2007

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.

NATIONAL COORDINATOR/ COORDINATEUR NATIONAL

Prof. Robin A. A. Morrall

Department of Biology, University of Saskatchewan
Saskatoon, Saskatchewan S7N 5E2

Tel. (306) 966-4410
Fax (306) 966-4461
Email: Robin.Morrall@usask.ca

Canadian Plant Disease Survey

CPDS Volume 87: 1 – 142 (2007)
March, 2007

Inventaire des maladies des plantes au Canada

IMPC Volume 87: 1 – 142 (2007)
Mars 2007

Contents: **DISEASE HIGHLIGHTS** - 2006 GROWING SEASON
(+ earlier years for historical significance)

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

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

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

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

Angie O'Shea, Compiler
530 Hogg Crescent
Saskatoon, Saskatchewan, S7N 3V6
Tel. (306) 249-3269
Email: aoshea@sasktel.net

Angie O'Shea, Compilateur
530 Hogg Crescent
Saskatoon, Saskatchewan, S7N 3V6
Tel. (306) 249-3269
Email: aoshea@sasktel.net

2007 CPDS SECTION EDITORS AND ADDRESSES

SECTION	EDITORS AND ADDRESSES
DIAGNOSTIC LABORATORIES /LABORATOIRES DIAGNOSTIQUES	Ms.Marilyn Dykstra Pest Management Centre Agriculture and Agri-Food Canada Building 57, 960 Carling Ave Ottawa, ON K1A 0C6 Tel: (613) 759-7430 Fax: (613) 759-1400 Email dykstram@agr.gc.ca
CEREALS / CÉRÉALES	Dr. Andy Tekauz Agriculture and Agri-Food Canada Cereal Research Centre 195 Dafoe Road Winnipeg, Manitoba R3T 2M9 Tel: (204) 983-0944 Fax: (204) 983-4604 Email: atekauz@agr.gc.ca
FORAGES/ PLANTES FOURRAGÈRES	Dr. Bruce D. Gossen Agriculture and Agri-Food Canada Research Centre 107 Science Place Saskatoon, Saskatchewan S7N 0X2 Tel: (306) 956-7529 Fax: (306) 956-7247 Email: gossenb@agr.gc.ca
OILSEEDS AND SPECIAL CROPS /OLÉAGINEUX ET CULTURES SPÉCIALES	Prof. Robin A.A. Morrall Department of Biology University of Saskatchewan 112 Science Place Saskatoon, Saskatchewan S7N 5E2 Tel: (306) 966-4410 Fax: (306) 966-4461 Email:morrall@sask.usask.ca
VEGETABLES /LÉGUMES	Dr. Jill Thomson Department of Plant Sciences University of Saskatchewan 51 Campus Drive Saskatoon, Saskatchewan, S7N 5A8 Tel: (306) 966-5862 Fax: (306) 966-5015 Email:Jill.Thomson@usask.ca
FRUIT, NUTS AND BERRIES, ORNAMENTALS AND TURFGRASS /FRUITS. FRUITS À ÉCALE ET BAIES, PLANTES ORNEMENTALES ET GAZON	Dr. Paul Hildebrand Agriculture and Agri-Food Canada Kentville Research Centre Kentville, Nova Scotia B4N 1J5 Tel: (902) 678-2171 Fax: (902) 679-2311 Email:hildebrandp@agr.gc.ca
FOREST TREES/ ARBRES FORESTIERS	Dr. Pierre DesRochers Service canadien des forêts Centre de foresterie des Laurentides Ressources Naturelles Canada Gouvernement du Canada 1055 rue du P.E.P.S., C.P. 3800 Saint-Foy (Québec), G1V 4C7 Tél: (418) 648-3922 Fax: (418) 648-5849 Email: pidesroc@NRCan.gc.ca

CANADIAN PLANT DISEASE SURVEY INDEX - AUTHORS AND TITLES

DIAGNOSTIC LABORATORIES / LABORATOIRES DIAGNOSTIQUES

CEREALS / CÉRÉALES

Diagnostic Laboratories / Laboratoires diagnostiques

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

NAMES AND AGENCY:
Vippen Joshi, P.Ag. and Maria Jeffries, P.Ag., Plant Diagnostic Pathologist and Plant Health Coordinator BC Ministry of Agriculture and Lands (BCMAL), Abbotsford Agriculture Centre, 1767 Angus Campbell Road, Abbotsford, BC V3G 2M3
Telephone: (604) 556-3128; **Facsimile:** (604) 556-3154; **E-mail:** Vippen.Joshi@gov.bc.ca
www.agf.gov.bc.ca/cropprot/lab.htm

TITLE: DISEASES DIAGNOSED ON COMMERCIAL CROPS SUBMITTED TO THE BCMAL PLANT DIAGNOSTIC LABORATORY IN 2006

METHODS: The BCMAL Plant Diagnostic Laboratory provides diagnoses and control recommendations for diseases and disorders of commercial agricultural crops grown in British Columbia. The following data reflect samples submitted to the laboratory by 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 with micro-well and membrane-based enzyme linked immunosorbent assay (ELISA) for some fungi and bacteria. 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 2006 had a wet spring followed by three months of dry weather after the end of June. Significant bacterial blight, root rot and poor growth type problems were observed in ornamental and small fruit crops during the wet period. The weather was very dry during the peak-cropping season and many fungal and bacterial organisms did not become established and cause crop damage. However many drought-related problems were observed. Powdery mildew was common on many ornamentals causing significant cosmetic damage. Summaries of the diseases and the causal agents diagnosed on commercial crops are presented in Tables 1-11 by crop category. The total number of submissions for each crop category is listed at the bottom of each table. Diagnoses 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 1.0 Summary of diseases diagnosed on **Christmas tree** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2006.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Abies grandis	Foliar blight	*Botrytis* sp. and *Hormonema* sp.	1
	Needle blight	*Botrytis cinerea*	1
	Needle rust	*Uredinopsis* sp.	1
Abies procera	Root rot	Oomycete	2
	Stem canker	*Dothiorella* sp.	1
	Stem canker	*Phomopsis* sp.	1
Abies sp.	Foliar blight	*Botrytis* sp.	1
	Root rot	Oomycete	1
Pseudotsuga menziesii	Foliar blight	*Botrytis* sp. and *Hormonema* sp.	1
	Needle spotting	*Alternaria* sp.	1
	Needle spotting	*Cladosporium* sp.	1
	Root rot	*Rhizoctonia* sp.	1
	Swiss needle cast	*Phaeocryptopus gaeumannii*	1

DISEASED SAMPLES	14
ABIOTIC AND OTHER DISORDERS	10
TOTAL SUBMISSIONS	24

Table 2.0 Summary of diseases diagnosed on **field crop** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2006.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Alfalfa	Crown / root rot complex	*Pythium* sp.and *Fusarium* sp.	1
Barley	Plant health decline	*Pratylenchus* sp.	1
Oat	Black stem	*Leptosphaeria* sp.	1
	Nematode damage	*Pratylenchus* sp.	1
	Root rot	Oomycete	1

DISEASED SAMPLES	5
ABIOTIC AND OTHER DISORDERS	1
TOTAL SUBMISSIONS	6

Table 3.0 Summary of diseases diagnosed on **greenhouse floriculture** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2006.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Begonia	Root rot	*Pythium* sp.	1
Bellis	Bacterial blight	*Pseudomonas syringae*	1
Brassica oleracea	Club root	*Plasmodiophora brassicae*	1
Chrysanthemum	Chrysanthemum white rust	*Puccinia horiana*	4
Dracaena	Leaf spot	*Cladosporium* sp.	1
Eupatorium	Tip blackening	*Pseudomonas syringae*	1
Euphorbia pulcherrima	Root rot	*Pythium* sp.	1
Galium	Tip blackening	Suspect *Pseudomonas syringae*	1
Gerbera	Foliar blight	*Rhizopus stolonifer*	1
Habenaria	Mold growth	*Cladosporium* sp.	1
Hibiscus	Damping off	*Rhizoctonia solani*	1
Lilium gloriosa	Mosaic leaf pattern	Suspect tulip breaking virus	1
Lilium	Botrytis blight	*Botrytis* sp.	1
Lobelia	Leaf spot	*Botrytis cinerea*	1
Matthiola	Tip blight	*Botrytis cinerea*	1
Mentha	Tip blackening	Suspect *Pseudomonas syringae*	1
Myosotis	Downy mildew	*Peronospora myositis*	1
Nemesia	Bacterial leaf spot	*Pseudomonas syringae*	1
	Damping-off	*Pythium* sp.	1
Pachysandra terminalis	Cutting rot	Oomycete	1
Petunia	Leaf mosaic	*Tobacco mosaic virus*	3
Poinsettia	Root rot	*Pythium* sp.	1
Rosa	Bacterial blight	*Pseudomonas syringae*	1
	Cutting rot	*Botrytis cinerea*	1
Salvia	Bacterial blight	Suspect *Pseudomonas syringae*	1
Vinca	Leaf mosaic	*Cucumber mosaic virus*	3
	Root rot	*Thielaviopsis* sp. and *Rhizoctonia* sp.	1
	Stem canker and dieback	*Phoma* sp.	1
Zantedeschia	Root rot	Oomycete	1
	Soft rot of bulb	*Pseudomonas marginalis*	1

