres*) qui a dominé. La rhynchosporiose (*Rhynchosporium secalis*) était elle aussi présente, mais elle s'est surtout manifestée en 2004 dans la zone 3. L'intensité des symptômes de ce complexe de maladies foliaires variait de moyenne à élevée selon les essais et les lignées. En 2005 la rouille des feuilles (*Puccinia hordei*) a été observée sur les semis tardifs, alors que l'oïdium (*Blumeria graminis* f.sp. *hordei*, syn. *Erysiphe graminis*) et la jaunisse nanisante de l'orge n'ont été notés ni en 2004 ni en 2005.

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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 2005

INTRODUCTION AND METHODS: Surveys for corn pests were conducted in Ontario and Québec from August 23 to September 13, 2005. The emphasis of this year's survey, as previously [2, 3, 4, 5, 6, 7], was to determine the distribution and severity of the bacterial disease, Stewart's wilt (*Pantoea stewartii* = *Erwinia stewartii*). We also recorded the distribution and severity of other diseases and insects, including eyespot (*Aureobasidium zeae*), common rust (*Puccinia sorghi*), northern leaf blight (*Exserohilum turcicum*), anthracnose leaf blight (*Colletotrichum graminicol*a), common smut (*Ustilago maydis*), head smut (*Sporisorium holci-sorghi* = *Sphacelotheca reiliana*), ear rot (*Fusarium spp*.), stalk rot (*Fusarium spp*., and *C. graminicol*a), corn red root rot (*Phoma terrestris* = *Pyrenochaeta terrestris*), European corn borer (*Ostrinia nubilalis*), corn rootworm (*Diabrotica longicornis* and/or *D. virgifera*), and corn flea beetle (*Chaetocnema pulicaria*). Scouting for any newer pests in Canada also was conducted, especially for grey leaf spot (*Cercospora zeae-maydis*) in Ontario.

At each of the 167 fields in Ontario and 63 fields in Québec surveyed, the incidence of each pest, and the severity of the predominant pest(s) were recorded. Six leaf samples with Stewart's wilt-like symptoms were collected in southern Ontario, as well as one possible seedling wilt sample from seed corn, obtained in late May/early June. These samples were tested for the pathogen *Pantoea stewartii*, by ELISA, using reagent sets, protocols, and antibodies provided by AGDIA Inc. (Elkhart, Indiana 46514, USA).

To test for the presence of red root rot (RRR), typical stalk rot samples with red to dark brown roots were collected from five Ontario fields and sent to S. Pouleur, Sainte-Foy (Québec) for confirmation of the presence of the causal pathogen *Phoma terrestris.* Roots were first washed carefully and then checked for symptoms. In 2005, two methods were used to confirm the presence of *P. terrestris*. The first method was the same as used last year, i.e. attempt to isolate the pathogen by plating affected tissue on a modified PDA medium, and to check for growth after 7 days [7]; the second method was to check for the presence of microsclerotia of *P. terrestris* inside root cells by direct observation under the microscope.

RESULTS AND COMMENTS:
Fungal leaf diseases: Eyespot was found in 46 fields in Ontario and 48 fields in Québec (Tables 1, 2). Eyespot was rarely found in fields surveyed in southern Ontario. Intermediate disease severity was seen in only six fields in Québec and one field in eastern Ontario, but even there, yield losses likely were very limited. Some hybrids entered in the Ontario Corn Committee (OCC) trial at Lancaster, Stormont Dundas and Glengarry County, ON, appeared to be moderately susceptible to eyespot. Common rust was found in 106 fields in Ontario and 42 fields in Québec; intermediate disease severity was observed at only one OCC trial in Chatham-Kent County, ON. All other fields surveyed in both Ontario and Québec , including six sweet corn fields, showed only limited rust development. Southern rust (*Puccinia polysora* Underw.) was not found this year. Typical symptoms of grey leaf spot were found in 56 fields in nine Ontario counties. As in 2004, grey leaf spot normally was found only on lower leaves and symptoms were never severe; however, grey leaf spot symptoms were abundant at the Ilderton OCC trial, Middlesex, ON, and particularly so in a seed corn field at Tilbury, Chatham-Kent, ON in 2005. Considering the environmental conditions in 2005 (see Summary below), this was surprising, and the grey leaf spot levels in this instance would have been sufficient to caused significant yield loss. The severity of grey leaf spot in this field is

the highest we have observed since we began our surveys of field and seed corn in 1998. No grey leaf spot was found in Québec.

Anthracnose leaf blight (ALB) was found in 113 fields in Ontario and 15 in Québec. There were more corn fields with ALB in southern Ontario than in eastern Ontario or Québec. One seed corn field in Chatham-Kent County, ON, had severe anthracnose leaf blight mixed with northern leaf blight, and this resulted in early death of the crop in late August. Northern leaf blight (NLB) was found in 66 fields in Ontario and 13 fields in Québec. In Chatham-Kent County, ON, intermediate and severe levels NLB were observed, including in two seed corn fields in which all of plants had died by the end of August. This was the third consecutive year that severe NLB was found around Erie Beach, Chatham-Kent, ON. Some hybrids at the Lancaster OCC trial, and some corn crops in Stormont Dundas and Glengarry County, ON appeared to be highly susceptible to NLB. One field having intermediate NLB severity was observed in each of the following counties: Elgin, Middlesex, and Wellington, in Ontario, and La Rivière-du-Nord, and Argenteuil, in Québec. The results of the 2004 [7] and 2005 corn disease surveys indicate that northern leaf blight is becoming a more serious problem in Canada, and that losses are increasing and could pose a significant risk in future.

The new foliar disease reported in 2004 [7], displaying brown to reddish brown lesions similar to those of diplodia leaf spot, was found again in 2005 at the Lancaster OCC trial field in Stormont Dundas and Glengarry County, ON, in a field in Les Maskoutains, QC, and in the same field in Le Bas-Richelieu, QC where this disease was first observed in 2004.

Fungal Ear and Stalk diseases: Gibberella/Fusarium ear rots were observed in 96 fields in Ontario and 32 fields in Québec (Tables 1, 2). Because the summer of 2005 was relatively warm, corn matured 10-14 days earlier than usual; therefore, ear rot symptoms appeared as early as the end of August. In most crops disease incidence was low (<1%); however, in some hybrids the incidence was more than 10% in Dufferin County, ON and as high as 50% in Middlesex County, ON. Ear rot incidence increased as the season progressed, likely due to the high rainfall in September and October. Common smut was widely distributed across 134 fields in Ontario and 47 fields in Québec. Disease incidence was >5% in 12 fields in Ontario, including in some hybrids with 50-70% incidence in Dufferin and Oxford Counties and in one silage corn hybrid with >50% smut in Leeds and Grenville. In Québec, three fields with a relatively high incidence of common smut were observed, one field in each of La Vallée-du-Richelieu (>10%), Les Maskoutains (26%), and Lotibinière (>5%). Drought stress was not equal in the 15 fields with >5% incidence; in eight it was intermediate, in four it was low, and three were without drought stress.

Head smut was found in a total of eight fields in the counties of Renfrew and Ottawa-Carleton, ON, and D'Autray, Francheville, Maskinongé, Montcalm, and Rouville, QC (Tables 1, 2). In Québec, the fields in Maskinongé and Rouville had head smut incidences of 10% and 15%, respectively. At the AAFC Greenbelt Farm, Ottawa-Carleton, ON, which has been monitored since 1998 [2, 3, 4, 5, 6, 7] the head smut incidence was again high (11%), despite a rotation to soybean in 2004. In 2005, only one corn field with head smut (<1%) was found around a Renfrew, ON farm where the incidence of head smut was as high as 89% in 2004 [6]. Head smut could not be found in some fields where head smut was present in 2004, including the fields at an organic farm in Les Maskoutains, QC [7].

Aspergillus ear rot and Cladosporium rot were found at harvest in Ottawa-Carleton, ON in 2005. Black kernel rot, caused by *Botryodiplodia theobromae*, was observed in two fields in Québec. Many ears had black mould/spores on kernels damaged by the feeding of birds or insects.

Stalk rot, including Anthracnose stalk rot/top-die back, *Fusarium* stalk rot, and *Pythium* stalk rot were found in 74 fields in Ontario and 32 fields in Québec (Table 1, 2). As in the case of ear rot, stalk rot symptoms appeared earlier that usual, i.e., by the end of August. In southern Ontario, none of these occurrences caused serious damage by the time of the surveys; however, three fields in Québec and two fields in eastern Ontario had incidences of top-die back of 50-90%. The typical pink to red to brown discolouration of roots symptomatic of corn red root rot (RRR) was observed in three southern and two eastern Ontario fields. Microsclerotia of *P. terrestris* were observed in all five samples, but the pathogen was isolated from only one sample when modified PDA medium was used. *Exserohilum pedicellatum* (teleomorph: *Setosphaeria pedicellata*), another corn root rot pathogen [1], was isolated from three of the five samples.

Bacterial diseases: As was the case in 2003 and 2004 [6, 7] Stewart's wilt was not frequent in 2005. Stewart's wilt-like symptoms were found in only six fields in southern Ontario in the county of Chatham-Kent (Table 1). No Stewart's wilt was found in eastern Ontario or Québec. Of the six leaf-wilt samples taken, three were positively identified to be Stewart's wilt by ELISA. The one seedling sample tested was negative. It was noted that populations of the corn flea beetle, the insect vector, were very low in southern Ontario in 2005, as they were in 2003 and 2004 [6, 7].

Holcus leaf spot (*Pseudomonas syringae*) was observed in one field in Elgin, ON. This disease only developed in the outside 5-rows of plants next to a road. No Goss' bacterial wilt (*Clavibacter michiganensis* subsp. *nebraskensis = Corynebacterium nebraskense*) was observed in 2005.

Viral diseases: Maize dwarf mosaic symptoms were observed on one occasion on small, late-germinated plants in Oxford County, ON. No other viral disease was recognized in 2005, even in late seeded sweet corn fields which were at the silking stage at the time of the surveys.

Insects: European corn borer (ECB) damage was observed in 122 fields in Ontario and 48 fields in Québec (Tables 1, 2). As usual, ECB damage was higher in eastern Ontario and Québec than in southern Ontario. Incidence of ECB damage ranged from 10 to 25% among certain hybrids in the counties of Dufferin, Wellington, and Stormont Dundas and Glengarry, ON. In Québec, some hybrids exhibited 5-30% incidence of ECB in the counties of Becancour, Bellechasse, Desjardins, Lotibinière, and Maskinongé.

Corn rootworm (CRW) damage in 2005 was observed in 118 fields in Ontario and 44 fields in Québec (Tables 1, 2). As found previously, the main damage from CRW in most fields was due to leaf feeding and silk pruning; however, lodging due to CRW was recorded in some fields in Essex and Renfrew, ON.

In 2005, as in 2004, aphid populations generally were lower than usual, but were numerous in a few fields in eastern Ontario and Québec. In one sweet corn field in Rouville, QC, aphid bodies covered the tassels and husks; however, no virus disease was detected in this field. Corn blotch leaf miner (*Agramyza parvicornis*) was found in all fields surveyed in both Ontario and Québec, but damage was very slight; this also was the case in 2003 and 2004. Fewer grasshoppers, most likely the red-legged grasshopper (*Melanoplus femur-rubrum*), were observed in 2005 than in 2004 and 2003, especially in southern Ontario. Brown stink bug (*Euschistus servus*) was found in few fields in Frontenac, Leeds and Grenville, ON and Desjardin, QC, but their populations were very low.

Mites: The dry and warm summer conditions led to high populations of two-spotted spider mite (*Tetranychus urticae = T. bimaculatus*) in 2005, a different situation from that in 2004 and 2003. In many fields in southern Ontario, and in Frontenac County and Leeds and Grenville County, ON, corn plants sufferedboth from drought stress and mite damage. In two seed corn fields in southern Ontario where mite pressure was very high, leaves turned red to brown in colour and some plants died.

Others: Damage from birds and other animals was severe in many fields. At one field in Renfrew, ON, deer ate the cobs as far as 10-30m into the field adjacent to neighbouring brush. Pythium seedling damp-off was not found in 2005

SUMMARY: As a result of the dry and warm 2005 summer and the rainy September and October that followed, eyespot and common rust were found at only very low severities. Compared to previous results, anthracnose leaf blight and northern leaf blight were found in more fields in 2005, sometimes with a high incidence and intermediate to high severity in crops without drought stress. Grey leaf spot was distributed across more fields in several southern Ontario counties, but at a low severity. Common smut was severe in various drought stressed fields. Ear rot and stalk rot were found earlier than usual as plants matured 10-14 days faster than usual in 2005. Some crops developed additional ear rot late in the season because of the rainy September and October. Mite damage was severe in 2005, and this

sometimes coincided with severe drought stress. Stewart's wilt incidence remained very low due to minimal disease expression in the previous two years and low corn flea beetle populations in 2005. European corn borer, corn rootworm, and grasshopper were lesser problems in 2005 than 2004 in both Ontario and Québec.

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Table 1: Distribution of corn pests in Ontario in 2005 in relation to counties.

County	# of fields	Eyespot	Rust	GLS	ALB	NLB	Wilt	Smut	H.smut	Ear rot	Stalk rot	ECB	CRW	CFB
Chatham-Kent	32	0	16	22	26	17	3	29	0	17	10	24	22	6
Dufferin	4	4	2	0	4	2	0	2	0	3	4	1	4	0
Elgin	9	0	6	2	7	4	0	4	0	5	3	5	5	0
Essex	6	0	1	6	4	3	0	6	0	1	0	2	6	0
Frontenac	5	3	2	0	2	2	0	1	0	3	4	2	1	0
Huron	9	4	9	6	5	4	0	7	0	7	2	8	9	0
Lambton	8	0	3	5	8	3	0	8	0	3	2	7	7	0
Lanark	4	1	4	0	3	1	0	4	0	2	4	3	2	0
Leeds and Grenville	9	0	4	0	6	2	0	7	0	3	6	6	8	0
Middlesex	14	3	10	8	9	5	0	10	0	7	3	11	9	0
Norfolk	4	1	4	1	2	2	0	3	0	2	1	3	3	0
Ottawa-Carleton	9	5	7	0	3	2	0	8	1	9	8	9	6	0
Oxford	8	3	4	5	7	2	0	5	0	4	1	7	7	0
Perth	5	2	3	0	5	4	0	5	0	4	2	4	5	0
Prescott and Russell	4	3	4	0	1	0	0	3	0	2	2	4	2	0
Renfrew	11	5	8	0	6	3	0	9	1	4	8	7	5	0
Simcoe	4	0	3	0	2	0	0	4	0	2	1	2	2	0
Stormont Dundas and Glengarry	12	9	8	0	6	4	0	11	0	9	9	10	6	0
Waterloo	3	2	2	0	2	2	0	3	0	3	0	2	3	0
Wellington	7	1	6	1	5	4	0	5	0	6	4	5	6	0
Total	**167**	**46**	**106**	**56**	**113**	**66**	**3**	**134**	**2**	**96**	**74**	**122**	**118**	**6**

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

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Table 2: Distribution of corn pests in Québec in 2005 in relation to counties.

County	# of fields	Eyespot	Rust	GLS	ALB	NLB	Wilt	Smut	H. smut	Ear rot	Stalk rot	ECB	CRW	CFB
Acton	2	2	2	0	0	1	0	1	0	1	1	2	1	0
Argenteuil	4	1	4	0	1	1	0	2	0	2	2	4	4	0
Arthabaska	2	2	1	0	1	0	0	0	0	0	2	2	1	0
Becancour	2	1	2	0	0	0	0	1	0	2	1	1	1	0
Bellechasse	2	1	2	0	0	0	0	1	0	0	0	1	0	0
Brome-Missisquoi	1	1	0	0	1	0	0	1	0	1	1	0	1	0
D’Autray	4	3	3	0	0	0	0	4	1	3	2	4	3	0
Desjardins	3	2	2	0	0	0	0	3	0	1	0	1	0	0
Drummond	1	1	0	0	0	1	0	0	0	0	0	1	1	0
Francheville	1	0	0	0	0	0	0	1	1	1	1	0	1	0
Joliette	1	0	1	0	1	0	0	1	0	1	1	1	1	0
Lajemmerais	1	1	1	0	1	0	0	1	0	1	0	1	1	0
La Rivière-du-Nord	1	1	1	0	0	1	0	0	0	0	0	1	0	0
La Vallée-du-Richelieu	1	1	0	0	0	0	0	1	0	1	0	1	1	0
Le Haut-Richelieu	3	3	0	0	1	1	0	3	0	0	1	2	3	0
Les Jardins-de-Napierville	3	3	2	0	1	1	0	2	0	1	2	2	3	0
Les Maskoutains	5	5	4	0	4	3	0	5	0	4	4	4	5	0
L´Erable	2	2	1	0	1	0	0	0	0	1	1	2	1	0
Lotibinière	4	3	3	0	0	0	0	4	0	1	0	3	3	0
Maskinongé	3	2	1	0	0	0	0	2	1	3	1	3	1	0
Montcalm	3	2	2	0	0	0	0	2	2	1	3	2	2	0
Montmagny	3	1	3	0	0	0	0	1	0	0	0	3	1	0
Roussillon	1	1	1	0	0	0	0	1	0	1	1	1	1	0
Rouville	4	3	2	0	2	2	0	4	1	2	3	2	4	0
Vaudreuil-Soulanges	6	6	4	0	1	2	0	6	0	4	5	4	4	0
Total	**63**	**48**	**42**	**0**	**15**	**13**	**0**	**47**	**6**	**32**	**32**	**48**	**44**	**0**

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

CULTURE / CROP: Maïs
RÉGION / LOCATION: Québec

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TITRE / TITLE: INVENTAIRE DE LA MALADIE DES RACINES ROSES DU MAÏS AU QUÉBEC EN 2005

INTRODUCTION ET MÉTHODES: La maladie des racines roses du maïs est causée par un complexe de champignons dont le plus important est le *Phoma terrestris* (syn. *Pyrenochaeta terrestris*) (2). Elle cause une détérioration des racines qui entraîne des pertes de rendement pouvant atteindre 15 à 20 % (1, 3). Le *P. terrestris* est surtout connu chez l'oignon où il cause aussi la maladie des racines roses (4). Chez le maïs, cette maladie a été observée pour la première fois au Québec en 1999 (7). La seule autre mention chez le maïs pour le Canada remonte à 1961 alors que Whitney et Mortimore (8) avaient signalé ce champignon dans le sud de l'Ontario. En 2004, un inventaire exploratoire a révélé la présence de cette maladie à plusieurs endroits dans la région du Sud-Ouest du Québec et dans la région d'Ottawa (9). Pour vérifier l'ampleur de la distribution de cette maladie dans la province, un autre inventaire a été réalisé. Du 7 au 9 septembre 2005, on a visité des champs de maïs situés au Québec pour déterminer l'incidence de la maladie des racines roses et la fréquence du *P. terrestris*. En septembre et octobre, des collaborateurs nous ont aussi fait parvenir des racines de maïs provenant de champs dont les plantes souffraient de problèmes aux racines.

Dans chacun des 54 champs prospectés, 3 à 5 plantes montrant des symptômes soupçonnés d'être causés par des problèmes aux racines ont été prélevées. En absence de telles plantes, les échantillons étaient prélevés au hasard. Chaque racine a été déterrée avec le sol et une motte de 10 à 20 cm de diamètre a été rapportée au laboratoire. Les racines ont été lavées minutieusement et l'intensité des symptômes de pourriture a été évaluée sur une échelle de 0 à 9. Par la suite, deux méthodes ont été utilisées pour vérifier la présence du *P. terrestris* dans les racines nécrosées. La première consistait à examiner des racines malades au microscope pour y rechercher des microsclérotes, structures de conservation du champignon qui se forment à l'intérieur des cellules de racines. La deuxième approche consistait à prélever des morceaux de racines montrant des symptômes de la maladie et à les placer sur une gélose à la pomme de terre (PDA modifié). La croissance du *P. terrestris* a été déterminée après 7 jours d'incubation à 25°C. La présence d'autres champignons pathogènes a aussi été notée.