DISEASED SAMPLES	37
ABIOTIC AND OTHER DISORDERS	24
TOTAL SUBMISSIONS	61

Table 4.0 Summary of diseases diagnosed on **greenhouse vegetable** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2006.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Cucumber	Fusarium wilt	*Fusarium oxysporum* f. sp. *cucumerinum*	1
Pepper	Powdery mildew	*Leveillula taurica*	1
	Root rot	*Pythium* sp.	1
Spinach	Root rot	Oomycete and *Thielaviopsis* sp.	1
Tomato	Bacterial canker	*Clavibacter michiganensis* subsp. *michiganensis*	1
	Foliar blight	*Botrytis cinerea*	1
	Fruit mold	*Cladosporium* sp., *Alternaria* sp. and *Botrytis* sp.	1
	Leaf mold	*Cladosporium* sp.	2
	Root rot	*Pythium* sp.	1

DISEASED SAMPLES	10
ABIOTIC AND OTHER DISORDERS	11
TOTAL SUBMISSIONS	21

Table 5.0 Summary of diseases diagnosed on **herbaceous ornamental** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2006.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Arctostaphylos	Root rot	*Thielaviopsis basicola*	1
Carex	Root rot	Oomycete	1
Clematis	Stem rot	*Ascochyta clematidina*	1
	Stem rot and leaf blight	*Ascochyta clematidina*	1
Daffodil	Nematode damage	*Pratylenchus* sp. *Ditylenchus* sp. and *Aphelenchoides* sp.	1
Dianthus	Basal anthracnose	*Colletotrichum* sp.	2
Erica	Root rot	Oomycete	1
Euphorbia	Stem canker	*Rhizoctonia solani*	1
Heuchera	Black root rot	*Thielaviopsis basicola*	1
Hedera	Leaf spot	*Phyllostica* sp.	1
	Twig die back	*Phomopsis* sp.	1
Hibiscus	Leaf spot	*Pseudomonas syringae*	1
Musa	Rhizome and stem rot	*Fusarium oxysporum*	1
Ribes	Leaf spot	*Alternaria* sp. and *Cladosporium* sp.	1
	Powdery mildew	*Sphaeropsis* sp.	1
	Septoria leaf spot	*Septoria* sp.	1
Scaevola	Foliar blight	*Botrytis* sp.	1
	Root rot	*Pythium* sp.	1

DISEASED SAMPLES	19
ABIOTIC AND OTHER DISORDERS	6
TOTAL SUBMISSIONS	25

Table 6.0 Summary of diseases diagnosed on **small fruit** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2006.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Blackberry	Leaf spot	*Phyllosticta* sp. and *Botrytis* sp.	1
		Phyllosticta sp.	1
Blueberry	Anthracnose	*Colletotrichum acutatum*	2
	Bacterial blight	*Pseudomonas syringae*	4
	Blossom blight	*Botrytis cinerea*	1
	Foliar blight	*Botrytis* sp.	1
	Godronia canker	*Godronia cassandrae*	1
	Leaf mosaic	Blueberry mosaic virus	1
	Nematode damage	*Pratylenchus* sp.	1
	Root rot	Oomycete	6
		Pythium sp.	1
	Root damage	Root weevil damage	1
	Root rot	*Phytophthora* sp.	1
	Scorched flowers	Blueberry scorch virus	2
	Twig blight	*Botrytis cinerea*	1
	Twig death	*Phomopsis* sp.	1
	Stem canker	*Phomopsis* sp. and *Coniothyrium* sp.	1
Cranberry	Root rot	Oomycete	2
	Vine death/stem canker	*Cytospora* sp.	1
Raspberry	Nematode damage	*Pratylenchus* sp.	7
	Root rot	*Pythium* sp.	1
	Yellow rust	*Pucciniastrum americanum*	1
	Ascospora dieback	*Clethridium corticola*	1
	Root rot	Oomycete	1
	Root rot	Oomycete and *Pratylenchus* sp.	1
Saskatoon	Rust	*Gymnosporangium* sp.	1
Strawberry	Nematode damage	*Pratylenchus* sp.	1
	Root rot	Oomycete	2
	Root lesion nematode	*Pratylenchus* sp.	1

DISEASED SAMPLES	51
ABIOTIC AND OTHER DISORDERS	67
TOTAL SUBMISSIONS	118

Table 7.0 Summary of diseases diagnosed on **specialty crop** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2006.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Echinacea	Leaf spot	*Alternaria* sp. and *Colletotrichum* sp.	1
	Root rot	*Sclerotinia* sp.	1
	Stem and root rot	*Sclerotinia sclerotiorum*	1
Ginseng	Leaf and stem blight	*Alternaria panax*	1
	Root rot	*Rhizoctonia* sp.	1
Rosemary	Bacterial blight	*Pseudomonas syringae*	1

DISEASED SAMPLES	6
ABIOTIC AND OTHER DISORDERS	0
TOTAL SUBMISSIONS	6

Table 8.0 Summary of diseases diagnosed on **tree fruit** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2006.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Apple	Leaf spot, blotch	*Alternaria* sp.	1
Cherry	Bacterial blight	*Pseudomonas syringae*	2
	Bacterial canker	*Pseudomonas syringae* pv. *syringae*	1
	Fruit rot	*Alternaria alternata*	1
	Fruit rot	*Cladosporium* sp.	1
	Ring nematode	*Criconemella* sp.	1
	Root lesion nematode	*Pratylenchus* sp.	1
	Silver leaf disease	*Chondrostereum purpureum*	1
	Twig canker	*Xanthomonas campestris*	1
Grape	Black rot	*Phyllosticta* sp.	1
	Bunch rot	*Botrytis cinerea*	1
	Leaf blister	Suspect *Taphrina* sp.	1
Plum	Bacterial canker	*Pseudomonas syringae*	1

DISEASED SAMPLES	15
ABIOTIC AND OTHER DISORDERS	4
TOTAL SUBMISSIONS	19

Table 9.0 Summary of diseases diagnosed on **turfgrass** samples from golf greens submitted to the BCMAL Plant Diagnostic Laboratory in 2006.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Turfgrass	Poor growth/dry patches	Basidiomycete	1
	Anthracnose	*Colletotrichum graminicola*	1
	Brown patch	*Rhizoctonia solani*	1
	Foliar blight	*Fusarium* sp.	1
	Irregular patches	Basidiomycete	1
	Leaf and sheath blight	*Rhizoctonia zeae*	1
	Nematode damage	*Criconemella* sp.	1
		Helicotylenchus sp.	1
	Root and foliar damage	*Meloidogyne* sp. and *Helicotylenchus* sp.	1
	Root rot	*Pythium* sp.	1

DISEASED SAMPLES	10
ABIOTIC AND OTHER DISORDERS	9
TOTAL SUBMISSIONS	19

Table 10.0 Summary of diseases diagnosed on **field vegetable** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2006.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Carrot	Foliar blight	*Cercospora carotae* and *Alternaria* sp.	2
	Leaf blight	*Cercospora carotae*	1
	Root deformation	*Meloidogyne* sp.	1
Cucumber	Fusarium wilt	*Fusarium* sp.	1
Endive	Soft rot	*Erwinia chrysanthemi*	1
Garlic	Leaf and stem blight	*Stemphylium* sp.	1
	Rust	*Puccinia porri*	1
	White rot	*Sclerotium cepivorum*	1
Lettuce	Downy mildew	*Bremia lactucae*	1
	Lettuce drop	*Sclerotinia sclerotiorum*	1
Parsnip	Black scurf	*Rhizoctonia solani*	1
	Leaf blight	*Cercospora* sp.	1
Potato	Black scurf	*Rhizoctonia solani*	3
	Dry rot	*Fusarium* sp.	2
	Late blight	*Phytophthora infestans*	1
	Pink rot	*Phytophthora erythroseptica*	1
	Soft rot	*Erwinia carotovora* subsp. *carotovora*	1
	Tuber vascular discoloration	*Verticillium dahliae*	1
	Verticillium wilt	*Verticillium* sp.	1
Pumpkin	Fusarium wilt	*Fusarium oxysporum*	1
	Root rot	*Pythium* sp.	1
Rhubarb	Nematode damage	*Pratylenchus* sp.	2
	Nematode damage	*Pratylenchus* sp.	3
	Nematode damage	*Pratylenchus* sp. / *Paratylenchus* sp.	1
	Root rot	Oomycete	1
Rutabaga	Downy mildew	*Peronospora parasitica*	1
	Powdery mildew	*Erysiphe* sp.	1
	Root infection	*Fusarium* sp.	1
Squash	Leaf damage	*Alternaria* and *Erysiphe* spp.	1
Tomato	Fusarium wilt	*Fusarium oxysporum*	1
Zucchini	Nematode damage	*Pratylenchus* sp.	1
	Soft rot of crown	*Erwinia carotovora* subsp. *carotovora*	1

DISEASED SAMPLES	39
ABIOTIC AND OTHER DISORDERS	24
TOTAL SUBMISSIONS	63

Table 11.0 Summary of diseases diagnosed on **woody ornamental** samples submitted to the BCMAL Plant Diagnostic Laboratory in 2006.

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Abies concolor	Nectria canker	*Nectria fuckeliana*	1
Abies grandis	Needle blight	*Sclerophoma* sp.	2
	Tip die-back	*Phomopsis* sp.	1
Acer	Anthracnose	*Kabatiella apocrypta*	1
	Foliar blight	*Botrytis cinerea*	1
	Powdery mildew	*Uncinula* sp.	1
Acer japonica	Anthracnose	*Gloeosporium* sp.	1
	Root rot	*Phytophthora* sp.	2
	Root rot	*Armillaria* sp.	1
	Root rot	Oomycete	2
	Root rot, leaf spot	Oomycete and *Phoma* sp.	1
	Twig canker /leaf spot	*Phoma* sp.	1
Arbutus	Blister blight	*Exobasidium* sp.	1
Arctostaphylos	Root rot	*Thielaviopsis basicola*	1
Berberis	Leaf spot	*Phyllosticta* sp.	2
Camelia	Stem canker	*Phomopsis* sp.	1
Castanea	Anthracnose	*Gloeosporium* sp.	1
Cedrus atlantica	Foliar blight	*Sclerophoma* sp.	1
Chamaecyparis	Root rot	Oomycete	1
Clematis	Leaf spot	*Phyllosticta* sp.	2
	Stem rot	*Phoma* sp.	2
Cornus	Septoria leaf spot	*Septoria* sp.	1
Cotinus	Leaf spot	*Alternaria* sp.	1
	Root rot	*Pythium* sp.	1
Crataegus	Bacterial blight	*Pseudomonas syringae*	1
	Bud death	*Cylindrocarpon* sp.	1
	Fire blight	*Erwinia amylovora*	1
	Leaf spot	*Entomosporium mespili*	1
	Bacterial canker	*Pseudomonas syringae*	1
	Stem canker	*Botryosphaeria dothidea*	1
Dicentra	Crown rot	*Fusarium oxysporum*	1
Escallonia	Root rot	*Rhizoctonia* sp.	1
Euonymus	Leaf spots	*Phyllosticta* sp.	1
Fraxinus	Leaf curl	Suspect *Taphrina* sp.	1
Gaultheria shallon	Leaf and stem spot	*Phyllosticta* sp.	1
Hibiscus	Leaf spot	*Pseudomonas syringae*	1
Juniperus	Root rot	Oomycete	1
	Twig blight	*Kabatina juniperi*	1
	Twig blight	*Lophodermium* sp.	2
Lavendula	Foliar blight	*Alternaria* sp.	1
Liriodendron tulipifera	Stem canker	*Cladosporium* sp.	1
Magnolia	Armillaria root rot	*Armillaria* sp.	1
	Leaf spotting	*Pseudomonas syringae*	1
	Stem canker	*Phoma* sp.	1
Magnolia grandiflora	Leaf spot	*Cladosporium* sp.	1
Malus	Bacterial blight	*Pseudomonas syringae* pv. *syringae*	2
	European canker	*Nectria galligena*	2
	Leaf spot	*Phoma* sp. and *Alternaria* sp.	1
	Stem canker	*Phomopsis* sp.	2
Pernettya	Stem canker and dieback	*Phoma* sp.	1
Photinia	Crown canker	Oomycete	1

CROP	DISEASE	CAUSAL/ASSOCIATED ORGANISM	NO.
Picea glauca	Root rot	*Armillaria* sp.	1
Picea pungens	Needle discoloration	*Setomelanomma holmii*	1
Picea sp.	Foliar blight	*Botrytis* sp. and *Hormonema* sp.	1
	Foliar blight	*Botrytis cinerea, Phyllosticta* sp. and *Alternaria* sp.	1
	Root rot	*Pythium* sp.	1
	Foliar blight	*Phoma* sp.	1
	Shoot blight	*Sphaeropsis* sp.	1
	Root rot	Oomycete	1
Pinus ponderosa	Sphaeropsis shoot blight	*Sphaeropsis* sp.	1
	Armillaria root rot	*Armillaria* sp.	1
	Root rot	Oomycete	1
	Tip blight	*Botrytis cinerea*	1
Quercus rubra	Trunk rot	*Trametes versicolor*	1
Quercus sp.	Leaf spot	*Phyllosticta* sp. and *Discula* sp.	1
	Crown and root rot	*Cylindrocladium* sp.	1
Rhododendron sp.	Dieback	*Botryosphaeria* sp.	1
	Powdery mildew	*Microsphaera* sp.	1
	Root rot	*Armillaria* sp.	1
	Root rot	Oomycete	2
Rosa sp.	Botrytis canker	*Botrytis cinerea*	1
	Brand canker	*Coniothyrium* sp.	2
	Cane blight	*Botrytis cinerea*	1
	Root rot	Oomycete	1
	Stem canker	*Botrytis cinerea*	1
Salix sp.	Stem canker	*Cytospora* sp.	1
Skimmia japonica	Black root rot	*Thielaviopsis basicola*	1
Syringa	Bacterial blight	*Pseudomonas syringae*	3
Taxus	Root rot	Oomycete	1
Thuja plicata	Keithia blight	*Didymascella thujina*	2
Thuja sp.	Foliar blight	*Seiridium cardinale*	1
	Keithia blight	*Didymascella thujina*	2
	Leaf and twig blight	*Pestalotiopsis* sp.	1
	Root rot	Oomycete	3
	Charcoal root rot	*Macrophomina phaseolina*	1
Ulmus	Stem canker	*Nectria* sp.	1
	Stem canker	*Nectria cinnabarina*	1
	Stem canker	*Tubercularia* sp.	4
Viburnum sp.	Bacterial blight	*Pseudomonas syringae*	2

DISEASED SAMPLES	108
ABIOTIC AND OTHER DISORDERS	117
TOTAL SUBMISSIONS	225

CROPS: Commercial crops - Diagnostic Laboratory Report
LOCATION: Saskatchewan

NAMES AND AGENCIES:
G. Holzgang[1] and P.G. Pearse[2]
[1] Crop Protection Laboratory, Crop Development Branch, Saskatchewan Agriculture & Food, 346 McDonald St., Regina, Saskatchewan S4N 6P6
Telephone: (306)-787-8130; **Facsimile:** (306)-787-8803; **E-mail:** GHolzgang@agr.gov.sk.ca
[2] Crop Development Branch, Saskatchewan Agriculture & Food, 3085 Albert St., Regina, Saskatchewan S4S 0B1

TITLE: DISEASES DIAGNOSED ON CROP SAMPLES SUBMITTED TO SASKATCHEWAN AGRICULTURE AND FOOD'S CROP PROTECTION LABORATORY IN 2006

METHODS: Saskatchewan Agriculture & Food's (SAF) Crop Protection Laboratory provides diagnostic services and recommendations for crop health problems in 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 personnel, crop insurance, agribusiness, and market/home gardeners. Disease diagnosis is accomplished by microscopic examination, culturing on artificial media, ELISA testing and BIOLOG™.

RESULTS: Between April 1 and October 31, 2006, the Crop Protection Laboratory received a total of 690 samples of which 73% were for disease diagnosis (63% of these were American elms submitted for DED testing). Categories of samples received (excluding DED samples) were: cereals (29%), special crops (21%), oilseeds (14%), fruit (13%), forages 6% and greenhouse crops (3%). Vegetables, woody ornamentals, and herbaceous ornamentals comprised the remaining 14% of the samples. Summaries of diseases and causal agents diagnosed on crop samples submitted to the Crop Protection Laboratory in 2006 are presented in Tables 1-7 by crop category. There were 301 samples of American elm and 1 Siberian elm submitted under the DED program (Table 8).