RÉSULTATS et DISCUSSIONS:
Maladie des racines roses: La gravité des symptômes de pourritures de racines en général a varié de nulle à très élevée (tableau 1). Dans certains cas les symptômes de la maladie des racines roses étaient typiques, soit une importante réduction du volume de racines et une coloration allant du rouge vin au rouge brique presque brun. Par contre, dans d'autres cas, il y avait seulement une coloration brun foncé tirant sur le noir et peu de racines atteintes.

Pour obtenir une vue d'ensemble de la distribution de la maladie au Québec, nous avons regroupé arbitrairement les endroits échantillonnés en trois zones et calculé les moyennes des différents paramètres pour chaque zone (tableau 2). La zone 1, située au sud du fleuve Saint-Laurent débute à l'Ouest à Vaudreuil-Dorion et se termine à Warwick, la zone 2, aussi au sud du Saint-Laurent, commence à Gentilly et s'étend vers l'est jusqu'à Montmagny, puis la zone 3, au nord du Saint-Laurent, débute à l'Assomption et se termine à Trois-Rivières.

Les indices de pourriture de racines ont été beaucoup plus élevés dans les zones 1 et 3 que dans la zone 2. La fréquence d'isolement du *P. terrestris* a suivi la même tendance avec 74 % des échantillons infectés dans la zone 1 et 82 % dans la zone 3 (tableau 2). Le climat plus chaud de ces deux régions combiné à la culture intensive du maïs depuis longtemps pourrait avoir contribué à l'augmentation des populations de ce champignon. En effet, il a été démontré que la monoculture du maïs fait augmenter l'intensité de cette maladie de façon appréciable (6). En général, on a retrouvé plus souvent ce champignon lorsque les indices de pourriture étaient élevés, mais dans certains cas le champignon n'a pas été isolé même lorsque l'indice était élevé (tableau 1). L'incapacité à retrouver le *P. terrestris* sur milieu de culture pourrait être due à des champignons saprophytes ayant envahi les racines ravagées par la maladie. Les microsclérotes de *P. terrestris* ont été observés pratiquement dans tous les échantillons (tableau 1) et le pourcentage d'échantillons positifs est semblable pour les trois zones (tableau 2). Par contre, en considérant les échantillons individuellement, on constate que les microsclérotes étaient moins abondants dans la zone 2 où ils étaient souvent présents à l'état de trace. Cela indique que le champignon est présent, mais en quantité insuffisante pour causer des dommages ou encore que les conditions climatiques ne l'ont pas favorisé. La détection des microsclérotes au microscope est donc une méthode beaucoup plus sensible que l'isolement sur milieu de culture. La densité de champignon doit peut-être atteindre un seuil minimum pour qu'il puisse se développer sur le milieu de culture. Les pertes de rendement n'ont pas été estimées mais, d'après l'état visuel des racines de certains champs, elles pourraient être considérables. De plus, des agronomes nous ont mentionné plusieurs cas de verse et de cas où il était facile d'arracher des plants de maïs à la main en fin de saison. Ceci est inhabituel et indique que les racines sont en mauvais état.

Autres agents pathogènes: Le *Exserohilum pedicellatum* a été isolé dans 56 % des échantillons de la zone 1, 19 % de la zone 2 et 9 % de la zone 3 (tableau 2). C'est la première fois que cet agent pathogène est rapporté au Canada chez le maïs. Il cause une pourriture appelée « helminthosporium pedicellatum root rot » qui n'est pas considéré comme maladie d'importance économique sauf en Californie (5). Le *Bipolaris sorokiniana* a été isolé dans 19 % des échantillons des zones 1 et 2, mais pas dans la zone 3. Ce champignon peut causer des pourritures de racines, mais sans pertes économiques importantes. D'autres agents pathogènes potentiels et souvent fréquents tels que les *Fusarium* et les *Pythium* ne pouvaient être mis en évidence dans le test d'isolement utilisé. Ces champignons font partie du complexe des pourritures de racines et pourraient avoir contribué aux pourritures que nous avons observées.

CONCLUSION: Le début de la saison 2005 a été humide et plutôt frais, ce qui a probablement ralenti l'implantation du maïs. Ces conditions favorisent habituellement le développement de maladies des racines, surtout celles causées par les *Pythium*. Par la suite, la saison s'est réchauffée plus qu'à l'habitude, ce qui pourrait avoir favorisé la maladie des racines roses qui affectionne le temps chaud. Cet inventaire confirme que cette maladie causée par le *Phoma terrestris* est bien présente au Québec. Elle semble très importante dans les zones à forte production de maïs de l'ouest du Québec. Elle pourrait probablement devenir importante ailleurs où le *P. terrestris* est présent si la production de maïs augmentait ainsi que les températures. L'analyse des racines a montré que l'observation microscopique directe des microsclérotes est une méthode plus sensible que l'isolement sur milieu de culture pour détecter le *P. terrestris*. Cet inventaire a aussi permis d'observer, pour la première fois au Canada chez le maïs, le *Exserohilum pedicellatum*, un autre agent pathogène des racines. Les maladies des racines du maïs sont manifestement présentes au Québec. Il serait donc pertinent d'intensifier les efforts de recherches dans ce domaine.

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Tableau 1. Distribution et intensité de maladies des racines du maïs au Québec en 2005 et fréquence de certains champignons pathogènes

Localité	Intensité moyenne (0 à 9)	Microsclérotes du *Phoma terrestris*	Isolement du *Phoma terrestris*	Isolement du *Exserohilum pedicellatum*	Isolement du *Bipolaris sorokiniana*
Zone 1					
Vaudreuil-Dorion	8,0	+++	–	+++	+
Boucherville	3,2	++	–	+++	–
Saint-Charles (Montérégie)	3,2	++	–	–	–
La Présentation	3,6	++	+	+	–
La Présentation	6,3	++	+	–	–
Saint-Pie (de Bagot)	3,0	++	+++	+	++
Saint-Pie (de Bagot)	5,3	+++	++	+	+
Saint-Pie (de Bagot)	6,5	+	–	+	–
Saint-Aimé	8,0	++	+	+	–
Saint-Ours	7,5	trace	+++	–	–
Sainte-Angèle	3,3	+++	+	++	–
Saint-Césaire	4,4	+	–	+++	–
Saint-Césaire	6,3	++	+	–	–
Saint-Césaire	4,7	++	++	–	–
Sainte-Sabine	4,0	+	++	–	–
Ange-Gardien	4,7	++	+	++	–
Saint-Alexandre	2,3	+	–	–	–
Saint-Jean-sur-Richelieu	4,7	+	+	++	–
Saint-Cyprien	2,0	+	++	+	–
Napierreville	6,7	++	++	++	–
Saint-Édouard	6,7	+	++	–	–
Saint-Rémi	5,3	++	+	+++	–
Upton	1,5	++	–	–	–
Upton	4,0	+	++	++	+
Durham	1,7	++	++	–	–
Warwick	3,7	+	++	–	–
Warwick	3,0	++	++	–	+

Zone 2					
Gentilly	4,0	+++	–	+	–
Princeville	1,3	+	+	–	–
Princeville	0,7	++	–	–	–
Deschaillons-sur-Saint-Laurent	2,0	+++	–	+	–
Lotbinière (près de Leclerville)	0,3	++	–	–	+
Sainte-Croix (de Lotbinière)	1,3	trace	–	–	+
Issoudun	0,0	++	–	–	–
Saint-Gilles (de Lotbinière)	1,7	+++	–	+	–
Saint-Henri (de Lévis)	1,3	trace	–	–	–
Saint-Henri (de Lévis)	2,7	++	+++	–	–
Lévis (rang Harlaka)	0,0	trace	–	–	–
La Durantaye	0,0	trace	–	–	–
Saint-Raphaël (Bellechasse)	0,3	–	–	–	+
Saint-François de Montmagny	0,3	++	–	–	–
Montmagny	1,3	+	–	–	–
Montmagny	0,3	trace	–	–	–
Zone 3					
L'Assomption	6,4	+	+++	–	–
L'Assomption	2,2	+++	+	–	–
Saint-Alexis	3,4	+	+++	+	–
Saint-Ambroise-de-Kildare	2,8	++	+	–	–
Sainte-Élisabeth	8,6	++	+++	–	–
Berthierville	4,0	++	++	–	–
Berthierville	6,0	++	+	–	–
Maskinongé	2,0	trace	–	–	–
Louiseville	2,0	trace	++	–	–
Yamachiche	2,3	+	+	–	–
Trois-Rivières	4,7	trace	–	–	–

Tableau 2. Résultats moyens par zones

Zone	Nombre d'échantillons	Intensité moyenne (0 à 9) (extrêmes)	Pourcentage d'échantillons			
			Microsclérotes du *Phoma terrestris*	*Phoma terrestris*	*Exserohilum pedicellatum*	*Bipolaris sorokiniana*
1	27	4,6 (1,5 à 8,0)	100	74	56	19
2	16	1,1 (0 à 4,0)	94	13	19	19
3	11	4 (2,0 à 8,6)	100	82	9	0

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

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TITLE / TITRE: CROWN RUST OF OAT IN WESTERN CANADA IN 2005

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 12 to August 18 in 2005. Surveys for the rust in southeastern Saskatchewan were conducted on July 18-19, August 10-11, and August 15-16. All locations surveyed in 2005 were recorded on a handheld global-positioning device (Garmin GPS map 60C). Crown rust collections were obtained from susceptible wild oat (*Avena fatua* L.) plants, commercially grown oat 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 at Indian Head, SK. Virulence phenotypes of single-pustule isolates established from the rust collections were identified, using 16 single-gene backcross lines carrying crown rust resistance genes *Pc38, Pc39, Pc40, Pc45, Pc46, Pc48, Pc50, Pc51, Pc52, Pc54, Pc56, Pc58, Pc59, Pc62, Pc64,* and *Pc68* as the primary differential hosts. Single-gene lines with *Pc91, Pc94*, and *Pc96* were used as supplemental differentials. Genes *Pc48, Pc68, Pc91, Pc94*, and *Pc96* in various combinations have been or are being used in oat breeding programs across Canada (Cereal Research Centre, Winnipeg, MB; Eastern Cereal and Oilseed Research Centre, Ottawa, ON; and Crop Development Center, Saskatoon, SK).

RESULTS AND COMMENTS: The outbreak of crown rust in Manitoba and eastern Saskatchewan was one of the earliest and most severe in many years. Conditions were favourable for the rust, plus many fields were planted late due to excessive rain in late spring and early summer. Fields of ‘AC Assiniboia’ and ‘Ronald’ in areas near Carman, Portage and Oak Lake, MB, had crown rust severities of 40%-80% by the fourth week of July. In many late-planted fields, while severities ranged from trace to 20% at this same time, the epidemic progressed rapidly and severity reached 60%-100% two weeks later. The acreage of oat cultivars relying on *Pc68* for resistance has increased steadily from 8% in 1998 to over 80% in 2005. The severe crown rust infections seen in many commercial oat fields across Manitoba and eastern Saskatchewan in 2005 most likely spell the end to the decade-long effectiveness of this gene.

To date, 265 single-pustule isolates of *P. coronata* f. sp. *avenae* have been established from collections obtained from wild oat and oat fields in Manitoba and eastern Saskatchewan; 154 of these came from wild oat and 111 from cultivated oat. Frequencies of virulence of these isolates to the 19 single-gene differential host lines are shown in Table 1. There was a large increase in isolates having virulence for *Pc68*. Over 44% of the isolates from wild oat and 73% of the isolates from cultivated oat were virulent on *Pc68*, compared to 17% of the isolates from wild oat and 39% of the isolates from cultivated oat in the previous year. In contrast, frequency of virulence to *Pc48*, a gene present in ‘Triple Crown’, was less than 9%. Since the first report of severe crown rust infections on this cultivar in Manitoba in 2001, there has been a marked decline in the acreage of ‘Triple Crown’. This might account for the gradual decrease in virulence frequency to this gene since 2001. Frequencies of virulence to *Pc38* and *Pc39* remained at high levels (over 82%) in the rust population as these genes are present in all the cultivars with *Pc68* (including ‘AC Assiniboia’, ‘AC Pinnacle’, ‘Ronald’, ‘Furlong’), as well as in the older cvs. ‘Dumont’, ‘Robert’, ‘Riel’ and ‘AC Preakness’, which are still being grown in the eastern prairies.

The cv. ‘Leggett’, released in 2004, contains *Pc94* in addition to *Pc68*. In 2005, no virulence was detected to *Pc94*. Virulence to this gene, though rare, has been detected previously in the prairie crown rust population. Virulence frequency to *Pc96* was 2%. Gene *Pc91* is being used extensively in the oat breeding program at the North Dakota State University and ‘HiFi’ is the first cultivar released from this program which has this gene. Genes *Pc91, Pc94* and *Pc96,* as well the resistance in cvs. ‘Gem’ and ‘Vista’ developed in the University of Wisconsin oat breeding program, are being used as resistance sources in the oat breeding program at the Cereal Research Centre, Winnipeg. One crown rust isolate from wild oat was found to have virulence for *Pc91* in 2005. An isolate with virulence for this gene also was found in the prairie rust population in both 2002 and 2003. Virulence to the resistance in ‘Gem’ and ‘Vista’ has also been detected in the prairie rust population.

Table 1. Frequencies (%) of *Puccinia coronata* f. sp. *avenae* isolates with virulence to 19 single-gene differential oat (*Avena sativa*) lines in western Canada in 2005

	Wild oat		Cultivated oat	
Pc gene line	No. of isolates	%	No. of isolates	%
38	127	82.5	100	90.1
39	137	89.0	109	98.2
40	86	55.8	61	55.0
45	1	0.6	0	0.0
46	52	33.8	55	49.5
48	14	9.1	11	9.9
50	8	5.2	12	10.8
51	67	43.5	44	39.6
52	14	9.1	11	9.9
54	4	2.6	4	3.6
56	54	35.1	48	43.2
58	5	3.2	3	2.7
59	20	13.0	14	12.6
62	5	3.2	4	3.6
64	19	12.3	16	14.4
68	69	44.8	81	73.0
91	1	0.6	0	0.0
94	0	0	0	0.0
96	3	1.9	2	1.0
Total no. of isolates	154		111	

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: FUSARIUM HEAD BLIGHT OF OAT IN MANITOBA IN 2005

INTRODUCTION AND METHODS: The occurrence of fusarium head blight (FHB) in oat in southern Manitoba was assessed by surveying 31 commercial fields from August 5 to 12, when most crops were at the late milk to soft dough stage of growth (ZGS 78-86). Fields were sampled at regular intervals along the survey routes, depending on availability. Fusarium head blight in each field was assessed by non-destructive sampling of a minimum of 80-100 plants at each of 3 locations for the percentage of infected panicles (disease incidence), and the average proportion of the panicle (spike) infected (SPI). FHB severity levels were calculated as the 'FHB Index' (% incidence x SPI (%) / 100). Several diseased (when found) panicles closest to each of the 3 sampled plant clumps were collected from each location, placed in plastic bags and frozen. Subsequently, 50 (when available) putatively infected kernels per field site, or a lesser number of discoloured kernels augmented by 'normal' ones, were surface-sterilized in 0.3% NaOCl for 3 min., air-dried, and plated onto potato dextrose agar to identify and quantify the *Fusarium* spp. present.

RESULTS AND COMMENTS: Conditions in spring and early summer (late April to early July) 2005 were abnormally wet and cool in southern Manitoba, affecting timely seeding operations. Due to excessive rainfall, many fields could not be planted or were damaged by subsequent flooding. Warmer, drier conditions prevailed during panicle emergence and kernel filling. The cool weather during the first half of the growing season likely depressed the production of *Fusarium* inoculum on overwintered, infested stubble in farm fields. Combined with the generally dry conditions during spike emergence and flowering, this likely reduced overall levels of FHB infection.

Most fields, 28 of 31 (90%), were assessed as being putatively affected by FHB. However, as has been the case in previous years, there was minimal evidence of the disease in the standing crop. This is likely due in part to the open head type (panicle) in oat, which compared to wheat or barley, makes it more difficult to distinguish discoloured (diseased) spikelets . Overall, the incidence of FHB was 1.6% (range 0 - 8.8%), the SPI 3.1% (range 0 - 6.6%) and the resulting FHB Index 0.05% (range 0 - 0.3%). As such, the impact of FHB was very low, and was estimated to have caused no yield loss to the commercial oat crop. This is similar to what was found in Manitoba in 2004 (Tekauz et al. 2005).

Fusarium spp. were isolated from 6.3% of 1550 oat kernels that were sampled. The highest level of *Fusarium* kernel infestation from a single field site was 28%. The six *Fusarium* spp. present and their relative frequencies are listed in Table 1. *Fusarium graminearum* and *F. poae* were most common.(each ~30% of the total), followed closely by *F. avenaceum*. On an individual field site basis, the highest levels of these three major species on kernels were 10%, 14% and 16%, respectively. Compared to 2004, the level of *F. avenaceum* was much higher, and that of *F. sporotrichioides* lower, in 2005. While the above data do not provide evidence for this, other results have indicated that considerably higher levels of *Fusarium* spp. can occur on oat kernels, accompanied by deoxynivalenol contamination; neither would be predicted from the minimal visual impact of the disease (Tekauz et al. 2004). *Cochliobolus sativus* was also found in the oat kernels in 2005 at an average level of 2.6% (range 0 - 16%).

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Table 1. *Fusarium* spp. isolated from Manitoba oat kernels in 2005.

***Fusarium* spp.**	**Percent of fields**	**Percent of kernels**
F. avenaceum	42	23.5
F. culmorum	3	1.0
F. equiseti	3	1.0
F. graminearum	90	32.7
F. poae	42	29.6
F. sporotrichioides	29	12.2

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

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TITLE / TITRE: LEAF SPOTS OF OAT IN MANITOBA AND EASTERN SASKATCHEWAN IN 2005

INTRODUCTION AND METHODS: Leaf spot diseases of oat were assessed by surveying 31 producer fields in south-central Manitoba from August 5 to 12 when most crops were at the early milk to soft dough stage of growth (ZGS 73-85). Fields were sampled at regular intervals along the survey routes, depending on availability. Disease incidence and severity were recorded by averaging their occurrence on approximately 10 plants 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 flag-1 leaves) and lower leaf canopies, using a six-category severity scale: 0 or nil (no visible symptoms); trace (<1% leaf area affected); very slight (1-5%); slight (6-15%); moderate (16-40%); and severe (41-100%). Infected leaves with typical symptoms were collected at each site, dried, and stored in paper envelopes. Subsequently, surface-sterilized pieces of infected leaf tissue were placed in moist chambers for 3-5 days to identify the causal agent(s) and the disease(s) present. Additionally, 12 oat fields in east-central Saskatchewan (Saskatoon to the Manitoba border) were sampled from August 9-11 to obtain infected leaf tissue to determine the pathogens present; these fields were not assessed for their overall foliar disease severity.

RESULTS AND COMMENTS: Conditions in spring (late April to early July) 2005 were abnormally wet and cool in southern Manitoba, affecting timely seeding operations. Due to excessive moisture, many fields could not be planted or were damaged by subsequent flooding. Warmer, drier conditions prevailed during panicle emergence and kernel filling, likely curtailing the spread of early-season infections to the upper leaves. Growing conditions in Saskatchewan in 2005 were generally favourable, although late-season rains and cooler temperatures delayed harvesting operations in some regions. It is not known how the abnormally cool spring and early summer temperatures in Manitoba affected the complex of leaf spot diseases (see below) in oat. However, development of spot blotch (*Cochliobolus sativus*), which is found in oat but is more prevalent in barley and wheat, likely would have been curtailed by the cooler conditions prevalent in 2005 (Gilbert et al. 1998).

Leaf spots were observed in the upper and/or lower leaf canopies of all 31 oat fields surveyed in Manitoba. Disease levels in the upper canopy were nil, trace, very slight or slight in 94% of fields, and moderate in 6%. Respective severity categories in the lower canopy were tabulated as 29% and 7%; in addition 64% of the foliage was senescent. Since most fields surveyed had only trace to slight levels of disease in the upper canopy, leaf spots would have caused only minimal damage in oat in 2005; on average, grain yield losses likely were <1%. This is similar to the yield loss estimates made for 2004 and 2003 (Tekauz et al. 2005, 2004).

Pyrenophora avenae (pyrenophora leaf blotch) was the predominant pathogen in 2005, accounting for about half of the foliar damage observed in south-central Manitoba, and most of that observed in east-central Saskatchewan (Table 1). *Phaeosphaeria avenaria*, asexual state *Stagonospora avenae* (stagonospora leaf blotch), and *Cochliobolus sativus* (spot blotch) each accounted for about 25% of the damage observed in Manitoba, but were of only minor significance in Saskatchewan. *Colletotrichum graminicola* was detected in one field in each of Manitoba and Saskatchewan.

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Table 1. Incidence and isolation frequency of leaf spot pathogens of oat in Manitoba and Saskatchewan in 2005

Pathogen	Incidence (% of fields)	Frequency (% of isolations)*
A. Manitoba		
Pyrenophora avenae	94	50
Stagonospora avenae	84	27
Cochliobolus sativus	74	22
Colletotrichum graminicola	3	1
B. Saskatchewan		
Pyrenophora avenae	100	86
Stagonospora avenae	33	6
Cochliobolus sativus	8	5
Colletotrichum graminicola	8	3

* indicative of the relative contribution to foliar damage

CROP / CULTURE: Oat
LOCATION / RÉGION: Ontario

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TITLE / TITRE: 2005 SURVEY FOR FUSARIUM HEAD BLIGHT OF OAT IN ONTARIO

INTRODUCTIONS AND METHODS: Grain samples from a total of eighteen oat cultivars and lines planted in the Ontario Oat Performance Trials at three locations (Palmerston, Elora and Centralia) were collected to identify the *Fusarium* spp. present on the kernels. The kernels were surface sterilized in 0.3% NaOCl and plated on potato dextrose agar to quantify and identify the species present. *Fusarium* species were identified according to Nelson et al. (1983).

RESULTS AND COMMENTS: This is the first report of the presence of *Fusarium* spp. on oat in Ontario. The species isolated from kernels are shown in Table 1. The summer of 2005 was hot and dry and not favorable for *Fusarium* infection of cereals in Ontario. In spite of this, 24.8 %, 11.1% and 33.0% of the oat kernels plated were infected with *Fusarium* spp. at Palmerston, Elora and Centralia, respectively. *Fusarium* was isolated from every oat entry grown in the Performance Trials at each of the three locations. Differences in the level of infection were noted among the entries. Additional multi year/location studies, including inoculation tests, will be necessary to confirm differences in FHB susceptibility among oat cultivars included in the Performance Trials. The level of *Fusarium*-infected kernels ranged from 6.7% to 33.3%, 6.7% to 26.7% and 6.7% to 46.7% in Palmerston, Elora and Centralia, respectively. *Fusarium sporotrichioides* was the predominant species identified on oat kernels at all three locations, followed by *F. graminearum* and *F. poae* (Table 1). Tekauz et al. (2005) isolated the same species from oat in Manitoba in 2004.

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Table 1. Percent of oat kernels infected with *Fusarium* spp. at three trial sites in Ontario in 2005.

		Percent of kernels		
***Fusarium* spp.**	**Palmerston**	**Elora**	**Centralia**	**Mean**
F. graminearum	27.8	32.1	37.1	32.3
F. sporotrichioides	50.0	44.5	48.0	47.5
F. poae	22.2	23.4	14.9	20.2

CROP / CULTURE: Wheat
LOCATION / RÉGION: Alberta

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TITLE / TITRE: FUSARIUM HEAD BLIGHT SURVEY OF WHEAT, ALBERTA 2005

INTRODUCTION AND METHODS: During August 2005, cooperative surveys for the presence of fusarium head blight (FHB) in wheat fields in the province were conducted by staff from Agriculture and Agri-Food Canada (AAFC) and four Applied Research Associations (ARA's). Collaborators were provided with sampling instructions and images of typical FHB symptoms to aid in the assessments. The surveys covered an area from the Peace River region in the north to the Oyen area of southeastern Alberta. Counts of 300 heads were taken in each of 41 fields and the incidence of FHB determined. Assessments typically were made by following a diamond-shaped path starting at least 25 m in from the edge of the field, when crops were at the late milk to dough stage of development. At each of three sites along the path, 100 random heads were evaluated. All heads exhibiting possible FHB symptoms were then sent to the AAFC Lacombe Research Centre for confirmation of symptoms and assessment of the causal agent(s). Portions of the affected heads were surfaced sterilized in 5% commercial bleach for approximately 1 minute followed by plating onto potato dextrose agar amended with 0.033 g L^{-1} Rose Bengal. Plates were incubated for at least 7 days under a combination of fluorescent and black light, before the identification of all *Fusarium* spp. present. *Fusarium* species were identified by morphological features using two reference manuals (Burgess et al. 1994, Nelson et al. 1983).

RESULTS AND COMMENTS: Twenty-one of the 41 fields surveyed had symptoms with a mean incidence of 1.3%; in individual fields incidence ranged from 0.3 to 4.7% (Table 1). Five of the 11 (45%) fields surveyed in the Peace River region displayed symptoms of FHB at incidence levels ranging from 1.3 to 4.7%, averaging 2.8%. In central Alberta and the Oyen area, 53% of fields had FHB symptoms ranging in incidence from 0.3 to 3.0%, and averaging 0.9%.

Fusarium avenaceum was the main species recovered from putative FHB-affected heads collected in central Alberta/Oyen and the Peace River, with the number of heads per field (out of 300) affected by this pathogen ranging from 1 to 2 in 10 of the 21 affected fields. No *F. graminearum* was detected from heads exhibiting suspected FHB symptoms. *Fusarium culmorum* was the sole causal agent in one of the five affected fields from the Peace River region and was recovered from only a single head.

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Table 1. Incidence of fusarium head blight in Alberta wheat crops, 2005.

Region	Total no. of crops survey-ed *	No. crops without symptoms	No. crops affected	% of crops affected	Mean incidence in affected crops (%)	Maximum observed incidence per crop
Peace River region	11	6	5	45.5	2.8	4.7
Central area and Oyen	30	14	16	53.3	0.9	3.0
Overall	41	20	21	51.2	1.3	

* 300 heads assessed per field

CROP / CULTURE: Wheat
LOCATION / RÉGION: Saskatchewan

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TITLE / TITRE: FUSARIUM HEAD BLIGHT IN COMMON AND DURUM WHEAT IN SASKATCHEWAN IN 2005

INTRODUCTION AND METHODS: Fusarium head blight (FHB) incidence and severity were assessed in 168 wheat crops in Saskatchewan in 2005: 125 common wheat (Canada Western Red Spring and Canada Prairie Spring classes) and 42 durum wheat (Canada Western Amber Durum class). Crops were surveyed between July 21 and August 19. Fields were grouped according to soil zones (Zone 1 = brown; Zone 2 = dark brown; Zone 3 = black/grey soils), and fields under irrigation were grouped separately and are referred to as in the irrigation zone (located along the South Saskatchewan River in west-central and central regions of the province).

Crop adjustors with Saskatchewan Crop Insurance Corporation (SCIC) and irrigation agrologists with Saskatchewan Agriculture and Food randomly collected 50 spikes from each crop at the milk to dough stages. The 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 glumes and/or kernels within them were recorded. A FHB disease severity rating, also known as the FHB index, was determined for each wheat crop (% FHB severity = % spikes affected x mean proportion (%) of the spike infected / 100). Mean FHB severity ratings were calculated for each soil/irrigation zone and for the whole province. Glumes and/or kernels with visible FHB symptoms were surface sterilized in 0.6% NaOCl solution for 1 min. and cultured on potato dextrose agar and carnation leaf agar for subsequent identification of *Fusarium* species.

RESULTS AND DISCUSSION: The 2005 spring and early summer conditions were moist and predicted to be ideal for crop development, abundant foliage growth, and for *Fusarium* spp. spore (inoculum) development. However, most regions experienced dry and hot conditions during cereal flowering and the risk of FHB was reduced. Hence, the overall fusarium infection levels for 2005 were very low. There was also late development of secondary moulds (including *Fusarium* spp.) due to rains during harvest in central and northern regions (Morrall et al. 2006), but that damage is not reflected in this survey.

In 2005, FHB occurred in only 34% of the common wheat and 50% of the durum wheat crops surveyed (Table 1). Mean FHB disease severities for common wheat were 0.1% in all zones. Mean FHB disease severities for durum wheat were <0.1% in Zones 1 and 2, and 0.7% for the irrigation zone. The overall mean severity ratings were less than, or similar to those of recent years (Pearse et al. 2005). Substantial FHB severities have not been reported since the 2001 survey when overall mean severity ratings were 2.9% for common- and 4.5% for durum wheat. In 2005, the highest severity in a single field was 2.4%, found in an irrigated crop of durum wheat in the south-central part of the province; most of the infection was with *F. graminearum*. Durum wheat crops had somewhat higher FHB incidence and severity ratings in the irrigation zone than elsewhere. Current durum cultivars have very poor resistance to FHB so growers using irrigation should be aware of the risk of FHB and prepared to implement management practices.

In 2005, the most commonly isolated *Fusarium* species was *F. poae*, accounting for 33% of total *Fusarium* isolations, followed closely by *F. avenaceum* (31%). The other species isolated were *F. graminearum* (11%), *F. sporotrichioides* (9%), *F. equiseti* (9%) and *F. acuminatum* (7%). *Fusarium* *graminearum* was isolated from 10 of the 125 wheat crops surveyed, which is higher than for the previous three years but lower than in 2000 and 2001 (Pearse et al. 2005). *Fusarium graminearum* was isolated from Zones 2, 3 and the irrigation zone.

Other fungi observed on the wheat spikes collected included *Cochliobolus sativus*, *Claviceps purpurea, Septoria nodorum*, *Pyrenophora* spp., and *Ustilago tritici.* Wheat midge damage was also observed on some of the samples.

ACKNOWLEDGEMENT:
We gratefully acknowledge the participation of the crop insurance adjustors with Saskatchewan Crop Insurance Corporation and the irrigation agrologists with Saskatchewan Agriculture and Food for the collection of head samples for this survey.

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Table 1. Prevalence and severity of fusarium head blight (FHB) in common wheat and durum crops grouped by soil or irrigation zones in Saskatchewan, 2005.

Soil Zones	Common Wheat		Durum Wheat	
	No. crops affected / total crops (% of crops infected)	**Mean FHB Index[1] (range of severity)**	**No. crops affected / total crops (% of crops infected)**	**Mean FHB Index[1] (range of severity)**
Zone 1 Brown	3 / 22 (14%)	T[2] (0 - 0.1%)	8 / 21 (38%)	T (0 - 0.2%)
Zone 2 Dark Brown	10 / 35 (29%)	T (0 - 0.2%)	10 / 17 (59%)	T (0 -0.4%)
Zone 3 Black/Grey	25 / 57 (44%)	T (0 - 0.3%)	-	-
Irrigated Zone	5 / 11 (45%)	0.1% (0 - 0.8%)	3 / 4 (75%)	0.7% (0 - 2.4%)
Overall Mean	43 / 125 (34%)	T	21 / 42 (50%)	0.1%

[1] FHB index = % heads affected x mean % severity of infection / 100
[2] T = Trace values of FHB (<0.1%)

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

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TITLE / TITRE: LEAF RUST OF WHEAT IN MANITOBA AND EASTERN SASKATCHEWAN IN 2005

INTRODUCTION AND METHODS: Trap nurseries and commercial fields of wheat in Manitoba and eastern Saskatchewan were surveyed for the incidence and severity of leaf rust (*Puccinia triticina* Eriks.) during July and August 2005.

RESULTS AND COMMENTS: Wheat leaf rust was first observed in Manitoba on June 20 in 2005. It developed rapidly during July and August due to warm and humid conditions. Wheat leaf rust was widely distributed throughout southern Manitoba and eastern Saskatchewan with high levels of infection throughout the region. Many fields in south-central Manitoba were treated with fungicides which limited rust development. Based on a survey of wheat fields in southern Manitoba, in non-treated fields leaf rust ranged from trace to 70% of the flag leaf area infected, with an average of 20%. Leaf rust ranged from trace to 50% of the flag leaf area infected in Saskatchewan, with an average of 22%. This was the highest level of leaf rust recorded in the past eight years in both provinces. The high level of leaf rust was particularly noticeable in eastern Saskatchewan, an area which normally only experiences relatively low levels of infection.

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: 2005 SURVEY OF FUSARIUM HEAD BLIGHT OF SPRING WHEAT IN MANITOBA

INTRODUCTION AND METHODS: Sixty-eight spring wheat fields were surveyed between July 27 and August 5, 2005 in southern Manitoba to monitor incidence and severity of fusarium head blight (FHB). The incidence and severity of FHB in each field were assessed by sampling 50 to 100 spikes at three locations (Zadoks growth stage 80-85) for incidence and severity, and additional spikes were collected for subsequent pathogen identification. Up to 30 kernels per field collection 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 *Fusarium* species was unknown, single spores were grown on carnation leaf agar or synthetic nutrient agar to facilitate identification. An FHB index was calculated as follows: Average % incidence X Average % severity/100.

RESULTS AND COMMENTS: The disease was present in all fields that were post-anthesis (67/68) at severities that were higher than in 2004. The mean FHB index ranged from 4.2% in the Interlake area and southeastern Manitoba to 8.0% in the Red River Valley. The overall average was 6.4%. Excessive moisture in May and June over much of Manitoba delayed seeding and sometimes drowned early-seeded crops. Dry warm conditions from mid-July onwards provided the temperatures needed for FHB to develop. *Fusarium graminearum* was the predominant species isolated from kernels sampled from infected heads (Table 1). Three other species were found at low levels, *F. sporotrichioides* , *F. avenaceum* and *F. equiseti* . Based on these results, FHB caused significant damage to some spring wheat fields in 2005.

Table 1. Relative frequency of *Fusarium* species isolated from kernels of spring wheat in southern Manitoba in 2005.

***Fusarium* spp.**	**%**
F. graminearuum	95.0
F. sporotrichioides	2.6
F. avenaceum	1.5
F. equiseti	0.9

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: SURVEY FOR LEAF SPOT DISEASES OF SPRING WHEAT IN MANITOBA IN 2005

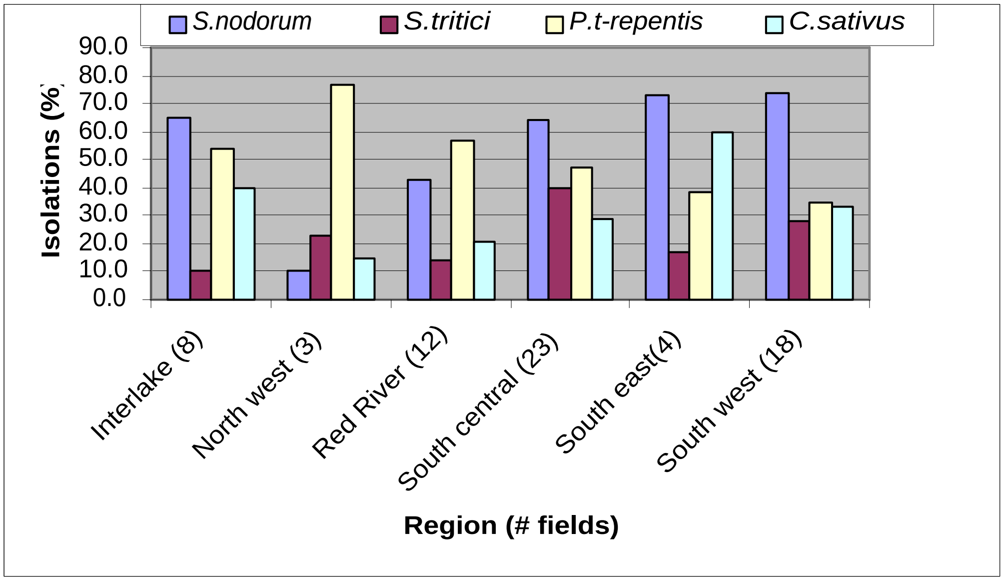
INTRODUCTION AND METHODS: A survey of 68 southern Manitoba spring wheat fields was conducted between 27 July and 5 August, 2005 to assess prevalence and severity of foliar diseases. Leaves were collected between the heading and soft dough stages of development. Severity of disease on the flag and flag $^{-1}$ leaves was recorded as the percent leaf affected. Samples of diseased leaf tissue were surface-sterilized and placed in moisture chambers for 5-7 days to promote pathogen sporulation for disease identification.

RESULTS AND COMMENTS: Average percent necrosis caused by leaf spots on the flag leaves was 55%, while the lower leaves were generally senescent by the time fields were visited. The weather was extremely wet in the early part of the growing season and warmed up after mid-July, providing favourable conditions for leaf spot disease development. *Stagonospora nodorum* and *Pyrenophora tritici-repentis* were the predominant pathogens, accounting for 40% and 32% of isolations (957 pathogen isolations in total), respectively. This continues a trend observed in recent years with isolations of *S. nodorum* increasing and those of *S. tritici* decreasing. For a second year in a row, there were lower than usual levels of *Cochliobolus sativus* observed. Tan spot and Stagonospora nodorum blotch were found in 94% and 93% of fields, respectively (Table 1). *Septoria tritici*, cause of septoria tritici blotch, accounted for 12% of isolations, similar to 2003 and 2004. Spot blotch, caused by *Cochliobolus sativus,* was the predominant leaf spot disease in southern Manitoba from 2001 to 2003, but the low temperatures did not favour development of spot blotch in 2004 or 2005. *Cochliobolus sativus* accounted for just 16% of the 957 fungal isolations from leaf tissue (Table 1). Tan spot was the predominant disease in fields around Neepawa MB (North-west survey district) in 2005. Stagonospora blotch was the predominant diseases elsewhere in Manitoba (Fig. 1).

Table 1. Prevalence and isolation frequency of leaf spot pathogens in 68 fields of hard red spring wheat in Manitoba in 2005.

	Pathogen (Disease)			
	***Stagonospora nodorum* (Stagonospora nodorum blotch)**	***Septoria tritici* (Septoria tritici blotch)**	***Cochliobolus sativus* (Spot blotch)**	***Pyrenophora tritici-repentis* (Tan spot)**
Wheat crops affected (%)	93	60	74	94
Isolations (%)	40	12	16	32

Figure 1. Isolations of foliar pathogens by region in southern Manitoba in 2005.



CROP / CULTURE: Winter Wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: 2005 SURVEY FOR FUSARIUM HEAD BLIGHT OF WINTER WHEAT IN MANITOBA

INTRODUCTION AND METHODS: The occurrence of fusarium head blight (FHB) in winter wheat in Manitoba in 2005 was assessed by surveying 36 farm fields from July 14 to 26, when most crops were at the early-dough to hard-dough stage of growth (ZGS 80-87). Because winter wheat is not widely grown in Manitoba (in 2005 it was planted on about 3.5% of the total wheat acreage in the province - Statistics Canada, Field Crop Reporting Series #8, December 2005) the fields were not surveyed at random; rather, information on their location was obtained by contacting extension personnel from Manitoba Agriculture, Food and Rural Initiatives, and producers who normally grow the crop. The fields surveyed were located in southern Manitoba, in an area bounded by Hwys #67, 1 and 16 to the north, the US border to the south, Hwy #83 to the west and Hwy #12 to the east. Fusarium head blight in each field was assessed by non-destructive sampling of a minimum of 80-100 plants at each of 3 locations to determine the percentage of infected spikes (disease incidence), and the average symptomatic spike proportion infected (SPI). These values were used to calculate the FHB Index (%) or overall FHB severity, according to the formula (% incidence x proportion (%) of the spike infected / 100). Several infected spikes were collected at each field site and stored in paper envelopes. A total of 50 discoloured and putatively infected kernels, or those of normal appearance to make up the remainder, were subsequently removed from five heads per location. The kernels were surface-sterilized in 0.3% NaOCl for 3 min., air-dried, and plated onto potato dextrose agar to quantify and identify the *Fusarium* spp. present.

RESULTS AND COMMENTS: Conditions in spring and early summer (late April to early July) 2005 were abnormally wet and cool in southern Manitoba. Due to excessive rainfall, many spring crops could not be planted or were damaged by subsequent flooding. Damage also occurred in some winter wheat crops planted in fall 2004. Warmer, drier conditions prevailed during head emergence and flowering of most spring crops, but earlier-maturing winter wheat headed and flowered from mid- June to early July, when rain and/or high humidity were still prevalent. The generally low levels of FHB in 2004 (Tekauz et al. 2005) likely reduced the amount of potential inoculum in overwintered straw and stubble in fields, and cool early-season temperatures probably resulted in less infection than may otherwise have occurred.