Table 1. Summary of plant diseases diagnosed on **forage crops** submitted to the SAF Crop Protection Laboratory in 2006.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Alfalfa	Spring black stem/leaf spot	*Phoma medicaginis*	7
	Common leaf spot	*Pseudopeziza medicaginis*	2
	Leptosphaerulina leaf spot	*Leptosphaerulina* sp.	2
	Root/crown rot	*Fusarium/Phoma/Pythium/Rhizoctonia* spp.	2
	Stemphylium leaf spot	*Stemphylium botryosum*	2
	Anthracnose	*Colletotrichum* sp.	1
	Black root rot	*Thievaliopsis basicola*	1
Brome	Leaf blotch	*Septoria nodorum*	2
	Leaf spot	*Pseudoseptoria bromigenia*	1
	Leaf spot	*Pyrenophora bromi*	1
Clover (red)	Stem/crown rot	*Fusarium avenaceum*	1

Table 2. Summary of plant diseases diagnosed on **cereal crops** submitted to the SAF Crop Protection Laboratory in 2006.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Barley	Common root rot/ seedling blight/ prematurity blight	*Cochliobolus sativus* / *Fusarium* / *Pythium* spp.	3
	Net blotch	*Pyrenophora teres*	1
	Chemical injury		2
	Environmental injury		1
Oats	Bacterial blight	*Pseudomonas syringae*	1
	Red leaf	Barley yellow dwarf virus	1
	Halo blight	*Pseudomonas coronafaciens*	1
	Pyrenophora leaf blotch	*Pyrenophora avenae*	1
	Chemical injury		4
	Environmental injury		3
	Physiological stress		
Rye	Head blight	*Fusarium avenaceum*	1
	Ergot	*Claviceps purpurea*	1
Wheat	Common root rot/ seedling blight/ prematurity blight	*Cochliobolus sativus/Fusarium* spp.	7
	Glume blotch/leaf blotch	*Septoria nodorum*	6
	Sooty mold	*Alternaria/Cladosporium* spp.	5
	Tan spot	*Pyrenophora tritici-repentis*	5
	Leaf rust	*Puccinia recondita*	3
	Ergot	*Claviceps purpurea*	1
	Head blight	*Fusarium avenaceum*	1
	Powdery mildew	*Erysiphe graminis*	1
	Seed rot	*Penicillium* sp.	1
	Smut (loose)	*Ustilago tritici*	1
	Speckled leaf blotch	*Septoria tritici*	1
	Stripe rust	*Puccinia striiformis* f.sp. *tritici*	4
	Chemical injury		12
	Environmental injury		9
	Nutrient deficiency		5
	Physiological stress		2

Table 3. Summary of plant diseases diagnosed on **fruit crops** submitted to the SAF Crop Protection Laboratory in 2006.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Apple	Scab	*Venturia inaequalis*	1
	Plum pockets	*Taphrina pruni*	1
Strawberry	Lesion nematode	*Pratylenchus neglectus*	12
	Spiral nematode	*Helicotylenchus* sp.	8
	Stunt nematode	*Tylencorhynchus* sp.	4
	Pin nematode	*Paratylenchus* sp.	2
	Spiral nematode	*Rotylenchus* sp.	2
	Tylenchus nematode	*Tylenchus* sp.	2

Table 4. Summary of plant diseases diagnosed on **greenhouse crops** submitted to the SAF Crop Protection Laboratory in 2006.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Cottonwood	Environmental injury		1
Dogwood	Environmental injury		1
Shrub willow	Environmental injury		1
	Root rot	*Pythium* sp.	1
Pepper	Fruit/leaf rot	*Penicillium* sp.	1
Tomato	Nutrient deficiency		1

Table 5. Summary of plant diseases diagnosed on **oilseed crops** submitted to the SAF Crop Protection Laboratory in 2006.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Canola	Root rot/Seedling blight	*Fusarium/Rhizoctonia* spp.	3
	Blackleg	*Leptosphaeria maculans*	2
	Alternaria black spot	*Alternaria* sp.	2
	Environmental injury		10
	Chemical injury		9
	Nutrient deficiency		4
Flax/linola	Root rot/Seedling blight	*Fusarium/Rhizoctonia* spp.	3
	Pasmo	*Septoria linicola*	1
	Chemical injury		7
	Nitrogen deficiency		2

Table 6. Summary of plant diseases diagnosed on **woody ornamental crops** submitted to the SAF Crop Protection Laboratory in 2006.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Ash	Anthracnose	*Apiognomia errabunda*	2
	Leaf spot	*Phyllosticta* sp.	1
Caragana	Powdery mildew	*Erysiphe* sp.	1
	Chemical injury		1
Crabapple	Fireblight	*Erwinia amylovora*	1
	Leaf spot	*Pseudomonas syringae*	1
Elm	Chemical injury		1
	Environmental injury		1
Lilac	Powdery mildew	*Microsphaera penicillata*	1
Maple	Anthracnose	*Discula* sp.	1
	Chemical injury		2
Pine	Root rot	*Cylindrocladium/Pythium* spp.	1
Russian olive	Environmental injury		1
Spruce	Cytospora canker	*Cytospora* sp.	1
	Needlecast	*Rhizosphaera kalkoffii*	1
	Environmental		2
	Chemical injury		1

Table 7. Summary of plant diseases diagnosed on **special crops** submitted to the SAF Crop Protection Laboratory in 2006.

CROP	DISEASE	CAUSAL AGENT	NO. OF SAMPLES
Canaryseed	Septoria leaf mottle	*Septoria triseti*	2
	Root rot	*Fusarium* spp.	2
	Sooty molds	*Alternaria/Cladosporium* spp.	1
	Environmental injury		3
	Chemical injury		2
	Nutrient deficiency		2
Chickpea	Ascochyta blight	*Ascochyta rabiei*	7
	Root rot	*Fusarium/Rhizoctonia* spp.	1
	Chemical injury		8
	Environmental injury		3
Cumin	Leaf/blossom/head blight	*Alternaria* sp.	2
	Root rot	*Fusarium/Pythium/Rhizoctonia* spp.	2
Faba bean	Chocolate spot	*Botrytis cinerea*	1
Lentil	Ascochyta blight	*Ascochyta lentis*	2
	Root rot	*Rhizoctonia solani*	2
	Stemphylium leaf spot	*Stemphylium botryosum*	2
	Secondary stem rot	*Fusarium avenaceum*	2
	Anthracnose	*Colletotrichum truncatum*	1
	Septoria leaf spot	*Septoria* sp.	1
	Pod/leaf rot	*Botrytis cinerea*	1
	Basal stem rot	*Fusarium* sp.	1
	Chemical injury		1
	Environmental injury		1
Mustard	Chemical injury		1
	Environmental injury		1
Pea	Root rot/seedling blight	*Fusarium/Pythium/Rhizoctonia* spp.	9
	Mycosphaerella blight	*Mycosphaerella pinodes*	3
	Powdery mildew	*Erysiphe pisi*	1
	Chemical injury		3
	Environmental injury		3
	Nutrient deficiency		21

Table 8. Summary of plant diseases diagnosed on **American elm** by the SAF Crop Protection Laboratory in 2006. 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*	150
	Dothiorella wilt	*Dothiorella ulmi*	36
	Verticillium wilt	*Verticillium* spp.	3

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

CROP: Diagnostic Laboratory Report
LOCATION: Manitoba

NAME AND AGENCY:
M.L. Desjardins[1], J. Heard[2], D.A. Kaminski[2] and P.R. Northover[2].
[1]Manitoba Agriculture, Food and Rural Initiatives, Crop Diagnostic Centre, 545 University Crescent, Winnipeg, MB R3T 5S6
Telephone: (204) 945-7707; **Facsimile:** (204) 945-4327; **E-mail:** mdesjardin@gov.mb.ca
[2]Manitoba Agriculture, Food and Rural Initiatives, Carman Knowledge Centre, Crops Branch, Box 1149, Carman, MB R0G 0J0

TITLE: 2006 MANITOBA CROP DIAGNOSTIC CENTRE LABORATORY SUBMISSIONS

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

RESULTS: Summaries of diseases diagnosed on plants in different crop categories are presented in Tables 1-11 and cover the time period from January 1 to November 24, 2006.