Symptoms of FHB were visible in all winter wheat fields surveyed. Overall, incidence of FHB was 25.8% (range 6.9 - 59.0%), SPI 53.5% (range 33.0 - 80.0%) and the resulting FHB Index 14.7% (range 3.4 - 47.1%). As such, FHB had a major impact on the crop in 2005 and was estimated to have caused average yield losses of about 10%. This level of loss is 10x higher than estimated for 2004 and 2003 (Tekauz et al. 2005, 2004), and represents the highest level of FHB in winter wheat since surveys were begun in 1998. This also is the highest level of FHB recorded for any cereal crop in Manitoba in the past 10 years. Despite the high levels of FHB, levels of deoxynivalenol (DON) in grain were below normal in 2005 (A.Tekauz, unpublished data). This may have been because lower than normal cumulative temperatures throughout the growing season curtailed DON synthesis in infected grain.

Fusarium spp. isolated and their occurrence in fields and on kernels are listed in Table 1. As regularly found for winter- and spring wheat in Manitoba, *F. graminearum* was the dominant species in 2005.

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Table 1. *Fusarium* spp. isolated from winter wheat in Manitoba in 2005.

***Fusarium* spp.**	**Percent of fields**	**Percent of kernels**
F. avenaceum	6	0.1
F. graminearum	97	99.8
F. sporotrichioides	6	0.1

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

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TITLE / TITRE: DISEASES OF SPRING WHEAT IN EASTERN ONTARIO IN 2005

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

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

RESULTS AND COMMENTS: Eleven diseases were observed in the fields surveyed (Table 1). Septoria/stagonospora leaf blotch (normally associated with infection by *Septoria tritici* and *Stagonospora* spp.) and spot blotch (*Cochliobolus sativus*) were the most prevalent foliar diseases, observed in 25 and 23 of the fields at mean severities of 2.3 and 2.4, respectively. Severe infection from either disease was not observed but moderate levels of infection were recorded in seven fields affected by Septoria/stagonospora leaf blotch and eight fields by spot blotch. Yield reductions due to either disease were estimated to average at least 5% in the surveyed fields.

Leaf rust (*Puccinia triticina*), septoria (stagonospora) glume blotch (*Stagonospora nodorum*), and tan spot (*Pyrenophora tritici-repentis*) were observed in 21, 24, and 25 fields at mean severities of 1.5, 1.2, and 1.0, respectively. All affected fields had only trace to slight infection levels of these diseases. Other foliar diseases observed included bacterial leaf blight (*Pseudomonas syringae* pv. *syringae*) and powdery mildew (*Erysiphe graminis* f. sp*. tritici*). These diseases were found in two and one fields at mean severities of 0.7 and 0.5, respectively. None of these diseases caused significant damage.

Ergot (*Claviceps purpurea*), loose smut (*Ustilago tritici*), and take-all (*Gaeumannomyces graminis* var. *tritici*) were observed in three, three, and 22 fields, at mean severities of 0.1, 0.1, and 2.2%, respectively. These diseases did not appear to cause significant damage.

Fusarium head blight was observed in 24 fields, at a mean incidence of 31.9%, ranging from 3.3 to 60.0%. Severity on infected spikes averaged 26.4%, ranging from 3.3 to 53.3%. The FHB index ranged from 0.1 to 32.0%, with a mean of 9.9%. Very severe FHB levels were observed in two fields. Seven fields had severe and the remainder slight to moderate disease levels.

Four *Fusarium* species were isolated from the infected kernels. *Fusarium graminearum* was the predominant species, occurring in 76.9% of the fields and on 38.3% of the infected kernels. *Fusarium sporotrichioides, F. poae* and *F.equiseti* were found infrequently, occurring in 34.6, 15.4, and 15.4% of the fields and on 3.5, 2.0, and 1.6% of the kernels, respectively.

The relative prevalence and severity of foliar diseases in 2005 were similar to those found in 2004 (Xue et al. 2005a), except for spot blotch, which was the most prevalent disease in 2005 but was insignificant in 2004. Although FHB was observed in most surveyed fields, the average disease impact (FHB Index) was only 9.9%, which is considered low and was less than half that recorded in 2004 (Xue et al. 2005b). *Fusarium graminearum,* the major casual agent of FHB in Ontario, was recovered from 76.9% of fields and 38.3% of fusarium damaged kernels in 2005 but was less prominent than in 2004 when it was recovered from 100% of fields and 96.8% of the kernels. Total precipitation was lower and mean temperatures were higher across Ontario in June and July compared to 2004 or the long-term average. Hot and dry weather conditions in June and July were likely responsible for the changes in foliar disease prevalence and the lower impact of FHB in Ontario spring wheat in 2005.

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Table 1. Prevalence and severity of spring wheat diseases in eastern Ontario in 2005.

DISEASE	NO. FIELDS AFFECTED (n=26)	DISEASE SEVERITY IN AFFECTED FIELDS*	
		Mean	Range
Bacterial blight	2	0.7	0.6-0.9
Leaf rust	21	1.5	0.3-2.4
Powdery mildew	1	0.5	0.5
Septoria glume blotch	24	1.2	0.3-2.3
Septoria/stagonospora leaf blotch	25	2.3	0.7-5.1
Spot blotch	23	2.4	0.5-5.6
Tan Spot	25	1.0	0.5-2.2
Ergot (%)	3	0.1	0.1
Loose smut (%)	3	0.1	0.1-0.2
Take-all (%)	22	2.2	0.3-5.0
Fusarium head blight	24		
Incidence (%)		31.9	3.3-60.0
Severity (%)		26.4	3.3-53.3
FHB index**		9.9	0.1-32.0

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

CROP / CULTURE: Winter wheat
LOCATION / RÉGION: Manitoba

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TITLE / TITRE: SURVEY FOR LEAF SPOT DISEASES OF WINTER WHEAT IN MANITOBA IN 2005

INTRODUCTION AND METHODS: Foliar diseases of the Manitoba winter wheat crop were assessed by surveying 36 farm fields from July 14 to 26, when most crops were at the early to soft dough stage (ZGS 80-86). Because winter wheat occupies a small acreage in Manitoba (in 2005 it was planted on about 3.5% of the total wheat acreage - Statistics Canada, Crop Reporting Series #8, December 2005), the farm fields were not surveyed at random; rather, information on their location was obtained beforehand from extension personnel from Manitoba Agriculture, Food and Rural Initiatives and from producers who normally grow the crop. The fields surveyed were located in southern Manitoba, in the area bounded by Hwys #67, 1 and 16 to the north, the US border to the south, Hwy #83 to the west and Hwy #12 to the east. Disease incidence and severity were recorded by averaging their occurrence on approximately 10 plants along a diamond-shaped transect of about 50 m per side, beginning near the field edge. Disease ratings were taken on both the upper (mainly the 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%). Infected leaves with typical symptoms were collected at each site, dried and stored in paper envelopes. Subsequently, surface-sterilized pieces of infected leaf tissue were placed in moist chambers for 3-5 days to identify the causal pathogen(s) and determine the disease(s) present.

RESULTS AND COMMENTS: Conditions in spring and early summer (late April to early July) 2005 were abnormally wet and cool in southern Manitoba. Due to excessive rainfall, many spring crops were planted late, not planted at all, or were damaged by the subsequent flooding. Flooding also damaged some winter wheat crops that had been planted in fall 2004. Warmer, drier conditions prevailed during the kernel filling stage of winter wheat. The lower than normal accumulation of growing degree days in the 2005 growing season (Anon 2005) was expected to result in differential disease expression by the various wheat leaf spot pathogens.

Leaf spots were observed in the upper and/or lower leaf canopies in all 36 winter wheat fields surveyed. Disease levels in the upper canopy were nil, trace or very slight in 14% of fields, slight in 33%, moderate in 22%, severe in 3% and leaves were senescent in 28%. In the lower canopy all leaves were senescent at the time of the surveys. Based on disease development in the upper canopy (47% of fields with trace to slight leaf spotting, and 25% with moderate or severe spotting; the remainder not rated because of senescence), foliar diseases in winter wheat in 2005 likely caused relatively little damage with a grain yield loss of about 2%. The widespread use of foliar fungicide(s) in winter wheat crops likely contributed to the relatively low leaf spot severities observed.

Pyrenophora tritici-repentis, causal agent of tan spot, was the predominant leaf spot pathogen in 2005, was found in most fields, and caused about 2/3 of the damage observed (Table 1). The relative amount of damage attributed to *Cochliobouls sativus* (spot blotch) returned to 'normal' levels, following its very low impact on winter wheat in 2004 (Tekauz et al. 2005). This was somewhat surprising as the cooler than normal temperatures that depressed disease development by this pathogen in 2004 also occurred in 2005. *Stagonospora nodorum* (stagonospora leaf blotch) levels likewise were higher in 2005, as was also observed for spring wheat in Manitoba in 2005 (Gilbert et al. 2006).

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Table 1. Incidence and isolation frequency of leaf spot pathogens of winter wheat in Manitoba in 2005

Pathogen	Incidence (% of fields)	Frequency (% of isolations)*
Pyrenophora tritici-repentis	97	63
Cochliobolus sativus	53	24
Septoria avenae f.sp. *triticea*	11	5
Stagonospora nodorum	28	8

* indicative of the relative foliar damage caused

CROP / CULTURE: Winter Wheat
LOCATION / RÉGION: South-western Ontario

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TITLE / TITRE: 2005 SURVEY FOR FUSARIUM HEAD BLIGHT OF WINTER WHEAT IN S.W. ONTARIO

INTRODUCTION AND METHODS: Grain samples from a total of nine commercial winter wheat fields were collected at harvest across S.W. Ontario. The objective was to determine deoxynivalenol (DON) levels, % of *Fusarium* infected kernels, and the *Fusarium* species involved. DON levels were determined using a fluorometric test - FluoroQuan (Romer® Labs, Inc, Union, MO). The kernels were surface sterilized in 0.3% NaOCl and plated on potato dextrose agar to quantify and identify the *Fusarium* spp. present. *Fusarium* species were identified according to Nelson et al. (1983).

RESULTS AND COMMENTS: The summer of 2005 was hot and dry and was not favorable for *Fusarium* infection in winter wheat in Ontario. The DON content in kernels ranged from 0.1 ppm to 1.0 ppm (Table 1). Percentage of *Fusarium* spp. and *F. graminearum* ranged from 0 to 33.3% and 0 to 20.0%, respectively (Table 1). Other *Fusarium* spp. isolated from winter wheat in Ontario in 2005 included *F. sporotrichioides* and *F. poae.* In general, the levels of all variables in 2005 were much lower than those found in 2004 in Ontario, when the highest level of DON was 4.9 ppm (Tamburic-Ilincic et al. 2005).

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Table 1. Deoxynivalenol (DON) levels and percent of winter wheat kernels infected with *Fusarium* spp. and *F. graminearum* in SW Ontario, 2005.

Field location	Winter wheat class	DON (ppm)	*Fusarium* spp. infected seed (%)	*F. graminearum* infected seed (%)
Elora	Hard red	0.9	33.3	15.0
Elora	Soft red	0.9	23.3	20.0
Mitchell	Soft red	1.0	8.3	5.0
Mitchell	Soft red	0.7	0.0	0.0
Guelph	Soft red	0.5	1.7	1.7
Inwood	Soft white	Na*	5.0	3.3
Ridgetown	Soft red	Na*	8.3	6.7
Ridgetown	Soft red	0.1	5.0	3.3
Ridgetown	Soft red	0.2	0.0	0.0
Mean	-	0.6	9.4	6.1

Na*=not available

Forages / Plantes fourragères

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

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TITLE / TITRE: FOLIAR DISEASE SEVERITY OF ALFALFA IN SASKATCHEWAN, 2005.

INTRODUCTION AND METHODS: Foliar disease severity (% leaf area affected) was assessed in 35 fields of alfalfa (*Medicago sativa*) grown for hay in eastern Saskatchewan, from late June to late July. 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 Horsfall-Barratt scale (0-11) and converted to mean percentage leaf area affected.

RESULTS AND COMMENTS: In 2005, conditions early in the growing season were cool and wet (15 - 50% above-normal rainfall) in Saskatchewan (1), but disease severity was low (Table 1). Spring black stem [*Phoma medicaginis*] was the dominant pathogen and was present in all 35 fields. Common leaf spot [*Pseudopeziza medicaginis*] was present in 33 fields, yellow leaf blotch [*Leptotrochila medicaginis*] in 23 fields, and lepto leaf spot [*Leptosphaerulina trifolii*] was found in 12 fields.

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Table 1. Foliar diseases (range in brackets) in alfalfa grown for hay in Saskatchewan, 2005.

Region/ Crop district(2)	No. of fields	Dominant disease	Mean (range) leaf area affected (%)	Other diseases
Northeast/	7	Spring black stem (SBS)	4% (trace - 6%)	CLS, LLS, YLB
(CD 8)	5	Common leaf spot (CLS)	5% (2 – 10%)	SBS, LLS, YLB
	1	Lepto leaf spot (LLS)	2%	SBS, CLS, YLB
Central/	3	Common leaf spot	1% (trace - 1%)	YLB, SBS
(CD 6)	1	Yellow leaf blotch (YLB)	1%	SBS, CLS
East-central/	3	Yellow leaf blotch	2% (1 - 3%)	SBS, CLS, LLS
(CD 5)	3	Spring black stem	1% (trace - 1%)	CLS, YLB, LLS
	2	Common leaf spot	2% (1 - 2%)	SBS, YLB, LLS
Southeast/	6	Spring black stem	2% (trace - 5%)	CLS, YLB, LLS
(CD 1 & 2)	4	Yellow leaf blotch	1% (trace - 2%)	SBS, CLS
Total	35			

Oilseeds and Special Crops / Oléagineux et Cultures spéciales

CROP: Field bean
LOCATION: Manitoba

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TITLE: DISEASES OF FIELD BEAN IN MANITOBA IN 2005

METHODS: Crops of field bean were surveyed for root diseases at 31 different locations and for foliar diseases at 52 locations in Manitoba. During the root disease survey, the severity of halo blight (*Pseudomonas syringae* pv. *phaseolicola*) also was assessed at 21 field locations. The survey for root diseases and halo blight was conducted in the third week of June when plants were at the early stages of pod formation and the survey for foliar diseases from mid August until the first week of September when the plants were at the pod-fill to early maturity stages. The crops surveyed were selected at random from regions in southern Manitoba, where most field beans are grown. Ten plants were sampled at each of three random sites for each crop surveyed. Diseases were identified by symptoms. Root diseases were rated on a scale of 0 (no disease) to 9 (death of plant, seedling did not emerge or died back soon after emergence). The severity of foliar diseases observed was estimated using a scale of 0 (no disease) to 5 (whole roots/plants were severely diseased). Five to ten roots with disease symptoms per crop were collected for isolation of fungi in the laboratory in order to confirm the visual assessment. Halo blight, anthracnose, rust and white mould were rated as a percentage of infected plant tissue. In each crop with anthracnose symptoms, pod samples were collected for isolation of the causal organism to confirm that the symptoms were caused by *Colletotrichum lindemuthianum*.

RESULTS AND COMMENTS: Three root diseases were observed (Table 1). Fusarium root rot (*Fusarium solani*) was observed in all the 31 crops surveyed for root disease, making it the most prevalent root disease of dry bean. Rhizoctonia root rot (*Rhizoctonia solani*) was detected in only 4 of the 31 crops surveyed. Pythium root rot (*Pythium* spp.) was identified in 1 of the 31 crops. Halo blight (*Pseudomonas syringae* pv. *phaseolicola*) was observed in 10 of the 21 crops, but it was present at trace levels in 8 crops and at severity levels of 10-20% in 2 crops.

Five foliar diseases were observed (Table 2). Common bacterial blight (*Xanthomonas axonopodis* pv. *phaseoli*) was the most prevalent; symptoms were observed in all of the 52 crops surveyed. Anthracnose was detected in 15 crops; however, its severity was generally low. White mould (*Sclerotinia sclerotiorum*) symptoms were detected in 6 crops at low levels of severity. Bean rust (*Uromyces appendiculatus*) was observed in only 2 crops, but its low severity ratings suggest that it had little effect on yield.

Table 1. Prevalence and severity of root diseases and halo blight in 31 crops of bean in Manitoba in 2005.

Disease	No. crops affected	Disease Severity	
		Mean[1]	Range
Fusarium root rot	31	5.0[2]	2.0-6.5
Rhizoctonia root rot	4	5.1	2.5-6.5
Pythium root rot	1	3.4	3.4
Halo blight[3]	10	3.2%	0.1-20%

[1]Means are based on an average of the crops in which the diseases were observed.
[2]Root diseases were rated on a scale of 0 (no disease) to 9 (death of plant, seedlings did not emerge or died back soon after emergence).
[3]Estimates of halo blight severity were based on the percentage of plant tissue infected in 21 dry bean crops observed.

Table 2. Prevalence and severity of foliar diseases in 52 crops of field bean in Manitoba in 2005.

Disease	No. crops affected	Disease Severity[1]	
		Mean[2]	Range
Common bacterial blight	52	2.8	1.7-4.0
Anthracnose	15	3.1	0.1-20.0
Rust	2	2.6	2.0-3.3
White mould	6	0.7	0.3-7.0

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

CROP: Canola
LOCATION: Alberta

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TITLE: INCIDENCE OF CLUBROOT ON CANOLA IN ALBERTA IN 2005

METHODS: In September 2005, a total of 112 commercial canola (*Brassica napus*) fields were surveyed in Sturgeon County (77 fields), Parkland County (6 fields), Strathcona County (10 fields), the County of Leduc (1 field), the County of Wetaskiwin (1 field), and northeast Edmonton (17 fields), Alberta, for the incidence of clubroot, caused by the obligate parasite *Plasmodiophora brassicae* Woronin. The fields were surveyed after swathing by inspecting the roots of all plants within a 1 m^2 area at each of 10 locations along the arms of a 'W' sampling pattern. The presence of conspicuous galls on the roots was taken as an indication of clubroot infection. As infections tended to occur in patches, disease incidence in individual fields was calculated as the percentage of points (out of the 10 sampling points within each field) that were positive for clubroot. The severity of root infection was assessed on a 0 to 3 scale, adapted from Kuginuki et al. (2), where 0 = no galling, 1 = a few small galls, 2 = moderate galling and 3 = severe galling. Representative soil and root samples were collected from each infested field for further analysis. The survey was conducted with a particular emphasis on areas where there had been reports of clubroot or clubroot-like symptoms, although 40 of the 112 fields were randomly selected. In addition, a smaller survey of 39 randomly selected canola fields was conducted in the acid soils of east-central Alberta, bringing to 151 the total number of fields visited in 2005.

RESULTS AND COMMENTS:
A total of 41 clubroot-infested canola fields were identified in 2005. The majority of infested fields were located in Sturgeon County (north of Edmonton) or in a rural area in the northeast corner of the city (Fig. 1). However, one clubroot-infested field was also identified east of Edmonton in Strathcona County (Fig. 1), and two infested fields were found south of the city, one in the County of Leduc (Fig. 1) and the other in the County of Wetaskiwin (not shown on map). No clubroot was identified in any of the 39 fields surveyed in east-central Alberta. The number of infested fields per region surveyed is given in Table 1. Within the 41 clubroot-infested fields, eight had a high incidence of disease (>70%), about half (21 fields) exhibited intermediate disease incidences, and 12 fields had a low incidence of disease (<30%) (Fig. 2).

Among fields showing a low level of disease, most clubroot-infected canola plants were identified in headland areas near field entrances, suggesting that the pathogen is introduced into fields on contaminated farming equipment. Furthermore, in all but the most heavily infested fields, the disease occurred in patches of varying size; these patches were sometimes associated with low-lying areas, perhaps reflecting the high moisture requirements of *P. brassicae* (1). In contrast, the disease distribution was relatively uniform in fields with high incidences of clubroot. Most infested fields were in a canola-cereal-canola-cereal rotation, which may have contributed to the build-up of pathogen populations in affected areas. The occurrence of clubroot was not restricted to fields with acidic soils (the soil pH of infested fields ranged from 4.8 to 7.6, with an average value of 6.2), but there was a significant negative correlation between disease severity and soil pH (data not shown). Acidic soils are known to favor development of clubroot (1).

ACKNOWLEDGEMENTS:
We would like to thank Diane Barker and Tara Cholik of Sturgeon County for their assistance in surveying several fields, and all of the canola growers who allowed us access to their fields. Financial support by the Alberta Crop Industry Development Fund, the Alberta Agricultural Research Institute, the Alberta Canola

Producers Commission and the Saskatchewan Canola Development Commission is also gratefully acknowledged.

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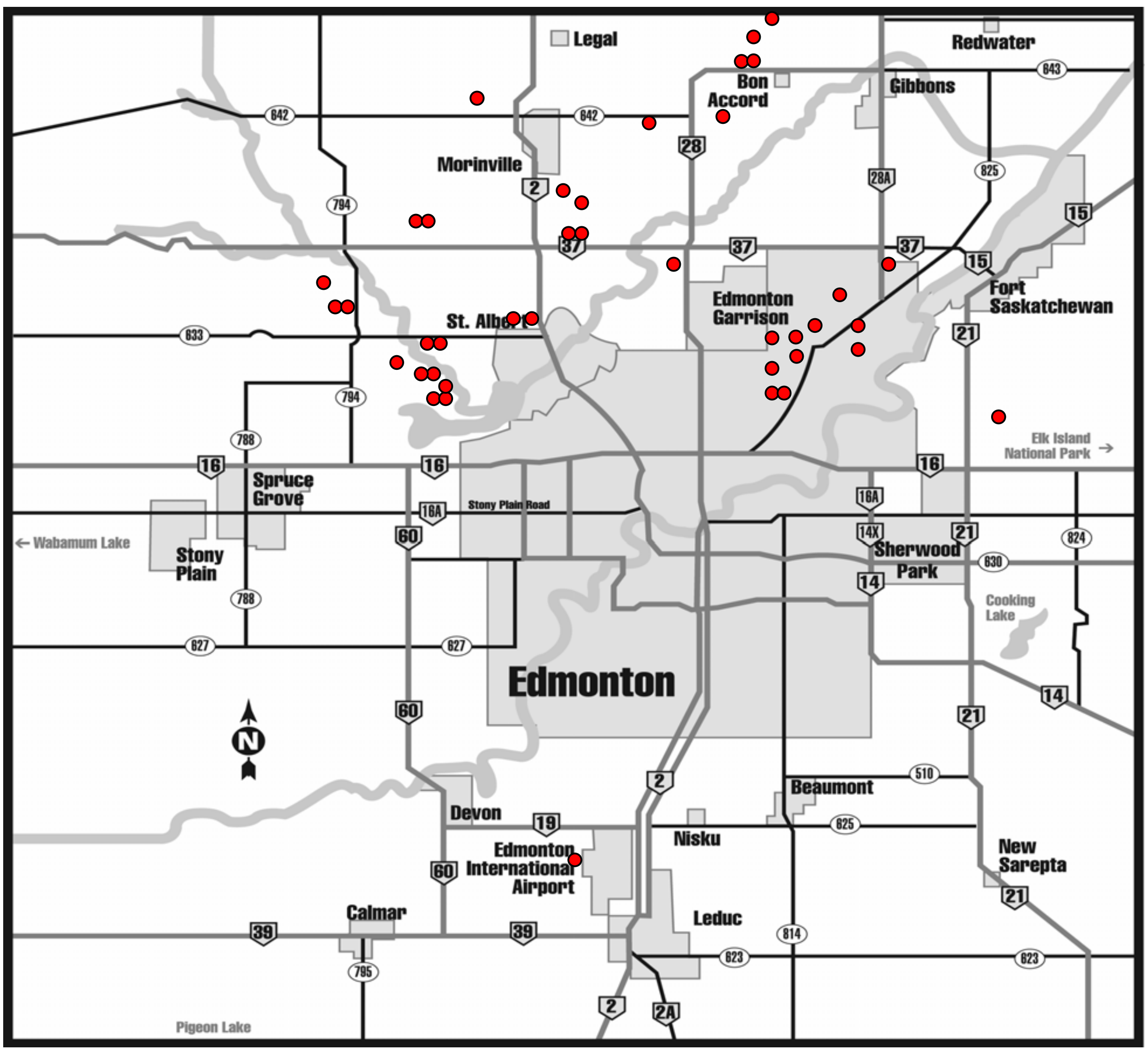

Figure 1. Incidence of clubroot on canola (*Brassica napus*) in the Edmonton, Alberta region. Each circle represents the approximate location of a commercial canola field in which the disease was identified in 2005. Forty fields are indicated on the map. Another infested field found near the City of Wetaskiwin (south of Leduc) is not shown.

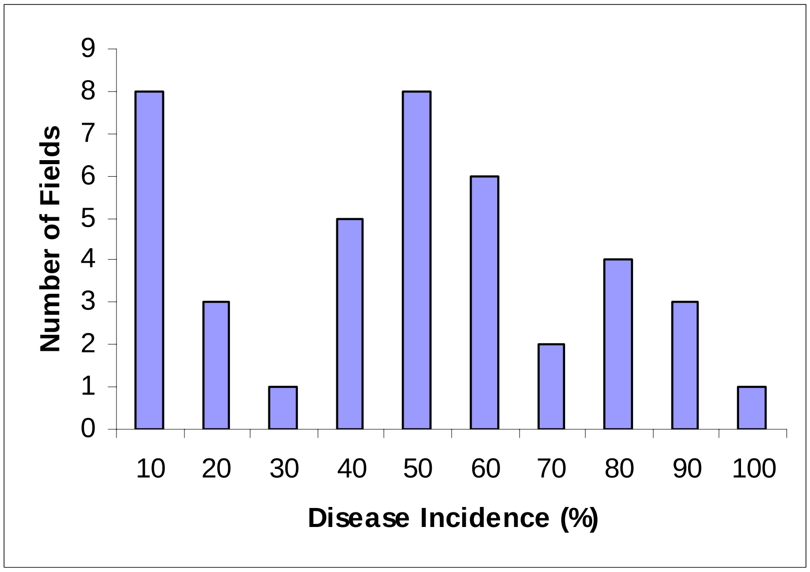

Figure 2. Incidence of clubroot in individual infested canola fields. Disease incidence was calculated as the percentage of points (out of a total of 10 sampling points within a field) that were positive for clubroot.

Table 1. Distribution of clubroot-infested canola fields identified in Alberta in 2005.

Region	Total fields surveyed	Number of clubroot infested fields
Sturgeon County	77	27
Northeast Edmonton	17	11
Strathcona County	10	1
Parkland County	6	0
County of Leduc	1	1
County of Wetaskiwin	1	1
East-Central Alberta	39	0

CROP: Canola
LOCATION: Saskatchewan

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TITLE: SURVEY OF CANOLA DISEASES IN SASKATCHEWAN, 2005

METHODS: A total of 106 fields of *Brassica napus* and one field of *B. rapa* were surveyed between August 9 and 31 in the major canola production regions of Saskatchewan including the north-west (23 fields), north-central (20), north-east (20), east-central (23) and south-east (21). Canola fields were surveyed before swathing and while the crop was between growth stages 5.2 and 5.3 (Canola Council of Canada). 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 by at least 20 m. The presence or absence of lesions on each plant was determined to give percent disease incidence for the following diseases: sclerotinia stem rot (*Sclerotinia sclerotiorum*), blackleg (*Leptosphaeria maculans*), aster yellows (AY phytoplasma), foot rot (*Rhizoctonia* spp.*, Fusarium* spp.) and fusarium wilt (*F. oxysporum* f. sp. *conglutinans*). For sclerotinia stem rot, each plant was scored for both main stem and upper branch/pod lesions. For blackleg, plants were scored for either severe basal stem cankers or any other type of blackleg stem lesion. For alternaria pod spot (*Alternaria brassicae*, *A. raphani*), the percent severity of lesions on the pods of each plant was assessed. If alternaria pod spot was present in a field, but at a level estimated to be below 1%, the disease was recorded as “trace”. Similarly, when the other diseases were observed in a field, but not in the sample of 100 plants, the disease was recorded as “trace”. When calculating means, all trace values were counted as 0.1%. Field results were combined for each region and mean disease incidence or severity values were determined.

RESULTS AND COMMENTS: Spring moisture conditions were generally adequate across the province and conditions continued to be favourable throughout June and the beginning of July, increasing the risk of canola diseases such as sclerotinia. However, drier growing conditions occurred in mid-late July and early August, reducing disease risk. Rains were received in late August and September, reducing seed quality and delaying harvest, especially in northern regions. Overall, the 2005 canola crop experienced above average yields but below average quality.

Sclerotinia stem rot was observed in 65 of the 107 fields surveyed and mean incidence values ranged from 0 to 18% for main stem lesions and from 0 to 20% for upper branch/pod lesions. The mean total incidence value was lowest in the south-east and north-central (1%) and highest in the north-west (7%) (Table 1). The overall total incidence value was substantially lower in 2005 (3%) than in 2004 (13%), when prolonged cool and wet conditions were experienced (Pearse et al. 2005).

Blackleg was observed in 57 of the 107 fields surveyed. Incidence values ranged from 0 to 10% for basal stem cankers and from 0 to 100% for lesions occurring elsewhere on the stem. The highest incidences were observed in fields that had received hail damage. Mean total incidence was highest in the north-west (Table 1). Overall blackleg incidence values for the province were 1% for basal lesions and 3% for lesions elsewhere on the stem. Overall blackleg incidence values for the province were similar to other years (Pearse et al. 2005).

Aster yellows was observed in 46 of the 107 fields surveyed, with incidence values ranging from 0 to 5%. Overall aster yellows incidence values for the province have remained less than 1% since 2000 (Pearse et al. 2005).

Foot rot was observed in 16 of the 107 fields, with incidence values ranging from 0 to 4%. The overall incidence value for the province in 2005 was similar to previous years (Pearse et al. 2005).

Alternaria pod spot was reported in 70 of the 107 fields surveyed. Mean severity values were trace in all regions (Table 1). Pod spot severity was likely to have increased after the survey was conducted due to late season rains in the northern regions.

One plant infected with fusarium wilt was sampled in one field in the northwest near Edam. There were no reports of staghead or brown girdling root rot.

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Table 1. Canola diseases in Saskatchewan, 2005.

REGION[1] (NO. OF FIELDS)	MEAN % DISEASE INCIDENCE						MEAN % SEVERITY
	Sclerotina[2]		Blackleg[3]		Aster yellows	Foot rot	Alternaria pod spot
	Main	Upper	Basal	Other			
North-west (23)	3	4	2	3	T[4]	T	T
North-central (20)	1	T	2	1	T	T	T
North-east (20)	2	1	T	2	T	T	T
East-central (23)	2	1	1	3	T	T	T
South-east (21)	1	0	0	T	T	T	T
Overall Mean (107)	2	1	1	3	T	T	T

[1] The Rural Municipalities (RM) in the major canola production regions where fields were surveyed include:
North-west = RM 344, 346, 347, 350, 379, 381, 406, 409, 410, 437, 438, 469-472, 499, 501
North-central= RM 400, 401, 428-431, 458-460
North-east= RM 427, 428, 456, 457, 486-488
East-central = RM 246, 271, 273, 276, 277, 279, 304, 305, 308, 336, 337, 368-370
South-east= RM 36, 63-66, 154-157
[2] Sclerotinia stem rot lesions were scored as either main stem lesion or as upper branch/pod lesions.
[3] Blackleg lesions were scored as either severe basal stem cankers or as any other type of stem lesion.
[4] T = trace amounts of disease (< 1%); see text.

CROP: Canola
LOCATION: Manitoba

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TITLE: CANOLA DISEASES IN MANITOBA: DISTRIBUTION, PREVALENCE AND INCIDENCE IN 2005

METHODS: In August 2005, 81 canola crops were surveyed in the eastern/interlake (8), southwest (35), northwest (20) and central (18) regions. All crops were *Brassica napus*. They were assessed for the prevalence (percent crops infested) and incidence (percent plants infected per crop) of sclerotinia stem rot (*Sclerotinia sclerotiorum*), aster yellows (phytoplasma), foot rot (*Fusarium* spp. and *Rhizoctonia* sp.), blackleg (*Leptosphaeria maculans*) and fusarium wilt (*Fusarium* spp.). Blackleg lesions that occurred on the upper portions of the stem were assessed separately from basal stem cankers. The prevalence and percent severity of alternaria pod spot (*Alternaria* spp.) were determined.

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

RESULTS: A number of diseases were present in each of the four regions of Manitoba. Sclerotinia stem rot and blackleg were the most prevalent diseases throughout the province (Table 1). The prevalence of sclerotinia-infested crops ranged from a high of 55% in the northwest region to 25% in the eastern/interlake region with a provincial mean of 40%. This decreased from a prevalence of 72% in 2004 (4). Mean disease incidence ranged from 5.5% in the central region to <1% in the eastern/interlake region with a provincial mean of 3%.

Blackleg basal cankers occurred in 60% of the crops surveyed in 2005 with disease incidence ranging from 7% in the central region to 1% in the northwest region, with a provincial mean of 3.5%. Mean disease incidence was lower than in 2004. However, in 2005, blackleg basal cankers were found in more crops.

The mean prevalence of blackleg stem lesions was 65%. Prior to 2005, 20%, 20%, 41% and 35% of crops were infested with stem lesions in 2001 (1), 2002 (2) and 2003 (3) and 2004 (4), respectively. The mean incidence in 2005 was 6%, which was similar to that observed in 2004.

The severity of alternaria pod spot was low (Table 2) and ranged from 6.6% in the central region to 1.0% in the eastern/interlake region, with no pod spot observed in the northwest region (Table 1). In the central, southwest, and eastern/interlake regions, pod spot was observed in 28, 29 and 13% of the crops surveyed, respectively. This increased from a prevalence of 6% in the central region, and 5% in the southwest region in 2004 (4).

The prevalence of aster yellows in the 2005 surveyed crops was 17% in the southwest region. This increased from a prevalence of 5% in the same region in 2004 (4). The average disease incidence in the southwest region was <1% (Table 1). No aster yellows was found in crops surveyed in the central, eastern/interlake and northwest regions. Foot rot was observed in 1% of the surveyed crops with a mean incidence below 1%.

Of the 81 canola crops examined in Manitoba, fusarium wilt was observed in 21%, with a mean incidence of 1.3%. The prevalence of fusarium wilt ranged from 33% in the central region to 10% in the northwest region (Table 1). Although no fusarium wilt was observed in the 68 canola crops surveyed in 2004, this disease was found in 2.3% of fields in 2003 with an incidence of 7%.

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Table 1. Number of canola crops surveyed and disease prevalence in Manitoba in 2005.

Crop Region	No. of Crops	Sclerotinia stem rot		Blackleg basal cankers		Blackleg stem lesions		Alternaria pod spot		Aster yellows		Fusarium wilt	
		P[1]	DI[2]	P	DI	P	DI	P	Sev.[3]	P	DI	P	DI
Central	18	33	5.5	78	7	67	13	28	6.6	0	0	33	3.1
E/Interlake	8	25	0.5	62	2	100	12	13	1.0	0	0	13	0.1
Northwest	20	55	3.5	35	1	35	1	0	0	0	0	10	0.7
Southwest	35	37	1.3	63	3	74	3	29	3.4	17	<1	23	1.0

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

Table 2. Distribution of incidence (sclerotinia, blackleg, aster yellows, and fusarium wilt) and severity (alternaria pod spot) classes in 81 crops of *Brassica napus* in Manitoba in 2005.

	Number of crops with					
	Sclerotinia stem rot	Blackleg basal cankers	Blackleg stem lesions	Alternaria pod spot	Aster yellows	Fusarium wilt
0	49	32	28	65	75	64
1-5%	23	33	30	12	6	9
6-10%	3	9	14	3	0	6
11-20%	4	6	1	1	0	1
21-50%	2	1	8	0	0	1
>50%	0	0	0	0	0	0

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

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TITLE / TITRE: ASCOCHYTA BLIGHT ON CHICKPEA IN SASKATCHEWAN, 2004 AND 2005.

INTRODUCTION AND METHODS: In 2004, a survey of 17 chickpea fields to assess levels of ascochyta blight [*Didymella rabiei*, anamorph *Ascochyta rabiei*] was conducted in southwest and southcentral Saskatchewan on July 5-7 (pre-flower to early flowering stage) and again on September 14-15 (pod stage to maturity). Ten plants were assessed at each of five sites along a teardrop-shaped circuit in each field to determine disease severity using the Horsfall-Barratt scale (0-11). In 2005, the survey was conducted on September 16, but only four fields of chickpea were found, all in southwest Saskatchewan. Disease severity ratings were converted to mean percentage leaf area affected.

RESULTS AND COMMENTS: In 2004, levels of ascochyta blight were very high (Table 1). Weather conditions during the growing season in the main chickpea production areas of Saskatchewan were cool and wet [10 - 35% above normal precipitation in the southwest and 35-65% above normal in south-central Saskatchewan (1)]. In early July, ascochyta blight was widespread (e.g., the incidence in one crop was almost 100%), but severity was low. By September, blight incidence was close to 100% in all fields and severity had increased substantially. In one field, there were large numbers of empty pods on the ground, associated with severe symptoms of ascochyta blight. Another crop had been sprayed with fungicides four times, but still had significant ascochyta blight. Several crops contained large 'hot spots' that had a distinct brownish colour caused by severe levels of blight.

In 2005, weather conditions during the growing season (1) in the survey region were again cool and wet [15 - 50% above normal precipitation]. Disease incidence was high in all fields, but severity was substantially lower than in 2004 (Table 1). There were large hot spots in three of the four fields examined. In one field of desi chickpea, plants with bright reddish to purple stems and branches were observed in patches throughout the crop. This appeared to be a physiologic condition associated with stress, but the exact cause is not known.

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Table 1. Mean incidence and severity (range in brackets) of ascochyta blight in chickpea crops in southern Saskatchewan, 2004 and 2005.

Year & Crop district (2)	**No. of fields**	**July**	**September**	
		Severity (%)	**Incidence (%)**	**Severity (%)**
2004				
7A	3	1 (trace - 2)	98 (95 - 100)	68 (38 - 83)
3A	7	1 (0 - 10)	91 (84 - 97)	31 (5 - 63)
3B	7	2 (0 - 10)	90 (81 - 100)	48 (5 - 73)
2005				
3B	4	-	92 (81 - 98)	16 (5 - 38)

CROP: Chickpea
LOCATION: Saskatchewan

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TITLE: SEED-BORNE PATHOGENS OF CHICKPEA IN SASKATCHEWAN IN 2005.

METHODS: The results of agar plate tests conducted by five Saskatchewan companies on seed samples mainly from the 2005 crop were summarized. The tests were conducted to detect the pathogens causing ascochyta blight (*Ascochyta rabiei*), botrytis blight [grey mould] (*Botrytis cinerea*) and sclerotinia stem and pod rot (*Sclerotinia sclerotiorum*). Not all samples were tested for *Botrytis* and *Sclerotinia* but all were tested for *Ascochyta*. Because of the small number of samples, kabuli and desi chickpea were combined; however, over 90% of the samples were kabuli chickpea. For both *Ascochyta* and *Botrytis,* mean % seed infection and % samples free of infection were calculated for each crop district [CD] in Saskatchewan (1). Similar values were not calculated for *Sclerotinia* because all levels are low. Most of the samples came from crops sprayed once or more with Bravo (a.i. chlorothalonil), Headline (a.i. pyraclostrobin), Lance (a.i. boscalid) or Quadris (a.i. azoxystrobin) to control ascochyta blight.

RESULTS AND COMMENTS: The growing season in Saskatchewan was marked in May by normal rainfall and timely completion of spring seeding; in June by high to excessive rainfall; in July by below normal rainfall in the south and near-normal rainfall in central and northern areas; in August by above normal rainfall, especially in the latter half of the month; and in September by low rainfall in the south, but excessive rainfall in central and northern areas. Since most chickpea crops in Saskatchewan were grown in southern and southwestern Saskatchewan in 2005, they were exposed to relatively good pre-harvest weather and good quality seed was harvested. The overall mean yield per acre of kabuli chickpea crops in Saskatchewan was 1,274 lbs per acre. While comparative figures are not available for previous years, the value is higher than the values for yield of all types of chickpea for the previous four years (3).