Table 1. Summary of diseases diagnosed on **forage legume crops** submitted to the MAFRI Crop Diagnostic Centre in 2006.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Alfalfa	Common leaf spot	*Pseudopeziza medicaginis*	3
	Downy mildew	*Peronospora trifoliorum*	2
	Rust	*Uromyces striatus*	2
	Spring black stem and leaf spot	*Phoma medicaginis*	2
	Yellow leaf blotch	*Leptotrochila medicaginis*	5
	Environmental injury		1
	Herbicide injury		1
	Nutrient deficiency		1
Clover	Herbicide injury		1

Table 2. Summary of diseases diagnosed on **greenhouse crops** submitted to the MAFRI Crop Diagnostic Centre in 2006.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Begonia	Environmental injury		1
Geranium	Micronutrient toxicity		1
Poinsettia	Root rot	*Pythium* sp.	2
Tomato	Nutrient deficiency		1
	Physiological disorder		1

Table 3. Summary of diseases diagnosed on **cereal crops** submitted to the MAFRI Crop Diagnostic Centre in 2006.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Wheat	Bacterial blight	*Pseudomonas syringae*	1
	Barley yellow dwarf	Barley yellow dwarf virus (BYDV)	6
	Common root rot	*Fusarium* spp., *Cochliobolus sativus*	13
	Leaf rust	*Puccinia triticina*	5
	Powdery mildew	*Erysiphe graminis*	11
	Septoria leaf spot	*Septoria* spp.	3
	Spot blotch	*Cochliobolus sativus*	1
	Tan spot	*Pyrenophora tritici-repentis*	12
	Wheat streak mosaic	Wheat streak mosaic virus (WSMV)	27
	Physiological leaf spot	Chloride deficiency	3
	Environmental injury		34
	Herbicide injury		24
	Nutrient deficiency		5
Barley	Common root rot	*Fusarium* spp., *Cochliobolus sativus*	1
	Spot blotch	*Cochliobolus sativus*	1
	True loose smut	*Ustilago nuda*	2
	Environmental injury		2
	Herbicide injury		8
	Nutrient deficiency		2
Oat	Bacterial blight	*Pseudomonas syringae*	10
	Common root rot	*Fusarium* spp., *Cochliobolus sativus*	4
	Pyrenophora leaf blotch	*Pyrenophora avenae*	5
	Stagonospora leaf spot	*Stagonospora avenae*	4
	Environmental injury		5
	Herbicide injury		8
	Nutrient deficiency		2
Rye	Leaf rust	*Puccinia triticina*	1
	Root rot	*Fusarium graminearum*	1
	Stem rust	*Puccinia graminis*	1
Spelt	Leaf rust	*Puccinia triticina*	1
	Powdery mildew	*Erysiphe graminis*	1
	Septoria leaf spot	*Septoria* sp.	1

Table 4. Summary of diseases diagnosed on **grasses** submitted to the MAFRI Crop Diagnostic Centre in 2006.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Turf grasses	Anthracnose	*Colletotrichum graminicola*	4
	Fusarium blight	*Fusarium* spp.	4
	Leaf spot	*Leptosphaerulina australis*	1
	Melting out	*Drechslera* sp.	1
	Pythium blight	*Pythium* spp.	4
	Environmental injury		1
Orchardgrass (*Dactylis glomerata*)	Brown stripe	*Cercosporidium graminis*	1
Perennial Ryegrass	Leaf spot	*Leptosphaeria* sp.	1
Timothy	Brown stripe	*Cercosporidium graminis*	3
	Purple eyespot	*Cladosporium phlei*	2

Table 5. Summary of diseases diagnosed on **vegetable crops** submitted to the MAFRI Crop Diagnostic Centre in 2006.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Carrot	Leaf spot	*Alternaria dauci*	1
	Root rot	*Rhizoctonia* sp.	1
	Physiological disorder		1
Celery	Physiological disorder		1
Corn	Root rot	*Fusarium* spp.	2
	Environmental injury		1
	Nutrient deficiency		1
Cucumber	Environmental injury		1
	Herbicide injury		1
Onion	Blue mould	*Penicillium* sp.	1
	Fusarium basal plate rot	*Fusarium oxysporum*	5
	Neck rot	*Botrytis allii*	4
	Environmental injury		4
Tomato	Phytophthora root rot	*Phytophthora* sp.	1
	Herbicide injury		3
Watermelon	Angular leaf spot	*Pseudomonas syringae* pv. *lachrymans*	1

Table 6. Summary of diseases diagnosed on **oilseed crops** submitted to the MAFRI Crop Diagnostic Centre in 2006.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Canola	Alternaria black spot	*Alternaria* spp.	1
	Blackleg	*Leptosphaeria maculans*	3
	Downy mildew	*Peronospora parasitica*	1
	Root rots/seedling blight	*Fusarium oxysporum*, *Rhizoctonia solani*	4
	Environmental injury		6
	Herbicide injury		17
	Nutrient deficiency	Sulphur deficiency	3
Flax	Brown stem blight	*Alternaria linicola*	1
	Fusarium wilt	*Fusarium oxysporum*	3
	Root rot	*Fusarium oxysporum*	1
	Environmental injury		3
	Herbicide injury		11
Sunflower	Downy mildew	*Plasmopara halstedii*	3
	Root rot	*Fusarium* spp.	2
	Environmental injury		2
	Herbicide injury		23

Table 7. Summary of diseases diagnosed on **potato crops** submitted to the MAFRI Crop Diagnostic Centre in 2006.

SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Bacterial ring rot	*Clavibacter michiganensis* subsp. *sepedonicus*	3
Bacterial soft rot	*Erwinia carotovora* subsp. *carotovora*	4
Blackleg	*Erwinia carotovora* subsp. *atroseptica*	2
Black dot (on tubers)	*Colletotrichum coccodes*	3
Black dot (on stems)	*Colletotrichum coccodes*	5
Black pit	*Alternaria alternata*	1
Brown spot	*Alternaria alternata*	11
Early blight	*Alternaria solani*	7
Fusarium dry rot	*Fusarium sambucinum*	4
Fusarium wilt	*Fusarium avenaceum, F. oxysporum*	4
Gray mould	*Botrytis cinerea*	4
Late blight	*Phytophthora infestans*	3
Leak	*Pythium ultimum*	8
Pink rot	*Phytophthora erythroseptica*	3
Rhizoctonia stem and stolon canker	*Rhizoctonia solani*	3
Rubbery rot	*Geotrichum candidum*	2
Scab, common	*Streptomyces* sp.	2
Silver scurf	*Helminthosporium solani*	3
Verticillium wilt	*Verticillium dahliae*	12
Physiological disorders		11
Environmental injury		1

Table 8. Summary of diseases diagnosed on **shelterbelt trees** and **woody ornamentals** submitted to the MAFRI Crop Diagnostic Centre in 2006.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Ash (*Fraxinus* sp.)	Anthracnose	*Gloeosporium aridum*	2
	Canker	unidentified	2
	Rust	*Puccinia sparganioides*	1
	Environmental injury		1
	Herbicide injury		11
Aspen, trembling (*Populus tremuloides*)	Bronze leaf disease	*Apioplagiostoma populi*	1
Basswood	Wood decay	unidentified	1
	Environmental injury		1
	Herbicide injury		1
Birch	Canker	unidentified	1
	Environmental injury		1
	Herbicide injury		1
Elm, American (*Ulmus americana*)	Canker	*Botryosphaeria* sp.	2
	Canker	unidentified	1
	Dutch elm disease	*Ophiostoma ulmi*	10
Elm, Siberian (*Ulmus pumila*)	Black spot	*Gloeosporium* sp.	1
	Canker	*Phoma* sp.	1
Lilac	Environmental injury		2
	Herbicide injury		3
Manitoba maple (*Acer negundo*)	Herbicide injury		10
Oak	Anthracnose	*Discula* sp.	1
	Canker	unidentified	1
	Herbicide injury		2
Poplar (*Populus* spp.)	Bronze leaf disease	*Apioplagiostoma populi*	1
	Canker	*Cytospora chrysosperma*	1
	Environmental injury		3
	Herbicide injury		3
Rose	Rust	*Phragmidium* sp.	1
Spruce	Brown felt blight	*Herpotrichia juniperi*	1
	Cytospora canker	*Leucostoma kunzei*	1
	Canker	unidentified	4
	Lirula needle blight	*Lirula* sp.	1
	Needle cast	unidentified	5
	Stigmina needle blight	*Stigmina lautii*	13
	Environmental injury		13
	Herbicide injury		2

Table 8 – cont'd

Thuja sp.	Canker	unidentified	1
	Needle blight	unidentified	1
Willow	Canker	*Cytospora* sp.	1
	Canker	unidentified	1
	Leaf spot	*Septoria* sp.	1
	Environmental injury		1
	Herbicide injury		7

Table 9. Summary of diseases diagnosed on **fruit crops** submitted to the MAFRI Crop Diagnostic Centre in 2006.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Apple	Fire blight	*Erwinia amylovora*	1
	Frogeye leaf spot	*Botryosphaeria obtusa*	1
	Environmental injury		1
	Herbicide injury		1
Plum	Plum pockets	*Taphrina communis*	1
Raspberry	Cane blight	*Leptosphaeria coniothyrium*	1
	Root rot	*Fusarium* sp., *Cylindrocarpon* sp.	2
	Iron chlorosis	Iron deficiency	1
	Herbicide injury		1
Saskatoon	Blossom blight	*Botrytis cinerea*	1
	Entomosporium leaf and berry spot	*Entomosporium mespili*	1
	Iron chlorosis	Iron deficiency	1
	Rust	*Gymnosporangium* sp.	1
	Herbicide injury		1
Strawberry	Black root rot	*Fusarium* spp., *Pythium* sp.	3
	Iron chlorosis	Iron deficiency	4
	Root rot	*Rhizoctonia solani*	3

Table 10. Summary of diseases diagnosed on **herbaceous ornamentals** and **interiorscape plants** submitted to the MAFRI Crop Diagnostic Centre in 2006.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Hollyhock	Rust	*Puccinia malvacearum*	1
Lily	Rodent injury		1
Sweet pea	Herbicide injury		1

Table 11. Summary of diseases diagnosed on **special field crops** submitted to the MAFRI Crop Diagnostic Centre in 2006.

CROP	SYMPTOM/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Caraway	Blight	*Alternaria* sp., *Botrytis cinerea*, *Septoria* sp.	1
Corn	Common smut	*Ustilago zeae*	1
	Root rot	*Fusarium graminearum*, *Fusarium* spp.	3
	Environmental injury		1
	Herbicide injury		3
	Nutrient deficiency		1
Faba bean	Botrytis flower blast	*Botrytis cinerea*	2
	Fusarium wilt	*Fusarium oxysporum*	1
	Leaf and pod spot	*Ascochyta fabae*	1
	Root rot	*Fusarium* spp., *Rhizoctonia solani*	2
	Herbicide injury		2
Field bean	Anthracnose	*Colletotrichum lindemuthianum*	3
	Bacterial blight	unspecified	1
	Brown spot	*Pseudomonas syringae* pv. *syringae*	1
	Common blight	*Xanthomonas axonopodis* pv. *phaseoli*	8
	Fusarium wilt	*Fusarium oxysporum*	1
	Halo blight	*Pseudomonas syringae* pv. *phaseolicola*	4
	Root rot	*Fusarium solani, F. oxysporum, Rhizoctonia solani*	5
	Environmental injury		4
	Herbicide injury		1
Field pea	Anthracnose	*Colletotrichum pisi*	3
	Aphanomyces root rot	*Aphanomyces euteiches*	3
	Bacterial blight	*Pseudomonas syringae* pv. *pisi*	1
	Mycosphaerella blight	*Mycosphaerella pinodes*	4
	Root rot/seed rot	*Fusarium* spp., *Pythium* sp., *Rhizoctonia solani*	9
	Herbicide injury		6
Millet	Bacterial blight	unidentified	1
Soybean	Downy mildew	*Peronospora manshurica*	1
	Root rot	*Fusarium oxysporum*, *F. solani*, *Pythium* spp.	22
	Root rot	*Phytophthora sojae*	4
	Seed rot	*Penicillium* sp.	1
	Stem blight	*Phomopsis* sp.	1
	Environmental injury		2
	Herbicide injury		7
	Nutrient deficiency		4

CROPS: Diagnostic Laboratory Report
LOCATION: Ontario

NAMES AND AGENCY:
M. Sabourin, C. Blaser, S. Cook, M. Waud, M.A. Renaud and L. Wegener
Pest Diagnostic Clinic, Laboratory Services Division, University of Guelph, 95 Stone Road West, Guelph, ON N1H 8J7
Telephone: (519) 767-6256; **Facsimile:** (519) 767-6240; **E-mail:** msabouri@lsd.uoguelph.ca

TITLE: DISEASES DIAGNOSED ON CROPS SUBMITTED TO THE PEST DIAGNOSTIC CLINIC IN ONTARIO IN 2006

METHODS: The Pest Diagnostic Clinic provides diagnostic services for the identification of plant diseases of commercial agricultural crops and ornamentals. Other services include nematode and *Verticillium* counts from soil, as well as plant and insect identification. Samples are submitted by crop specialists from the Ontario Ministry of Agriculture, Food and Rural Affairs, farmers, consultants, agri-business, the landscape industry and the general public. Diagnostic methods include visual examination, microscopy, transmission electron microscopy, culturing onto artificial semi-selective and selective media, enzyme-linked immunosorbent assay (ELISA), BIOLOG® and MIDI microbial identification systems. Molecular techniques including PCR and sequencing were used for some diagnoses and some samples were referred to external laboratories for diagnosis or confirmation of diagnosis.

RESULTS AND COMMENTS: Summaries of diseases diagnosed in different crop categories are presented in Tables 1- 10. Not included in the summary are diagnoses of abiotic problems, environmental and chemical damage, insect-related injury, or submissions for which the causal agent of the damage was not identified.

Table 1. Summary of diseases diagnosed on **cereal crop** samples submitted to the Pest Diagnostic Clinic in 2006.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Wheat	Barley yellow dwarf	Barley yellow dwarf virus - SGV	3
	Leaf rust	*Puccinia triticina*	1
	Leaf spot	*Septoria tritici*	1
	Sooty mold	Various fungi	1
	Wheat mosaic	Soil-borne wheat mosaic virus	1
	Wheat streak mosaic	Wheat streak mosaic virus	1

Table 2. Summary of diseases diagnosed on **forage and field crops** submitted to the Pest Diagnostic Clinic in 2006.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Canola	Blackleg	*Phoma lingam*	1
	Pseudomonas leaf spot	*Pseudomonas syringae*	1
	Sclerotinia stem rot	*Sclerotinia sclerotiorum*	1

Table 3. Summary of diseases diagnosed on **fruit crops** submitted to the Pest Diagnostic Clinic in 2006.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Apple	Anthracnose	*Colletotrichum* sp.	1
	Blue mold rot	*Penicillium* sp.	1
	Scab	*Venturia inaequalis*	1
Blueberry	Tomato ringspot	Tomato ringspot virus	10
Cantaloupe	Virus infection	*Potyvirus*	1
Grape	Crown gall	*Rhizobium radiobacter*	1
Peach	Peach scab	*Cladosporium carpophilum*	1
	Phytoplasma	Phytoplasma	1
	Powdery mildew	*Sphaerotheca pannosa*	1
Raspberry	Cane blight	*Coniothyrium fuckelii*	1
	Leaf spot	*Sphaerulina rubi*	1
	Phytophthora crown rot	*Phytophthora* sp.	1
	Pseudomonas blight	*Pseudomonas syringae*	1
	Rust	*Pucciniastrum* sp.	2
Strawberry	Phomopsis leaf blight	*Phomopsis obscurans*	3
	Rhizoctonia root rot	*Rhizoctonia solani*	1
	Root and crown rot	*Fusarium* sp.	1
Watermelon	Anthracnose	*Colletotrichum orbiculare*	1
	Virus infection	Potyvirus	3

Table 4. Summary of diseases diagnosed on **vegetable field crops** submitted to the Pest Diagnostic Clinic in 2006.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Carrot	Rhizopus rot	*Rhizopus stolonifer*	1
Cauliflower	Alternaria rot	*Alternaria brassicicola*	1
	Pythium root rot	*Pythium* sp.	
Celery	Aster yellows	Aster yellows phytoplasma	2
Onion	Rhizopus blight	*Rhizopus* sp.	1
Potato	Bacterial soft rot	*Erwinia carotovora* subsp. *carotovora*	1
	Dry rot	*Fusarium* sp.	2
Sweet potato	Rhizopus blight	*Rhizopus* sp.	1
	Rhizopus rot	*Rhizopus* sp.	1
Shallot	Slippery skin	*Burkholderia gladioli* pv. *alliicola*	1

Table 4 – cont'd

Squash	Angular leaf spot	*Pseudomonas syringae* pv. *lachrymans*	1
	Virus infection	Potyvirus	2
Tomato	Bacterial spot	*Xanthomonas campestris* pv. *vesicatoria*	2
	Black mold rot	*Alternaria* sp.	1
	Grey mold	*Botrytis cinerea*	1
	Root rot	*Pythium* sp.	1
	Septoria leaf spot	*Septoria lycopersici*	2

Table 5. Summary of diseases diagnosed on **bean crops** submitted to the Pest Diagnostic Clinic in 2006.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Azuki bean	Anthracnose	*Colletotrichum lindemuthianum*	1
	Anthracnose foliar blight	*Colletotrichum graminicola*	1
	Ascochyta leaf spot	*Ascochyta* sp.	1
Soybean	Anthracnose	*Colletotrichum lindemuthianum*	1
	Anthracnose	*Colletotrichum truncatum*	9
	Ascochyta leaf spot	*Ascochyta* sp.	1
	Bacterial brown spot	*Septoria glycines*	11
	Pod and stem blight	*Diaporthe* sp.	2
	Powdery mildew	*Microsphaera diffusa*	22
	Sclerotinia rot	*Sclerotinia sclerotiorum*	1
	Virus infection	Potyvirus	3
White bean	Anthracnose	*Colletotrichum lindemuthianum*	2
Yellow bean	Anthracnose	*Colletotrichum lindemuthianum*	1

Table 6. Summary of diseases diagnosed on **trees and woody ornamentals** submitted to the Pest Diagnostic Clinic in 2006.