Data were compiled on samples tested between early September and mid-December 2005. In that period only 138 samples were tested by the five companies, but this is more than double the number reported last year (2). The increase reflects a 65% increase in provincial chickpea acreage over 2004 (3) and future market prices for kabuli chickpea that are encouraging.

The mean % *Ascochyta* infection for the province was 2.0% (compared with 2.6% in 2004) and the percentage of samples free of infection was 33% (very similar to 2004). High mean levels in some crop districts (Table 1) reflected a few samples with very high levels (e.g. 19% for two from CD 2B) among a small total number tested. Overall, 67% of samples had *Ascochyta* infection levels between 0% and 1% (data not shown). The mean *Botrytis* infection level for the province was 0.6%, similar to 2004 (2), and the highest level was 7.3% (in a sample from CD 7A). Generally *Botrytis* was not a problem except in a few crops in central Saskatchewan (Table 1), outside the region where chickpea is best adapted.

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Table 1. Number of chickpea seed samples tested from September, 2005 to mid-December, 2005 by five commercial companies, and levels of infection with *Ascochyta* and *Botrytis* in relation to Saskatchewan Crop Districts.

Crop District		***Ascochyta***			***Botrytis***	
	No. of samples tested	Mean % infection	% samples with 0% infection	No. of samples tested	Mean % infection	% samples with 0% infection
1A	0	-	-	0	-	-
1B	0	-	-	0	-	-
2A	25	2.4	24	9	0.9	22
2B	15	4.5	47	12	0.1	75
3AN	14	2.9	29	10	0.2	70
3AS	24	2.0	38	11	< 0.1	91
3BN	26	1.5	27	21	0.6	71
3BS	11	0.2	45	5	0.1	80
4A	4	0.1	75	2	0	100
4B	0	-	-	0	-	-
5A	0	-	-	0	-	-
5B	0	-	-	0	-	-
6A	2	0.4	50	2	3.3	0
6B	4	0.9	25	2	0	100
7A	13	1.4	23	8	2.3	25
7B	0	-	-	0	-	-
8A	0	-	-	0	-	-
8B	0	-	-	0	-	-
9A	0	-	-	0	-	-
9B	0	-	-	0	-	-
TOTAL	138	2.0	33	82	0.6	64

CROP: Flax
LOCATION: Manitoba

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TITLE: DISEASES OF FLAX IN MANITOBA AND SASKATCHEWAN IN 2005

METHODS: A total of 87 flax crops were surveyed in 2005, 47 in Manitoba and 40 in Saskatchewan. Seven crops were surveyed during the third week of August, 61 in the fourth week of August, and 19 in the first week of September. Ninety percent of the crops were the brown seed-colour linseed flax, and 10 % were low linolenic acid or yellow seed-colour solin flax. Crops surveyed were selected at random along preplanned routes in the major areas of flax production. Each crop was sampled by two persons walking 100 m in opposite directions in the field following an "M" pattern. Diseases were identified by symptoms and the incidence and severity of each disease were recorded. Stand establishment and vigour were rated on a scale of 1 to 5 (I = very good, and 5 = very poor)

In addition, 16 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: Seventy four percent of the flax crops surveyed in 2005 were rated excellent to good for stand establishment. Fifty six percent of the crops surveyed were early maturing with excellent to good vigour. Thirteen percent of the crops were late-seeded and were expected to mature and be harvested late, thereby reducing yield and seed quality. The 2005 growing season started early, with abnormally wet conditions during the first half of the season especially in southeastern Manitoba, and dry conditions for the second half of the season. These conditions favoured diseases such as pasmo and powdery mildew, slowed down crop growth early in the season and hastened maturity, thus producing low yields in most crops.

Pasmo (*Septoria linicola*), the most prevalent disease, was observed in 90% of all crops surveyed (Table 1). The prevalence and severity on stems were higher in 2005 than in 2004 but similar to previous years (1, 2, 3), due perhaps to the wet conditions favouring the early start of the disease in 2005. In most infested crops, pasmo severity ranged from 1% to 20% of the stem area affected, but was up to 50% in a few crops towards the end of the season (Table 1). Pasmo severity was high on leaves but remained low on stems due to the dry conditions in August.

Root infections and fusarium wilt (*Fusarium oxysporum* f.sp*. lini*) were observed in 14% of flax crops and incidence ranged from trace to 20% infected plants (Table 1). The prevalence and incidence of fusarium wilt in 2005 were very low, and lower than in 2004 and previous years (1, 2, 3).

Powdery mildew (*Oidium lini*) was observed in 47% of crops surveyed with a severity range from trace to 20% leaf area affected in the majority of crops infected (Table 1). The incidence and severity of powdery mildew were high in only a few fields near Russell in Manitoba and near Melfort and Oxbow in Saskatchewan. The incidence and severity of this disease were higher in 2005 than in 2004 and previous years due perhaps to the dry warm conditions in August, which favoured disease development and spread (1, 2, 3).

Rust (*Melampsora lini*) was not observed in any of the 87 crops surveyed in 2005, nor in the rust-differential flax nurseries planted at Morden, Portage la Prairie, Saskatoon, and Indian Head.

Traces of aster yellows (phytoplasma) were observed in several crops in 2005. Severe lodging was recorded in nine flax crops. No signs of stem infection by *Sclerotinia sclerotiorum* were encountered in this survey. However, traces to 10% leaf area infected by *Alternaria* spp. were observed on the foliage of 38% of maturing crops. Aphid infestation was low to moderate in several flax crops, while low levels of grasshopper infestation were observed in several crops.

Of the 16 flax samples submitted to the Crop Diagnostic Centre, four samples were identified as wilt caused by *Fusarium oxysporum*, two as root rot caused by *Pythium* spp. and *Rhizoctonia* spp., three as stem and boll blight caused by *Alternaria linicola*, three as chemical injuries, and four as environmental stress.

ACKNOWLEDGEMENTS: The assistance of T. Walske, M. Penner, T. Westfall, and D. Young is gratefully acknowledged.

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Table 1. Incidence and severity of fusarium wilt, pasmo, and powdery mildew in 87 crops of flax in Manitoba and Saskatchewan in 2005.

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%	75	86	0%	0%	9	10	0%	0%	46	53
1-5%	1-5%	10	12	1-10%	1-5%	35	40	1-10%	1-5%	26	30
5-20%	5-10%	2	2	10-30%	5-10%	20	23	10-30%	5-10%	6	7
2-40%	10-20%	0	0	30-60%	10-20%	20	23	30-60%	10-20%	7	8
>40%	10-40%	0	0	>60%	20-50%	3	4	>60%	20-50%	2	2

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

CROP: Lentil
LOCATION: Saskatchewan

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TITLE: SEED-BORNE PATHOGENS OF LENTIL IN SASKATCHEWAN IN 2005.

METHODS: The results of agar plate tests conducted by five Saskatchewan companies on seed samples mainly from the 2005 crop were summarized. The tests were conducted to detect the pathogens causing ascochyta blight (*Didymella* [*Ascochyta*] *lentis*), anthracnose (*Colletotrichum truncatum*), botrytis stem and pod rot (grey mould) and seedling blight (*Botrytis* spp.), and sclerotinia stem and pod rot (*Sclerotinia sclerotiorum*). All samples were tested for *Ascochyta* and slightly fewer for *Colletotrichum*, *Botrytis* and *Sclerotinia*. For both *Ascochyta* and *Botrytis,* mean % seed infection and % samples free of infection were calculated for each crop district [CD] in Saskatchewan (3). However, mean % infections were not calculated for *Colletotrichum* and *Sclerotinia* because levels are usually so low that comparisons between CDs are valueless. The % samples infected by *Colletotrichum* were calculated for each CD.

It is unknown which of the seed samples came from lentil crops that had been treated with registered fungicides used as seed treatments or foliar protectants against ascochyta blight or anthracnose. Many of the samples tested came from crops of ascochyta-resistant cultivars, which were first widely grown in 2000 (3) and have expanded in acreage since. However, the data could not be classified according to cultivar.

RESULTS AND COMMENTS: In Saskatchewan in 2005 the growing season was marked in May by normal rainfall and timely completion of spring seeding; in June by high to excessive rainfall causing some flooding damage; in July by below normal rainfall in the south and normal rainfall in central and northern areas; in August by above normal rainfall, especially in the latter half of the month; and in September by low rainfall in the south, but excessive rainfall in central and northern areas. In more southerly areas the lentil harvest was well advanced by late August and the quality of harvested seed was high. However, in many central and northern areas the rain in August and September delayed harvest and resulted in poor quality seed. The overall mean yield per acre of lentil crops in Saskatchewan was 16% higher than in 2004 and 24% above the 10-year average (6).

Data were compiled on samples tested between early September and mid-December 2005. By this time only 449 samples had been tested by the five companies, about 37% of the number reported for 2004 (4). This low number probably reflects a large overproduction of lentil in 2004 and 2005 and the resulting low market prices, which have led to uncertainty about planting intentions in 2006.

Levels of seed-borne *Ascochyta* in individual samples ranged from 0% to 60% (in a sample from CD 2B) with a provincial mean level of 1.9%. This is the second highest mean in the last 5 years (4), i.e. since ascochyta-resistant cultivars have dominated production. Mean *Ascochyta* infection varied substantially among crop districts (Table 1). For the second year in succession a high mean, based on a substantial number of samples, was recorded for CD 7A (4), a major areas of lentil production in west-central Saskatchewan. Despite this, no *Ascochyta* was detected in over 50% of the samples from the district. Thus, the contrast in CD 7A between samples with very low and with high *Ascochyta* infection probably reflects differences between crops harvested before and harvested after August rains started. Ascochyta blight is known to increase seed infection through saprophytic growth in ripening pod tissue at harvest time (2).

The highest level of *Botrytis* found in an individual sample was 24.25% (in a sample from CD 6B). The mean provincial level of *Botrytis* was 1.7% (Table 1), identical to that in 2004, and similar to several recent years (4). However, the percentage of samples in which no *Botrytis* was detected was 45%, in contrast with 28% in 2004 (4). The lesser prevalence of *Botrytis* in seed in 2005 than in 2004 is probably due to better growing conditions in some areas in 2005. Botrytis stem and pod rot develops in lentil crops when cool, wet weather favors rank growth after flowering. In 2004 preharvest weather favored the disease in all lentil-production areas, but in 2005 this applied mostly in central and northern production areas. In 2005 mean *Botrytis* infection levels in seed were higher in CDs 5-7 than in crop districts to the south (Table 1).

Colletotrichum truncatum, which is not a highly seed-borne pathogen, was found in 14% of seed samples tested (Table 1), mostly at low levels. The value of 14% is lower than the corresponding figure of 21% for 2004 (4) but closer to the long-term average of about 10% (5). One seed sample from CD 2B had an unusually high infection level of 9.25%.

In addition to the seed-borne pathogens of lentil which laboratories normally evaluate, tests in 2005 revealed high levels of *Stemphylium* spp., the cause of stemphylium blight (1), in many samples from central and northern crop districts. *Fusarium* species, especially *F. avenaceum,* were also frequent in seed, although only occasionally at levels exceeding 5%. A high level of both of these pathogens in seed is a reflection of cool wet weather in late summer that delayed harvest.

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Table 1. Number of lentil seed samples tested from September, 2005 to mid-December, 2005 by five commercial companies, and levels of infection with *Ascochyta*, *Botrytis* and *Colletotrichum* in relation to Saskatchewan Crop Districts.

Crop District	***Ascochyta***			***Botrytis***			***Colletotrichum***
	No. of samples tested	Mean % infection	% samples with 0% infection	No. of samples tested	Mean % infection	% samples with 0% infection	% samples with >0% infection
1A	9	0	100	9	0.3	67	22
1B	0	-	-	0	-	-	0
2A	48	1.9	58	48	1.4	41	33
2B	111	1.0	61	110	0.6	69	20
3AN	9	0.3	78	8	<0.1	86	13
3AS	25	2.3	68	20	0.8	65	10
3BN	57	1.4	58	57	1.2	54	0
3BS	9	0.3	56	9	1.4	44	0
4A	5	0.2	60	5	0.1	80	0
4B	5	10.5	20	5	0.7	40	0
5A	7	0.4	57	7	2.4	71	0
5B	2	0	100	2	2.1	0	0
6A	31	0.1	65	30	3.4	13	10
6B	51	1.6	78	51	4.5	16	22
7A	74	4.3	51	73	2.7	26	7
7B	4	8.8	50	4	5.1	0	0
8A	0	-	-	0	-	-	-
8B	0	-	-	0	-	-	-
9A	0	-	-	0	-	-	-
9B	2	0.1	50	1	15.3	0	0
TOTAL	449	1.9	62	439	1.7	45	14

CROP: Lupine (*Lupinus angustifolius* L.)
LOCATION: Alberta

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TITLE/TITRE: OCCURRENCE OF LUPINE DISEASES IN CENTRAL ALBERTA IN 2005

METHODS: Surveys for lupine diseases were conducted during the third week of August, 2005 at four locations near Barrhead, two locations near Lacombe, two locations near Tofield, and at single locations near Edmonton (CDCN), Carstairs, Devon, Ellerslie, Penhold, Vegreville and Westlock. Roots, stems and leaves of diseased plants were collected from each field. Samples were collected at five equally spaced sites (approximately 50 plants/site) along the arms of a “W” sampling pattern. Roots were washed and assessed for root rot severity using a scale described by Chang et al. (2005). For foliar and stem diseases, ratings were based on infected area in both upper and lower leaf canopies and on stems, and were based on a 0-4 scale where 0= healthy leaf/stem, 1= 1-10%, 2= 11-25%, 3= 26-50%, and 4=> 51% leaf/stem area infected. Microorganisms were isolated from infected tissue using the method described by Chang et al. (2005).

RESULTS AND COMMENTS: Powdery mildew (*Erysiphe cichoracearum* DC.) occurred in only two fields, with negligible disease incidence and severity. Powdery mildew was much less prevalent than reported in 2003 by Chang et al. (2005).

Leaf spot (*Alternaria* spp., *Cladosporium* spp.) was observed in 7 of the 15 fields surveyed (Table 1). Disease incidence averaged 46% in a field near Penhold. Leaf spot was also common, but appeared late, on lupine plants at CDCN and at Carstairs, where heavily infected Canada thistle and burdock plants served as alternative hosts of *Alternaria* spp. Although leaf spot was frequently observed on lupine, the disease did not cause any apparent reduction in yield.

A low percentage (<1%) of plants at Devon and Ellerslie were infected with botrytis blight (*Botrytis cinerea* Pers.:Fr) on stems, rachides and pods. *Botrytis* killed plants when infection occurred at or close to the basal stem. Fungal spores washed down to the soil and infected the taproots. Seeds did not mature in pods due to infection of the flowering stem, rachis and pods by *Botrytis*. Stem infection caused leaf yellowing, wilting and plant death due to stem girdling. The disease most likely started in late July or early August when the plant canopy became thicker and closed over the ground. Conidia of *Botrytis* spread very quickly under cool, wet environmental conditions. This disease has potential to cause significant yield loss of lupine crops if suitable conditions prevail.

Root rot problems occurred in 10 of the fields. Severity varied with location (Table 1). The highest incidence occurred in the fields near Lacombe and Tofield, where the crops incurred severe water damage. The severity of root rot was low at the other locations. Root rot was mostly caused by *Fusarium* spp., with infected plants showing yellowing, stunting or wilting symptoms. A total of 303 infected roots were processed for microorganism isolation. *Alternaria* spp., *Rhizopus* spp., *Rhizoctonia solani* Kühn, *Pythium* spp., *Trichoderma* spp., *Botrytis cinerea*, *Penicillium* spp. and *Sclerotinia sclerotiorum* (Lib.) de Bary were isolated from infected roots. Most of the seed planted in the surveyed fields had been treated with Apron Maxx (fludioxonil + metalaxyl-M) before seeding and the seedling emergence rate was above 80%. In 2004, very little seed treating was done on lupine and the emergence rate averaged 60%. This illustrates the importance of seed treatment as a means of preventing seedling blight and damping-off.

Sclerotinia blight (*S. sclerotiorum*) was observed in six of the fields surveyed. The disease occurred in scattered patches in a field near Barrhead. Disease incidence ranged from 0 to 25% and averaged 10.5%. Disease incidence in a field near Penhold was 0 to 10% with a mean of 2.9%. Very minor infection occurred in the other four fields, with a mean incidence of less than 1%.

An unidentified virus-like disease was observed in a few plants in fields near Devon and Ellerslie. Diseased plants developed small upper leaves, with an upright growth habit and repeated branching, somewhat like a witches' broom. Flowering was delayed in diseased plants or the flowers aborted. Younger affected plants were similar in height to healthy plants, but after canopy closure, diseased plants grew approximately 3-5 cm taller than the healthy plants. The late appearance of symptoms in diseased plants may indicate that primary infection came from insect vectors rather than from seed. Affected plants remained green, while healthy plants became senescent at later stages of growth.

As in 2004, fusarium root rot was still the most prevalent disease of lupine in Alberta. Sclerotinia blight was also quite prevalent after canopy closure and was favored by excessive rainfall.

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Table 1. Prevalence and severity of lupine diseases in experimental plantings and seed multiplication fields of lupine at 15 locations in central Alberta in 2005.

Disease	Number of affected fields	Disease severity in affected crops (0 – 4)	
		Mean	Range
Powdery mildew	2	0.01	0 – 0.5
Leaf spot	7	0.2	0 – 2
Root rot	10	1.5	0.1 – 4
Sclerotinia blight	6	0.2	0 – 3
Botrytis blight	2	0.2	0 – 1
Virus-like	2	-[a]	-[a]

[a] Trace amounts

CROP: Pea
LOCATION: Saskatchewan

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TITLE: SEED-BORNE PATHOGENS OF PEA IN SASKATCHEWAN IN 2005.

METHODS: The results of agar plate tests conducted by five Saskatchewan companies on seed samples mainly from the 2005 crop were summarized. The tests were conducted to detect the pathogens causing ascochyta blights (*Mycosphaerella* [*Ascochyta*] *pinodes*, *A*. *pisi* and *Phoma medicaginis* var. *pinodella* = *A. pinodella*), botrytis blight (*Botrytis cinerea*) and sclerotinia stem and pod rot (*Sclerotinia sclerotiorum*). Not all samples were tested for *Botrytis* and *Sclerotinia* but all were tested for the ascochyta blight pathogens. For both *Ascochyta* and *Botrytis,* mean % seed infection and % samples free of infection were calculated for each crop district [CD] in Saskatchewan (2). However, this was not done for *S*. *sclerotiorum* because infection levels are too low for comparisons of means to be valuable.

It is unknown which of the seed samples came from pea crops that had been treated with registered fungicides used as seed treatments or foliar protectants against one or more seed- or soil-borne diseases. However, use of foliar fungicides on pea in Saskatchewan is uncommon because of economic factors.

RESULTS AND COMMENTS: The growing season in Saskatchewan was marked in May by normal rainfall and timely completion of spring seeding; in June by high to excessive rainfall in June causing some flooding damage; in July by below normal rainfall in the south and near-normal rainfall in central and northern areas; in August above normal rainfall, especially in the latter half of the month; and in September by low rainfall in the south, but excessive rainfall in central and northern areas. The overall mean yield per acre of pea crops in Saskatchewan was 6% lower than in 2004, but 18% above the 10-year average (6). In southern areas the pea harvest was almost complete by early September and the quality of harvested seed was high. However, in central and northern areas rain in August and September delayed harvest and in many cases resulted in poor quality seed.

Data were compiled on samples tested between early September and mid-December 2005. By this time only 357 samples had been tested by the five companies, about 52% of the number reported for 2004 (3). This low number probably reflects high production in both 2004 and 2005, which has resulted in high stocks, low market prices and uncertainty about planting intentions in 2006.

Levels of seed-borne ascochyta in individual samples varied from 0% to 36% (in a sample from CD 9B) and mean levels for crop districts varied widely (Table 1). Some mean ascochyta values for CDs are based on too few samples to be meaningful, but generally levels were much lower in the south (CDs 1-4) intermediate in central areas (CDs 5-7) and highest in the north (CDs 8-9). This pattern of infection correlated with a trend towards later harvesting and greater exposure of the ripening crops to rainfall. The overall provincial mean level of infection of 5.1% was the second highest over the last 7 years (3) and compared with 7.4% in 2004 and 4.3% in 1999 (5). However, in all three of these years the percentage of samples in which no *Ascochyta* was detected was similar (17-19%).