CROP	SYMPTOMS/ DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Ash (*Fraxinus* sp.)	Ash anthracnose	*Apiognomonia errabunda*	2
Beech (*Fagus* sp.)	Sooty mold	Saprophytic fungi	1
Caragana pea shrub (*Caragana* sp.)	Powdery mildew	*Oidium* sp.	1
Cedar-Eastern white (*Thuja occidentalis*)	Tip blight	*Pestalotiopsis* sp.	2

Table 6 – cont'd

Common honeysuckle (*Lonicera japonica*)	Powdery mildew	*Erysiphe* sp.	1
Cypress (*Cupressus* sp.)	Stem and crown rot	*Rhizoctonia* sp.	1
Dogwood (*Cornus* sp.)	Leaf spot	*Septoria cornicola*	1
Elm (*Ulmus glabra* cv.*camperdownii*)	Dutch elm disease	*Ophiostoma novo-ulmi*	2
Euonymus (*Euonymus* sp.)	Anthracnose	*Gloeosporium* sp.	3
Hawthorn (*Crataegus* sp.)	Hawthorn rust	*Gymnosporangium globosum*	1
Japanese barberry (*Berberis thunbergii*)	Root rot	*Pythium* sp.	1
Lilac (*Syringa* sp.)	Root rot	*Pythium sylvaticum*	3
Maple (*Acer* sp.)	Anthracnose	*Aureobasidium apocryptum*	3
	Anthracnose	*Discula* sp.	1
Maple-Japanese (*Acer palmatum*)	Maple anthracnose	*Aureobasidium apocryptum*	2
Maple-Norway (*Acer platanoides*)	Tar spot	*Rhytisma acerinum*	1
Maple-Red (*Acer rubrum*)	Anthracnose	*Aureobasidium apocryptum*	1
Maple-Sugar (*Acer saccharum*)	Anthracnose	*Aureobasidium apocryptum*	1
Oak (*Quercus* sp.)	Anthracnose	*Apiognomonia quercina*	2
	Leaf spot	*Mycosphaerella* sp.	1
Oak-Red (*Quercus rubra*)	Leaf blister	*Taphrina caerulescens*	1
Oak-White	Anthracnose	*Apiognomonia quercina*	1
Rosary vine (*Ceropegia woodii*)	Canker	*Myrothecium roridum*	1
Smokebush (*Cotinus coggygria*)	Grey mold	*Botrytis cinerea*	1
Spruce (*Picea pungens*)	Rhizosphaera needlecast	*Rhizosphaera kalkhoffii*	2

Table 7. Summary of diseases diagnosed on **greenhouse vegetable crops** submitted to the Pest Diagnostic Clinic in 2006.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Cucumber	Crown rot	*Fusarium* sp.	1
	Cucumber green mottle mosaic	Cucumber green mottle mosaic virus	2
	Downy mildew	*Pseudoperonospora cubensis*	1
	Fusarium wilt	*Fusarium oxysporum*	1
	Powdery mildew	*Sphaerotheca fuliginea*	2
	Pythium root rot	*Pythium* sp.	5
	Pythium root rot	*Pythium aphanidermatum*	1
	Phytophthora crown rot	*Phytophthora* sp.	1
	Phytophthora stem rot	*Phytophthora capsici*	1
	Stem canker	*Fusarium* sp.	1
	Virus infection	Potyvirus	4
Pepper	Bacterial leaf spot	*Pseudomonas syringae* pv. *syringae*	1
	Bacterial leaf spot	*Xanthomonas campestris*	1
	Bacterial spot	*Xanthomonas campestris* pv. *vesicatoria*	1
	Fusarium stem rot	*Fusarium solani*	1
	Grey mold	*Botrytis cinerea*	1
	Pepper mild mottle	Pepper mild mottle virus	1
	Phytophthora blight	*Phytophthora capsici*	1
	Pythium root rot	*Pythium* sp.	2
Pepper-hot	Phytophthora blight	*Phytopthora capsici*	1
	Verticillium wilt	*Verticillium dahliae*	1
Tomato	Alternaria rot	*Alternaria* sp.	1
	Bacterial canker	*Clavibacter michiganensis* subsp. *michiganensis*	12
	Corky root rot	*Pyrenochaeta lycopersici*	1
	Grey mold	*Botrytis cinerea*	1
	Pepino mosaic	Pepino mosaic virus	14
	Pythium root rot	*Pythium* sp.	2
	Pythium root rot	*Pythium aphanidermatum*	1
	Tomato spotted wilt	Tomato spotted wilt virus	1
	Virus infection	Potyvirus	1

Table 8. Summary of diseases diagnosed on **greenhouse floriculture crops** submitted to the Pest Diagnostic Clinic in 2006.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Alstroemeria	Alstroemeria mosaic	Alstroemeria mosaic virus	5
	Cucumber mosaic	Cucumber mosaic virus	1
Arabidopsis	Impatiens necrotic spot	Impatiens necrotic spot virus	2
Begonia	Anthracnose	*Colletotrichum* sp.	1
	Botrytis blight	*Botrytis cinerea*	1

Table 8 – cont'd

Calibrachoa	Calibrachoa mottle	Calibrachoa mottle virus	7
	Tobacco mosaic	Tobacco mosaic virus	1
Chrysanthemum	Fusarium stem rot	*Fusarium oxysporum*	1
	Pythium crown and root rot	*Pythium ultimum*	1
	Pythium root rot	*Pythium* sp.	1
	White mold	*Sclerotinia sclerotiorum*	1
Clematis	Grey mold	*Botrytis* sp.	4
Cyclamen	Fusarium crown rot	*Fusarium oxysporum*	2
	Fusarium wilt	*Fusarium oxysporum*	1
	Impatiens necrotic spot	Impatiens necrotic spot virus	10
Dahlia	Fusarium crown rot	*Fusarium oxysporum*	1
Draceana	Root and crown rot	*Fusarium oxysporum*	1
Gentiana	Rhizopus blight	*Rhizopus* sp.	1
	Fusarium crown and root rot	*Fusarium sp.*	1
	Fusarium root rot	*Fusarium sp.*	1
Geranium	Bacterial blight	*Xanthomonas campestris* pv. *pelargonii*	1
Gloxinia	Impatiens necrotic spot	Impatiens necrotic spot virus	1
Helenium	Virus infection	Potyvirus	2
Heuchera	Grey mold	*Botrytis* sp.	1
	Fungal infection	*Cladosporium* sp.	1
	Root and crown rot	*Phytophthora* sp.	1
Hydrangea	Bacterial leaf spot	*Xanthomonas* sp.	1
	Pseudomonas leaf spot	*Pseudomonas syringae*	1
Impatiens	Impatiens necrotic spot	Impatiens necrotic spot virus	2
	Rhizoctonia crown rot	*Rhizoctonia solani*	1
Iris (*Iris xiphium*)	Blue mold	*Penicillium* sp.	1
Iris (*Iris germanica*)	Pythium root rot	*Pythium* sp.	1
	Leaf spot	*Mycosphaerella macrospora*	1
Kalanchoe	Grey mold	*Botrytis cinerea*	1
Lenten Rose *(Helleborus orientalis*)	Grey mold	*Botrytis cinerea*	1
	Pythium root rot	*Pythium* sp.	1

Table 8 – cont'd

Lily (*Lilium longiflorum* var. *eximium*	Phytophthora root rot Pythium root rot	*Phytophthora* sp. Pythium *sp.*	1 2
Lobelia	Impatiens necrotic spot	Impatiens necrotic spot virus	1
Mandevilla	Crown gall	*Rhizobium radiobacter*	1
Nemesia	Grey mold	*Botrytis cinerea*	1
Orchid (*Lycaste* sp.)	Cymbidium mosaic	Cymbidium mosaic virus	1
Orchid (*Phalaenopsis* sp.)	Cymbidium mosaic	Cymbidium mosaic virus	1
Orchid (unidentified)	Fusarium root rot	*Fusarium solani*	1
Petunia	Calibrachoa mottle Tobacco mosaic	Calibrachoa mottle virus Tobacco mosaic virus	5 4
Physostegia	Alfalfa mosaic	Alfalfa mosaic virus	1
Poinsettia	Grey mold Pythium crown and root rot Pythium root rot	*Botrytis* sp. *Pythium* sp. *Pythium* sp.	
Rose	Black spot Botrytis blight Common canker Downy mildew Powdery mildew Pythium root rot	*Diplocarpon rosae* *Botrytis* sp. *Coniothyrium fuckelii* *Peronospora sparsa* *Sphaerotheca* sp. *Pythium* sp.	2 1 1 4 1 1
Sedum	Root rot Root and crown rot	*Rhizoctonia* sp. *Fusarium* sp.	1 1
St. John's-wort	Thielaviopsis root rot	*Thielaviopsis basicola*	1
Sweet potato vine	Phyllosticta leaf blight	*Phyllosticta* sp.	1
Viburnum	Grey mold	*Botrytis cinerea*	1
Wishbone flower	Tobacco mosaic	Tobacco mosaic virus	1

Table 9. Summary of diseases diagnosed on **specialty field crops** submitted to the Pest Diagnostic Clinic in 2006.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Garlic	Basal plate rot	*Fusarium oxysporum*	1
	Penicillium decay	*Penicillium* sp.	1

Table 10. Summary of diseases diagnosed on **herbaceous ornamentals and interiorscape plants** submitted to the Pest Diagnostic Clinic in 2006.