For the fifth consecutive year (3) *A. pisi* was most commonly isolated from samples from southern Saskatchewan, while in samples from central and northern areas *A. pinodes* was by far the dominant species. However, there were occasional samples from the central and northern areas where *A. pisi* was isolated equally or more frequently than *A. pinodes*. There appeared to be an association between *A. pisi* and specific pea cultivars in these cases; the susceptibility to *A. pisi* of new pea cultivars in western Canada and the origin of inoculum of *A. pisi* deserve further investigation (1).

Botrytis was detected in 24% of pea samples tested, similar to the percentage for 1999, 2000 and 2004 and far more than for 2001-2003 (3, 4). The highest seed infection level was 3.5% in a sample from CD 6B but the mean level was less than 1% in all crop districts. Some variation occurred among districts (Table 1), but, as in previous years, *Botrytis* was generally not a problem on pea crops in Saskatchewan in 2005. Similarly, *S. sclerotiorum* was isolated from only a small percentage of seed samples tested in 2005 and at low levels.

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Table 1. Number of pea seed samples tested from September, 2005 to mid-December, 2005 by five commercial companies, and levels of infection with Ascochyta and Botrytis in relation to Saskatchewan Crop Districts.

Crop District	***Ascochyta***			***Botrytis***		
	No. of samples tested	Mean % infection	% samples with 0% infection	No. of samples tested	Mean % infection	% samples with 0% infection
1A	6	0.3	50	3	0	100
1B	14	1.5	21	12	0.1	83
2A	17	2.9	41	13	0.1	85
2B	31	1.6	32	28	0.1	89
3AN	6	0.8	50	4	0.1	75
3AS	22	0.4	59	10	0	100
3BN	18	1.3	44	18	0.1	77
3BS	7	1.1	14	6	0.2	67
4A	0	-	-	0	-	-
4B	2	0.3	50	3	0	100
5A	24	4.0	17	8	0	100
5B	33	3.5	6	20	0.3	65
6A	32	4.2	9	27	0.2	74
6B	27	5.4	0	20	0.7	70
7A	9	3.9	0	9	0	100
7B	11	8.6	9	9	0.7	22
8A	23	8.3	0	17	0.4	59
8B	40	10.6	3	19	0.2	68
9A	14	10.3	0	8	0.5	75
9B	21	12.7	0	6	0.2	67
TOTAL	357	5.1	17	240	0.2	76

CROP: Field pea
LOCATION: Manitoba

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TITLE: DISEASES OF FIELD PEA IN MANITOBA IN 2005

METHODS: Crops of field pea were surveyed for root and foliar diseases at 49 and 47 different locations in Manitoba, respectively. The survey for root diseases was conducted during the third to fourth week of July when the plants were at the intermediate to round pod stage and for foliar diseases in late July and early August when the plants were at the round pod stage to early maturity. The crops surveyed were chosen at random from regions in southwest and south-central Manitoba, where most field pea is grown. Thirty plants (10 plants at 3 sites/field) were observed/sampled for each crop surveyed. Diseases were identified by symptoms. Root diseases were rated on a scale of 0 (no disease) to 9 (death of plant, the seedling could not emerge or died back quickly after emergence). Five to ten symptomatic roots were collected per field for isolation of fungi in the laboratory in order to confirm the visual disease assessment. The severity of most of the foliar diseases observed was estimated using a scale of 0 (no disease) to 9 (whole roots/plants severely diseased). Powdery mildew severity was rated as the percentage of leaf area infected.

RESULTS AND COMMENTS: Three diseases were observed in the root disease survey (Table 1). Fusarium root rot (*Fusarium solani* f. sp. *pisi*) was the most prevalent disease and was observed in 43 fields. Fusarium wilt *(F. oxysporum*) and rhizoctonia root rot (*Rhizoctonia solani*) were observed in 34 and 3 of the fields surveyed, respectively. Disease severity means for all root diseases were higher in 2005 than in the previous year (McLaren et al. 2005).

Five foliar diseases were observed (Table 2). Mycosphaerella blight (*Mycosphaerella pinodes*) was the most prevalent disease and was present in all 47 crops surveyed. Sclerotinia stem rot (*Sclerotinia sclerotiorum*) was detected in one field only. Prior to 2004, little or no sclerotinia stem rot was observed in pea fields (Yager et al. 2003, 2004), but due to the cool, wet environmental conditions of 2004, sclerotinia stem rot was commonly observed in this crop and had a detrimental effect on pea yield (McLaren et al. 2005). Powdery mildew was observed in four fields, three at low levels and one with 100% of plants infected. A significant impact on yield was expected in the severely diseased field sown to a susceptible pea cultivar. All newly registered pea cultivars are now required to have resistance to powdery mildew. Bacterial blight (*Pseudomonas syringae* pv. *pisi*) was observed at trace levels in one field. No fusarium wilt was observed possibly due to the fact that the survey was conducted later in the growing season than usual. The plants were mostly at the early maturity stage at the time of rating, making it difficult to distinguish the symptoms of fusarium wilt. Foliar diseases, such as septoria blotch (*Septoria pisi*), and downy mildew (*Peronospora viciae*) were not observed in the surveyed fields. Anthracnose (*Colletotrichum* sp.) was observed in two fields (Table 2). *Colletotrichum pisi* is suspected as the causal agent.

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Table 1. Prevalence and severity of root diseases in 49 crops of field pea in Manitoba in 2005.

		Disease severity (0-9)*	
Disease	**No. crops affected**	**Mean**	**Range**
Fusarium root rot	43	5.9	3.9-8.8
Fusarium wilt	34	6.0	4.2-8.8
Rhizoctonia root rot	3	7.0	5.9-8.0

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

Table 2. Prevalence and severity of foliar diseases in 47 crops of field pea in Manitoba in 2005.

		Disease severity[1]	
Disease	**No. crops affected**	**Mean**	**Range**
Mycosphaerella blight	47	4.4	2.0-8.0
Sclerotinia stem rot	1	6.7	6.7
Fusarium wilt	0	0	0
Powdery mildew	4	8.1	<1-30
Septoria blotch	0	0	0
Anthracnose	2	1	1
Downy mildew	0	0	0
Bacterial blight	1	1	1
Unidentified	10	0.95	0.5-1.0

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

CROP: Sunflower
LOCATION: Manitoba

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TITLE: DISEASES OF SUNFLOWER IN MANITOBA AND SASKATCHEWAN IN 2005

METHODS: A total of 68 sunflower crops were surveyed in 2005 in Manitoba and three in Saskatchewan. Eighty seven percent of the crops were confectionery hybrids and 13% were oilseed hybrids. Twenty six crops were surveyed in mid July aiming primarily at detecting downy mildew disease, 15 in the third week of August, 24 in the first week of September, and 6 in the last week of September. Crops were surveyed along preplanned routes in the major areas of sunflower production. Each crop was sampled by two persons walking 100 m in opposite directions in the field following an "M" pattern. Diseases were identified by symptoms and the percent incidences of downy mildew (*Plasmopara halstedii*), sclerotinia wilt or head and stem infections (*Sclerotinia sclerotiorum*), rhizopus head rot (*Rhizopus* spp.), and verticillium wilt (*Verticillium dahliae*) were estimated. Disease severity for rust (*Puccinia helianthi*), leaf spots (*Septoria helianthi* and *Alternaria* spp.), powdery mildew (*Erysiphe cichoracearum*) and stem diseases (*Phoma* spp. *& Phomopsis* spp.) were estimated as percent leaf or stem area infected. A disease index was calculated for each disease in every crop based on disease incidence or disease severity (Table 1).

In addition, 16 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: Seventy percent of the sunflower crops surveyed in 2005 had good to excellent stands and were early maturing. Fifty seven percent of the crops had excellent to good vigour. Only 4% of the sunflower crops had very poor stands, 7% were late maturing, and 10% had poor vigour. The 2005 growing season started early with abnormally wet conditions prevailing throughout the first month of the season, especially in southeastern Manitoba. These conditions favoured downy mildew early in the season. Dry and above normal temperature conditions in July, August, and September were ideal for sunflower growth but not for most diseases, such as sclerotinia head rot, rust and powdery mildew. Traces to 30% infestations with aphids were common in 54% of the crops, and traces to 10% infestation of sunflower beetle (*Zygogramma exclamationis*) were observed in 17% of the crops, however, the damage was low in comparison to previous years (1, 2, 3). Traces of grasshoppers and stem weevils were observed in a few crops with minor damage resulting.

Sclerotinia wilt was present in 47% of the crops surveyed, with incidences ranging from trace to 5% (Table 1). Sclerotinia head rot and mid-stem infection, both caused by ascospore infections, were present in 24% of all crops surveyed with incidence ranging from trace to 5%. The incidence and severity of sclerotinia head rot in 2005 were the lowest observed in recent years due perhaps to the dry and above normal temperature conditions in the second half of the growing season (1, 2, 3).

Rust was the present in 27% of the crops surveyed, with severity ranging from trace to 30% leaf area affected (Table 1). The incidence and severity of rust were lower than in previous years due perhaps to the abnormally dry conditions in July-September in the 2005 growing season (1, 2, 3).

Verticillium wilt was present in 57% of the crops surveyed, with incidence ranging from trace to 30% (Table 1). Incidence and severity were similar to 2005 and 2004 but higher than previously (1, 2, 3).

Downy mildew was the most prevalent disease of sunflower in 2005, observed in 73% of all crops (88% of the 26 crops surveyed in July) with incidences of trace to 30% infected plants (Table 1). The prevalence and incidence of downy mildew in 2005 were higher than in previous years (1, 2, 3) due perhaps to the wet soil conditions at the seedling stage in 2005.

Traces to 30% leaf area infected by *Septoria helianthi* and *Alternaria* spp. were observed in 71% of the crops surveyed in 2005 (Table 1). This is a dramatic increase in the severity of leaf spots in comparison to previous years (1,2, 3). Stem lesions caused by *Phoma* and *Phomopsis* were present in several crops at trace to 5% stem area affected. Traces to 5% leaf area affected by powdery mildew were observed in some crops in south central Manitoba.

Of the 16 samples submitted to the Crop Diagnostic Centre, five were identified with downy mildew, 4 with root rot caused by *Pythium* spp., one with leaf spots caused by *Alternaria* spp., one with insect damage, and five with chemical injury.

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Table 1. Prevalence and intensity of diseases in 71 crops of sunflower in Manitoba in 2005.

Disease	Crops Affected		Disease Index[1]	
	No. of crops	% of crops	Mean	Range
Sclerotinia wilt	33	47%	1.0	T - 1
Sclerotinia head rot/stem rot	17	24%	1.0	T - 1
Verticillium wilt	40	57%	2.0	T - 3
Downy mildew	51	72%	1.3	T - 4
Rust	19	27%	1.3	T - 3
Leaf spots (Septoria & Alternaria)	50	70%	1.7	1 - 3
Lateness[2]	5	7%	2.1	1 - 4
Poor stand	3	4%	1.9	1 - 4
Poor vigour	7	10%	2.2	1 - 4

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

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

Vegetables / Légumes

CROP: Cruciferous vegetables
LOCATION: Central Alberta

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TITLE: INCIDENCE OF CLUBROOT ON CRUCIFEROUS VEGETABLES IN CENTRAL ALBERTA IN 2005

METHODS: Nine commercial vegetable farms and gardens near Edmonton, Alberta were surveyed for symptoms of clubroot caused by *Plasmodiophora brassicae* Woronin (Figure 1). Within these locations, 84 vegetable plots from 16 different fields were sampled between August 29 and September 2, 2005. Twelve types of cruciferous vegetables were examined across the 84 plots. These included: bok choy [*Brassica rapa* L. subsp. *chinensis* (Lour.) Hanelt]; broccoli [*Brassica oleracea* L. var. *italica* Plenck]; brussels sprouts [*Brassica oleracea* L. var. *gemmifera* DC.]; cabbage, white, red and savoy [*Brassica oleracea* L. var. *capitata* L.]; cauliflower [*Brassica oleracea* L. var. *botrytis* L.]; kale [*Brassica oleracea* L. var. *acephala* DC.]; kohlrabi [*Brassica oleracea* L. var. *gongylodes L.*]; rutabaga [*Brassica rapa* L. var. *napobrassica* (L.) Reichb.]; su choy [*Brassica rapa* L. subsp. *pekinensis* (Lour.) Hanelt; and turnip [*Brassica rapa* L.]. Conspicuous galls or tumors visible on root tissues were assumed to be positive for the disease. Twenty-three of the 84 plots occurred at small gardens with rows less than 20m in length. At these locations, three random sampling sites were selected and five roots were dug up and examined at each site for a total of 15 roots per plot. For the remaining 61 plots, five random sampling sites were chosen within each plot along a diagonal transect of the plot. Five roots were dug up and examined at each of these sampling sites for a total of 25 roots per plot.

RESULTS AND COMMENTS: All of the vegetable crops surveyed were mature or nearing maturity, with some already harvested. Cabbage was sampled at seven of the nine farms/gardens, while broccoli, brussels sprouts, cabbage, cauliflower, kale, kohlrabi, rutabaga and turnip were encountered less frequently. Clubroot was found on two farms. A single root gall was observed on one of 125 roots of the cabbage cv. Brutus sampled at location #1 (Figure 1). Clubroot caused an estimated 50% yield loss in a field of cauliflower at location #9, where infected plants exhibited stunting, wilting and root rot, and many of the heads were small and unmarketable. In addition to the nine commercial locations, experimental plots of cruciferous vegetables and canola at the Crop Diversification Centre (CDC) North in Edmonton were intensely examined in the course of conducting research trials at that location. In the past two years, clubroot (pathotype 5) infection has been observed in crops such as canola in 2003 (1) and mixed cruciferous vegetables in 2004 (2) at this site. Approximately 60 cultivars of cruciferous vegetables were planted on this infested land in 2005 to evaluate clubroot susceptibility amongst the various entries. In addition, chemical control trials on canola and Chinese cabbage were also carried out. The results of these studies will be presented in separate reports, which can be obtained from R.J. Howard (cabbage) and S.E. Strelkov (canola).

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ACKNOWLEDGEMENTS: We are grateful to the many growers who allowed us to survey their fields for clubroot and to the Alberta Farm Fresh Producers Association and the Agriculture Funding Consortium for their financial support of this work.

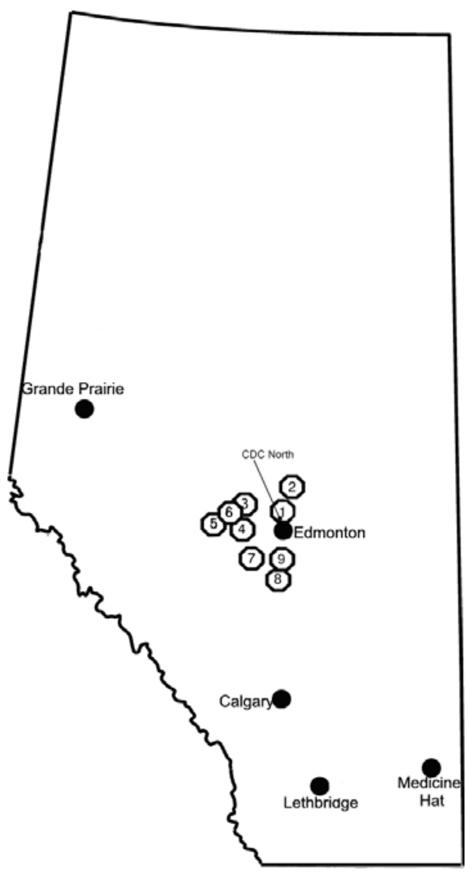

Figure 1. Locations of cruciferous vegetable plantings surveyed for clubroot in central Alberta in 2005.

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

CROP / CULTURE: Rose (*Rosa* L. *x hybrida*)
LOCATION / RÉGION: Langley, British Columbia, Canada

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TITLE / TITRE: SUSCEPTIBILITY OF ROSE CULTIVARS TO DOWNY MILDEW AND ROSE MIDGE, 2005

METHODS: Rose cultivars were grown outdoors at a commercial nursery in Langley, British Columbia, Canada. Susceptibility and resistance to downy mildew (*Peronospora sparsa* Berk.) was estimated visually in spring (May) and fall (October) 2005 using the following scale: R = Resistant (0-2 lesions or < 2 % of leaves affected per plant); MR = Moderately Resistant (3-10 lesions or 2-10 % of leaves affected per plant); MS = Moderately Susceptible (11-20 lesions or 11-20 % of leaves affected per plant); S = Susceptible (> 20 lesions or > 20 % of leaves affected per plant). Symptoms of downy mildew were reddish-purple to brown, angular lesions on leaves, petioles and stems plus leaf chlorosis and defoliation.

Level of susceptibility to rose midge (*Dasineura rhodophaga* Coquillet) was estimated visually during the peak infestation period (June-September) using the following rating scale: Plant Damage: R = Resistant (< 2 % of buds affected); MR = Moderately Resistant (2-10 % of buds affected); MS = Moderately Susceptible (11-20 % of buds affected); S = Susceptible (20-50 % of buds affected); HS = Highly Susceptible (> 50 % of buds affected). Adult females lay eggs in unopened leaf and flower buds. Maggots hatch and feed inside the bud resulting in distorted, blackened buds that fail to open and eventually drop. The maggots pupate in the soil and a new generation of adults emerges approximately every 14 days.

RESULTS AND COMMENTS: There are no published lists of rose cultivars resistant or susceptible to downy mildew or rose midge. Rose cultivars have rarely been rated for susceptibility to downy mildew because the pathogen (*Peronospora sparsa*) cannot be grown in culture and many rose breeding gardens are located in areas where the environment is unfavorable for development of the disease. In the Langley nursery, many different cultivars are grown outdoors in close proximity. Weather conditions are cool and wet in spring and fall, which is highly favourable for downy mildew infection and disease development. Thus, it is possible to visually rate cultivars for resistance and susceptibility to downy mildew disease with a high degree of confidence. Similarly, rose midge infestations can be spotty but high populations have been present at many nurseries in the BC lower mainland in recent years. It has been observed that certain cultivars are more severely damaged by midges than others. This is the first attempt to record and document these differences.

It is not known whether a chemical or physical attraction or repulsion leads the adult female midge to lay eggs in the buds of some rose cultivars but not others. Most cultivars demonstrated the same resistance or susceptibility in both leaf and flower buds. However, in one cultivar, 'Fellowship' also known as 'Livin' Easy' it was observed that leaf buds were highly susceptible while flower buds were very rarely infested.

One hundred and ninety-eight cultivars and species were rated for susceptibility to downy mildew and 88 were rated for susceptibility to rose midge. For both pest problems, a full spectrum of susceptibility and resistance was found (Table 1).

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ACKNOWLEDGEMENTS: The authors wish to thank the Vancouver Rose Society for financial support for this work.

Table 1. Susceptibility and resistance of rose cultivars to downy mildew and rose midge in Langley, British Columbia, Canada in 2005.

Cultivar	Downy mildew[1]	Rose midge[2]
Miniatures		
Angel Darling	R	-
Anita Russell	MS	-
Anytime	MR	-
Auntie Louise	MR	R
Baby Love	R	-
Behold	S	-
Cheeky Monkey	S	-
Cider Cup	MS	-
Cinderella	MS	-
Coral Reef	MR	-
Cupcake	S	S
Dresden Doll	MR	-
George's Burnt Orange	R	-
Golden Beryl	S	-
Green Ice	MR	R
Hot Tamale	S	-
Joan Yeomans	MS	-
Joanne's Wedding	MS	-
Lavender Crystal	R	-
Lemon Kiss	MR	-
Lemon Zest	S	-
Len Gallagher	MR	MS
Loving Touch	MS	-
Mystery Mauve	S	-
Orange Blossom	S	-
Orange Patio Wonder	S	-
Pandemonium	MS	-
Pixie Dust	MS	-
Plum Sauce	MR	-
Popcorn	MS	-
Rabble Rouser	S	-
Rainbow's End	MS	-
Reah Nicole	MR	-

Table 1 – Cont'd

Hybrid Tea		
Adriana	MR	-
Ainsley Dickson	S	MS
Barbra Streisand	S	S
Bella'roma	S	-
Benelux Star	R	-
Big Purple	S	-
Black Magic	S	-
Bob Hope	S	-
Bride's Dream	S	HS
Cabana	S	-
Canadian White Star	S	-
Cesar Chavez	MS	-
Double Delight	MS	S
Dream Pink	S	-
Elle	MR	-
Elina	MS	MR
Elizabeth Taylor	MR	-
Florentina	-	MS
Fragrant Cloud	S	R
Fragrant Keepsake	S	-
Frédéric Mistral	MR	S
Gemini	MS	-
Gerda Hnatyshyn	MS	MS
Heirloom	S	S
High Sheriff	S	S
Home and Family	MR	-
Honor	S	S
Ingrid Bergman	MS	R
John F. Kennedy	S	S
Just Joey	MS	MS
Lady Mitchell	MS	S
Lasting Love	R	-
Liebeszauber	S	S
Loria	S	R
Love & Peace	MS	-
Loving Memory	MS	S
Malcolm Sargent	MR	MS
Mariann Tudor	-	S
Marilyn Monroe	MS	-
Mellow Yellow	MS	MS
Mémoire	-	S
Memorial Day	S	-
Michael Crawford	MR	MS
Mister Lincoln	S	-
Mrs. Oakley Fisher	-	MS
Nancy Reagan Rose	MR	-
Nantucket	-	R
Neptune	MS	-
New Zealand	S	R
Octoberfest	MR	S
Olympiad	MR	-
Peace	MS	MS
Precious Platinum	MS	S

Table 1 – Cont'd

Pristine	S	MS
Queen Charlotte	S	MR
Ronald Reagan Rose	S	-
Rosemary Harkness	S	S
Rosie O'Donnell	MR	S
Royal Philharmonic	R	MS
Royal William	S	-
St. Patrick	MR	-
Savoy Hotel	R	HS
Schwarze Madonna	MS	S
Secret	S	-
Sight Saver	S	-
Special Occasion	MR	R
Stainless Steel	S	-
Sultry	MR	-
Sunset Celebration (aka Warm Wishes)	MR	MS
Whisper	MS	-
Yorkshire Bank	S	HS
Climber		
Autumn Sunset	MR	-
Blaze of Glory	MS	-
Compassion	S	MS
Crimson Cascade	MR	R
Dublin Bay	MR	R
Éoile de Hollande	S	-
Fourth of July	MR	-
Flutterbye	MS	R
Galway Bay	-	R
High Society	MR	-
Lemon Meringue	MR	-
Royal Sunset	-	MS
Sombreuil	MS	-
Climbing Miniatures		
Gloriana	MS	S
Jeanne Lajoie	MR	R
Laura Ford	MR	MS
Love Knot	MS	MS
Open Arms	MR	R
Shrub		
Baby Blanket	MR	R
Ballerina	S	MS
Bee-Bop	MR	-
Crystal Fairy	R	R
Fairy Queen	R	-
Flower Carpet Yellow	R	-
Flower Girl	MR	-
Golden Wings	MR	R
Heart 'n' Soul	R	-
Knock Out	MR	-
Lady Elsie May	R	-

Table 1 – Cont'd

Magic Blanket	R	R
Modern Blush	MS	-
Modern Fireglow	MR	-
Outta the Blue	MS	-
Sea Foam	S	R
White Meidiland	R	R
David Austin		
Abraham Darby	S	MS
Christopher Marlowe	S	S
Eglantyne	MR	-
Graham Thomas	S	MS
Jubilee Celebrations	MR	-
Leander	MS	MS
Lillian Austin	MR	-
Mortimer Sackler	MR	R
Sweet Julia	MS	S
The Mayflower	R	-
Old Garden Rose		
Common Moss	S	-
Madame Plantier	S	-
Tuscany Superb	MS	-
Polyantha		
Cécile Brünner	MS	-
Rugosa		
Frau Dagmar Hartopp	R	MR
Alba	R	S
Native species		
Rosa nutkana	-	S
Rosa acicularis	-	S
Rosa gymnocarpa	-	R

[1] Downy Mildew: Visual Rating of Disease Severity: R = Resistant (0-2 lesions or < 2 % of leaves affected per plant); MR = Moderately Resistant (3-10 lesions or 2-10 % of leaves affected per plant); MS = Moderately Susceptible (11-20 lesions or 11-20 % of leaves affected per plant); S = Susceptible (> 20 lesions or > 20 % of leaves affected per plant).
[2] Rose Midge: Visual Rating of Plant Damage: R = Resistant (< 2 % of buds affected); MR = Moderately Resistant (2-10 % of buds affected); MS = Moderately Susceptible (11-20 % of buds affected); S = Susceptible (20-50 % of buds affected); HS = Highly Susceptible (> 50 % of buds affected).
[3] Cultivar 'Fellowship' aka 'Livin' Easy': flower buds are resistant to midge; leaf buds highly susceptible.

CROP / CULTURE: Apple
LOCATION /RÉGION: British Columbia

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
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TITLE / TITRE: APPLE PACKINGHOUSE SANITATION IN BRITISH COLUMBIA IN 2005

INTRODUCTION: Almost half of the apples harvested from British Columbia's primary apple growing areas of the Okanagan and Similkameen Valleys are placed in large cold storage rooms located at seven major packinghouses. Apples are removed from cold storage throughout the winter and spring and packed. Fruit destined to be kept the longest is put into controlled atmosphere (CA) storage where temperature, oxygen, and carbon dioxide air concentration are rigorously controlled. Postharvest disease in the Okanagan is mainly caused by either *Penicillium* spp. or *Botrytis cinerea* (Sholberg and Haag, 1996) and can be a significant problem for apples which are stored for more than 3 months. Normally CA storage reduces decay because the low oxygen concentration reduces growth of pathogens such as *Botrytis* and *Penicillium* spp.; however a trend for more decay in CA storage (Sholberg et al 2005) is continuing. It is possible that these fungi are becoming tolerant to the low levels of oxygen and, if CA storages are not thoroughly cleaned each year and adequate sanitation practices followed, tolerant isolates could persist and infect the new crop, especially if the fruit is stored for over 3 months. Here sanitation refers to the reduction of microorganisms on surfaces to levels that do not pose a risk of decay (Sholberg, 2004). In an effort to reduce decay during the storage season and to pinpoint other factors during storage that might contribute to postharvest decay, a survey was conducted by taking wall swab samples from a number of CA storage rooms at each of the packinghouses and identifying the major decay causing fungi present.

METHODS: Wall swab samples were taken from rooms in the seven major packinghouses in the Okanagan between March and June 2005. In a number of the packinghouses the walls were made of different materials ranging from metal, painted plywood, styrofoam, concrete foam, white fire retardant mineral fibre, to a dark fibre material. Samples were taken by dipping a sterile swab into a sterile tube containing 10 mL of sterile distilled water (SDW) and swabbing over an area of 10 cm^2. For a single wall area, 5 swabs were taken across the wall and placed into the same tube. For the walls covered with the white and dark fibre material 5 sample areas were collected from across the wall by removing a 2 cm^2 area each time and placing it into a sterile tube. Each tube containing the swabs was vortexed for 30 seconds before plating. Aliquots of 100 µL were then pipetted on to 100 mL Petri plates containing acidified potato dextrose agar (APDA), and this was repeated three times for each sample. The plates were incubated at 20 ºC for 5 days or until the fungal colonies could be identified and counted. For those samples taken from the fibre material, 10 mL of SDW was added to each tube, and the tubes were vortexed, plated and incubated as above.

RESULTS: Table 1 shows the number of packinghouse sites at each location and the combined number of rooms tested from each site. *Penicillium* spp. were the most frequently identified fungi. The highest numbers of decay fungi were found in the plywood wall samples from the North Okanagan and Kelowna samples with 5.36×10^3 and 3.71×10^2 colony-forming-units (CFU)/cm^2 respectively compared to 3.0, 12.2 and 1.5 CFU/cm^2 for the South and Central Okanagan and Similkameen samples. At the Kelowna area site, plywood samples painted in 2004 had 0 *Penicillium* CFU/cm^2 compared to 1.11×10^3 CFU/cm^2 from plywood painted five years ago in 2000. With the exception of the North Okanagan all rooms that contained the white fire retardant fibre had consistently high levels of *Penicillium* spp. when compared to the other wall materials. Wall material such as styrofoam, concrete foam and the dark fibre showed a lower level of decay fungi, with the best material being the stainless steel/metal walls.

DISCUSSION: All types of wall material studied in this survey were shown to contain various levels of decay fungi. *Penicillium* spp. were the most frequently found, with *Mucor* spp. being found occasionally, and *Botrytis* spp. rarely. Painting or cleaning the plywood walls was shown to be an effective way of reducing the number of propagules /cm^2; however, this is more difficult for the fibre material and it was reflected in the high level of *Penicillium* spp. present at some locations. A cleaning regime is practised in some of the packinghouses to varying degrees and this is reflected by lower levels of decay fungi in some areas. It is known that the growth of decay fungi is favoured by conditions in cold storages, especially the high humidity and non-lethal temperatures (Crombrink, 1975). Conidia of *Penicillium* spp., *Botrytis* spp., and *Mucor* spp. were shown to survive 7 months at -1.1C (Spotts, 1985), and therefore a regular sanitation program would be beneficial to both the growers and packers. Further research is needed to develop a monitoring system and to determine a threshold level for decay organisms in storage facilities.

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Table 1. Number of *Penicillium* spp. colony-forming-units (CFU) found on controlled atmosphere (CA) apple storage room walls constructed of various materials at different locations in the Okanagan Valley.

Location, packing- house sites and number of rooms	**Pathogen**	**Colony-forming-units per wall material**				
		Plywood[1]	**white fibre[2]**	**dark fibre[3]**	**metal[4]**	**other[5,6]**
North Okanagan: 1 site, 6 rooms	*Penicillium* spp.	5.36×10^3	1.60×10^2	-	-	79.0
Kelowna Area: 1 site, 8 rooms	*Penicillium* spp.	3.71×10^2	3.13×10^4	70.9	0.30	0.50
Central Okanagan: 2 sites, 5 rooms	*Penicillium* spp.	3.00	3.40×10^2	-	-	14.0
South Okanagan: 2 sites, 5 rooms	*Penicillium* spp.	12.2	9.33×10^2	0	-	-
Similkameen: 1 site, 1 room	*Penicillium* spp.	1.50	-	-	-	29.0
All locations and all rooms combined	*Penicillium* spp.	5.75×10^3	3.28×10^4	70.9	0.30	0.50[5] 122[6]

[1] Painted plywood walls (mean count from five swabs of 10 cm^2 area of wall per room)
[2] White fire retardant mineral fibre (mean count from five 2 cm^2 pieces of wall material per room)
[3] Dark cellulose fibre (mean count from five 2 cm^2 pieces of wall material per room)
[4] Metal stainless steel walls (mean count from five swabs of 10 cm^2 area of wall per room)
[5] Styrofoam walls (mean count from five swabs of 10 cm^2 area of wall per room)
[6] Concrete foam walls (mean count from five swabs of 10 cm^2 area of wall per room)

Forest Trees / Arbres forestiers

CULTURE : Peuplier (*Populus* spp.)
RÉGION : Québec

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TITRE : ROUILLES DU PEUPLIER DANS LES PLANTATIONS ET PÉPINIÈRES DU QUÉBEC EN 2004 ET 2005

MÉTHODES : Des feuilles de peuplier ont été récoltées dans dix plantations et pépinières et dans une peupleraie naturelle du Québec pour déterminer l'étendue de la distribution de deux rouilles du peuplier récemment découvertes au Québec : la rouille *Melampsora medusae* f. sp. *deltoidae* Shain (MMD) et la rouille *Melampsora larici-populina* Kleb. (MLP), (Innes et al. 2004). Des feuilles de peuplier présentant des signes de rouille ont été récoltées entre le début juillet et la mi-septembre 2004 et 2005 sur 52 clones et une famille de peupliers hybrides. Des échantillons ont été récoltés à travers la province de Québec, dans les régions suivantes : Abitibi-Témiscamingue, Bas-Saint-Laurent, Capitale-Nationale, Chaudière-Appalaches, Estrie, Lanaudière, Outaouais, Mauricie Saguenay-Lac-Saint-Jean. Les urédospores ont été récoltées à la surface des feuilles et examinées par microscopie pour identifier par morphologie l'espèce de rouille présente (Pinon 1973). Pour confirmer l'identification, l'ADN de certains échantillons a été extrait et le gène d'ADN ribosomique (rRNA-ITS) a été amplifié en utilisant des amorces PCR spécifiques à chacune des deux espèces (Boyle, Hamelin, and Seguin 2005).

RÉSULTATS ET COMMENTAIRES : Les deux rouilles du peuplier ont été observées dans presque toutes les régions du Québec. La rouille européenne du peuplier, *M. larici-populina*, a été observée pour la première fois au Québec en 2002 dans la pépinière forestière de Berthier (46 2 N, 73 11W) dans la région de Lanaudière. Les peupliers de la section Tacamahaca sont en général résistants à *M. medusae* f. sp. *deltoidae*, mais susceptible à *M. larici-populina*. Par contre, les peupliers de la section Aegiros sont susceptibles à *M. medusae* f. sp. *deltoidae*. Dans notre inventaire, *M. larici-populina* a été retrouvée presque seulement sur les clones hybrides possédant un parent *P. maximowiczii*, *P. balsamifera* ou encore *P. trichocarpa*, trois membres de la section Tacamahaca (Tableau 1). Par contre, nous avons découvert quelques exceptions. Par exemple, dans un arboretum de la région Chaudière-Appalache et dans une pépinière de Lanaudière, la rouille *M. larici-populina* a été identifiée sur des hybrides *P. deltoides* x *P. nigra*, donc ne possédant aucun parent Tacamahaca (Tableau 1). Les deux rouilles ont été répertoriées dans toutes les régions, sauf en Abitibi-Témiscamingue où seulement *M. medusae* f. sp. *deltoidae* était présente. Dans toutes les autres régions, les deux rouilles se rencontrent en infection mixte sur les clones déployés. La rouille *M. larici-populina* a aussi été détectée dans deux plantations de peupliers hybrides en Outaouais et en Abitibi. Par contre, seulement *M. medusae* f. sp. *deltoidae* a été inventoriée dans une plantation de peupliers hybrides *P. deltoides* x *P. trichocarpa*. Dans la seule forêt naturelle échantillonnée, dans la région de la Mauricie, les *P. deltoides* étaient infectés par de la *M. medusae* f. sp. *deltoidae*. En conclusion, il semble que la rouille européenne *M. larici-populina* se soit propagée assez rapidement dans les pépinières et les plantations depuis son introduction. Il a récemment été révélé que cette dernière peut compléter son cycle biologique sur le mélèze et peut donc hiverner et se reproduire d'année en année. Il restera à voir si la croissance et la survie des essences susceptibles seront affectées.

REMERCIEMENTS : Les auteurs tiennent à remercier L. Paradis, L. Marchand, J. Grondin et N. Feau pour leur aide et leurs commentaires.

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Tableau 1. Incidence des rouilles *Melampsora medusae* f. sp. *deltoidae* et *M. larici-populina* au Québec en 2004 et 2005 sur les peupliers naturels et hybrides en plantation, pépinières et peuplement naturel.

Secteurs infectés	Types de production	Hôtes	Nos de clone	Hybrides[2]	Rouille
Abitibi-Témiscamingue	Pépinière forestière	PEH[1]	1079	J	MMD[3]
		PEH	1080	J	MMD
		PEH	1081	J	MMD
		PEH	1083	J	MMD
		PEH	3374	M x B	MMD
		PEH	3375	M x B	MMD
		PEH	3389	J	MMD
		PEH	747210	B x T	MMD
		PEH	747215	B x T	MMD
		PEH	915004	M x B	MMD
Bas-Saint-Laurent	Pépinière forestière	PEH	3375	M x B	MMD
		PEH	3729	N x M	MLP
		PEH	505249	M x DT	MMD
		PEH	505326	M x DT	MLP[4]
		PEH	505327	M x DT	MLP
		PEH	505372	M x DT	MLP
		PEH	505468	M x DT	MMD et MLP
		PEH	505508	M x DT	MLP et MMD
		PEH	750301	M x DT	MLP et MMD
		PEH	750306	M x DT	MMD et MLP
		PEH	750314	M x DT	MMD
		PEH	750315	M x DT	MLP
		PEH	750316	M x DT	MLP et MMD
		PEH	915003	M x B	MMD
		PEH	915004	M x B	MMD
		PEH	915005	M x B	MMD
		PEH	915308	M x B	MMD et MLP
		PEH	915311	M x B	MLP et MMD
		PEH	915314	M x B	MLP
		PEH	915318	M x B	MLP et MMD
		PEH	915319	M x B	MLP et MMD
		PEH	915320	M x B	MLP et MMD
		PEH	916401	DN x M	MLP
Capitale-Nationale	Pépinière forestière	PEH	23511-23493[5]		MLP

Tableau 1 (suite). Incidence des rouilles *Melampsora medusae* f. sp. *deltoidae* et *M. larici-populina* au Québec en 2004 et 2005 sur les peupliers naturels et hybrides en plantation, pépinières et peuplement naturel.

Secteurs infectés	Types de production	Hôtes	Nos de clone	Hybrides	Rouille
Chaudière-Appalaches	Arboretum	PEH	3333	D x N	MLP et MMD
		PEH	3342	D x N	MLP et MMD
		PEH	3675	TD x T	MMD
		PEH	4723	D x N	MMD
		PEH	915313	M x B	MLP
Estrie	Plantation	PEH	3225	T x D	MMD
Lanaudière	Pépinière forestière	PEH	131	D x N	MMD
		PEH	3225	T x D	MMD et MLP
		PEH	3230	T x D	MMD
		PEH	3308	D x N	MMD
		PEH	3333	D x N	MMD
		PEH	3565	D x N	MMD
		PEH	3567	D x N	MMD
		PEH	3570	D x N	MMD
		PEH	3585	D x N	MMD
		PEH	3586	D x N	MMD
		PEH	3587	D x N	MMD
		PEH	3729	N x M	MLP
		PEH	4397		MMD
		PEH	4813	D x N	MMD et MLP
		PEH	915302	M x B	MLP
		PEH	915303	M x B	MLP et MMD
		PEH	915311	M x B	MLP
		PEH	915313	M x B	MLP
		PEH	915508	DN x M	MMD
		PEH	ND[6]		MLP
	Plantation forestière				MLP
Outaouais	Plantation forestière	PEH	ND	D x N	MMD
Mauricie	Pépinière forestière	PEH	3308	D x N	MMD
		PEH	3333	M X B	MMD
		PEH	3375	D x N	MMD
		PEH	3570	M x DT	MLP
		PEH	505326	M x DT	MMD et MLP
		PEH	505508	B x T	MLP
		PEH	747210	M x B	MMD
		PEH	915004	M x B	MLP
		PEH	915311	M x B	MLP
		PEH	915313	M x B	MLP
		PEH	915318	M x B	MLP
		PEH	915320	M x B	MLP
		PEH	915508		MMD
	Forêt naturelle	D[7]			

Tableau 1 (suite et fin). Incidence des rouilles *Melampsora medusae* f. sp. *deltoidae* et *M. larici-populina* au Québec en 2004 et 2005 sur les peupliers naturels et hybrides en plantation, pépinières et peuplement naturel.

Secteurs infectés	Types de production	Hôtes	Nos de clone	Hybrides	Rouille
Saguenay-Lac-Saint-Jean	Pépinière forestière	PEH	3374	M x B	MMD
		PEH	3375	M x B	MMD
		PEH	3389		MMD
		PEH	3889		MMD
		PEH	747210	B x T	MLP et MMD
		PEH	915004	M x B	MMD
		PEH	915313	M x B	MMD

1 PEH : Peuplier hybride

2 J : *Populus* X *jackii* Sargent; M : *P. maximowiczii*; B : *P. balsamifera*; T : *P. trichocarpa*; D : *P. deltoides*; N : *P. nigra*

3 MMD : *Melampsora medusae* f. sp. *deltoidae*

4 MLP: *Melampsora larici-populina*

5 Famille

6 ND : clone non disponible

7 D : *Populus deltoïdes* J. Bartr. ex Marsh.

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