CROP	SYMPTOMS/DISEASE	CAUSAL AGENT	NUMBER OF SAMPLES
Aster	Sclerotinia stem rot	*Sclerotinia sclerotiorum*	1
Heather	Pythium root rot	*Pythium* sp.	1
Hosta	Hosta virus X	Hosta virus X	14
Tulip	Blue mold	*Penicillium* sp.	1
	Pythium root rot	*Pythium* sp.	1

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

NOMS ET ORGANISME :
G. Gilbert, D. Hamel, C. Dallaire, M. Lacroix
Laboratoire de diagnostic en phytoprotection, Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec (MAPAQ), Complexe scientifique, 2700, rue Einstein - D.1.200h, Sainte-Foy, Québec G1P 3W8
Téléphone: (418) 528-1978; **Télécopieur:** (418) 646-6806;**Courriel:** gerard.gilbert@mapaq.gouv.qc.ca

TITRE: MALADIES DIAGNOSTIQUÉES SUR LES CULTURES COMMERCIALES SOUMISES AU LABORATOIRE DE DIAGNOSTIC EN PHYTOPROTECTION DU MAPAQ EN 2006

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

RÉSULTATS ET DISCUSSION : Depuis le 1er janvier 2006, près de 1800 échantillons ont été traités pour les maladies; les plantes maraîchères et les petits fruits constituent presque la moitié de ce nombre. Le climat frais et humide, du printemps et de la fin de l'été, a favorisé les infections fongiques, surtout racinaires, et de fréquents désordres liés à ce climat. Une maladie de quarantaine, le nématode doré de la pomme de terre, a été identifiée à la fin de juillet. Chez la tomate de serre, les demandes de détection pour le chancre bactérien et la résistance du *Botrytis* aux fongicides ont été fréquentes. Dans cette culture, nous rencontrons des chancres de tige semblables à ceux de *Botrytis* mais causés par *Fusarium solani*, une nouvelle maladie. Depuis 2005, de nombreuses demandes de détection du virus X du hosta (HVX) sont traitées au laboratoire. Les tableaux 1 à 12 présentent le sommaire des maladies identifiées sur les cultures commerciales et leurs origines. Les totaux ne tiennent pas compte des causes indéterminées et des diagnostics incertains. Lorsque non précisés, les agents non infectieux regroupent les déséquilibres minéraux, les pH inadéquats, les sols asphyxiants, salins, les insolations, le froid, le gel et la chaleur, les polluants atmosphériques, l'intumescence, les phytotoxicités causées par des pesticides, l'excès ou le manque d'eau et les désordres génétiques.

REMERCIEMENTS : Les auteurs remercient Marion Berrouard, Carolle Fortin, Chantal Malenfant, Mario Tésolin et Lise Vézina pour leur assistance technique.

Tableau 1. Sommaire des maladies diagnostiquées parmi les cultures maraîchères de champs reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Ail	*Botrytis* sp.	Pourriture du col	2
	Burkholderia gladioli	Pourriture bactérienne	1
	Potyvirus	Anomalie de coloration des feuilles	1
	Alternaria sp.	Tache alternarienne	1
	Cladosporium sp.	Tache des bulbes	1
	Stemphylium sp.	Tache stemphyllienne	1
Asperge	*Fusarium acuminatum*	Tache des tiges	1
	Puccinia asparagi	Rouille	2
	Stemphylium sp.	Tache stemphyllienne	1
Aubergine	*Phytophthora capsici*	Pourriture des fruits	1
Betterave	*Fusarium* sp.	Pourriture des racines	1
	Agents non infectieux		2
Brocoli	*Erwinia carotovora* ssp. *carotovora*	Pourriture molle bactérienne	1
	Fusarium oxysporum	Chancre de tige	1
	Pseudomonas viridiflava	Pourriture molle bactérienne	1
	Pythium sp.	Pourriture du collet	1
	Rhizoctonia solani	Rhizoctone	1
	Xanthomonas campestris pv. *armoraciae*	Tache bactérienne	1
	Xanthomonas campestris pv. *campestris*	Nervation noire	9
	Agents non infectieux		7
Cantaloup	*Alternaria cucumerina*	Tache alternarienne	3
	Fusarium oxysporum	Flétrissement fusarien	1
	Pseudomonas lacrymans	Tache angulaire	1
	Pythium dissotocum	Pourridié pythien	1
	Agents non infectieux		1
Carotte	*Fusarium oxysporum*	Pourridié fusarien	3
	Meloidogyne sp.	Nodosité des racines	2
	Pratylenchus sp.	Lésions racinaires	1
	Rhizoctonia carotae	Rhizoctone	1
	Rhizoctonia solani	Rhizoctone commun	3
	Agents non infectieux		1
Céleri	*Fusarium oxysporum*	Pourriture du collet	2
	Pythium sp.	Pourridié pythien	3
	Rhizoctonia solani	Rhizoctone commun	1
	Septoria sp.	Tache septorienne	3
	Agents non infectieux		1
Chou	*Alternaria brassicae*	Tache grise	1
	Alternaria brassicicola	Tache noire	3
	Pythium ultimum	Pourridié pythien	2
	Xanthomonas campestris pv. *campestris*	Nervation noire	14
	Phytotoxicité herbicide		3
	Agents non infectieux		8

Tableau 1 – suite

Chou chinois	*Erwinia carotovora*	Pourriture molle bactérienne	1
	Pythium ultimum	Pourridié pythien	1
	Agent non infectieux		1
Chou-fleur	*Alternaria brassicicola*	Tache noire sur feuille et capitule	4
	Erwinia carotovora	Pourriture molle bactérienne	2
	Pseudomonas syringae	Moucheture bactérienne	1
	Pythium ultimum	Pourridié pythien	1
	Sclerotinia sclerotiorum	Pourriture sclérotique	2
	Xanthomonas campestris pv. *armoraciae*	Tache bactérienne	2
	Xanthomonas campestris pv. *campestris*	Nervation noire	9
	Agents non infectieux		8
Citrouille	*Cladosporium cucumerinum*	Gale	1
	Erwinia tracheiphila	Flétrissement bactérien	2
	Fusarium sp.	Pourriture fusarienne des fruits	1
	Phoma sp.	Pourriture noire	2
	Phytophthora capsici	Pourridié phytophthoréen	1
	Potyvirus	Anomalie de coloration des feuilles	1
	Pseudomonas syringae	Tache angulaire	3
	Sclerotinia sclerotiorum	Pourriture sclérotique	2
	Septoria sp.	Tache septorienne	1
	Agents non infectieux		1
Concombre	*Alternaria alternata*	Tache foliaire	1
	Erwinia tracheiphila	Flétrissement bactérien	14
	Erysiphe cichoracerum	Blanc	1
	Fusarium oxysporum	Fusariose vasculaire	6
	Phoma sp.	Pourriture noire	1
	Pseudomonas syringae	Tache angulaire	2
	Pseudoperonospora cubensis	Mildiou	1
	Pythium sp.	Pourriture des fruits	1
	Agents non infectieux		3
Courge	*Botrytis cinerea*	Moisissure grise	1
	Cladosporium cucumerinum	Gale	1
	Erwinia tracheiphila	Flétrissement bactérien	3
	Erysiphe cichoracearum	Blanc	1
	Fusarium oxysporum	Fusariose vasculaire	2
	Phytophthora capsici	Pourriture des fruits	3
	Pseudomonas syringae	Tache angulaire	3
	Sclerotinia sclerotiorum	Pourriture sclérotique	2
	Agents non infectieux		6
Épinard	*Fusarium oxysporum*	Fusariose vasculaire	1
	Phytophthora sp.	Pourriture des racines	1
	Pythium spp.	Fonte des semis	2
	Rhizoctonia solani	Fonte des semis	1

Tableau 1 – suite

Haricot / Pois	*Colletotrichum* sp.	Anthracnose	1
	Fusarium oxysporum	Pourriture fusarienne	5
	Phaeoisariopsis griseola	Tache foliaire	1
	Pseudomonas syringae	Graisse bactérienne	2
	Pythium spp.	Pourriture pythienne	4
	Rhizoctonia solani	Rhizoctone commun	1
Laitue	*Bremia lactucae*	Mildiou	1
	Meloidogyne sp.	Nodosité des racines	1
	Microdochium panattonianum	Anthracnose	1
	Pseudomonas cichorii	Tache luisante	1
	Pseudomonas fluorescens	Tache bactérienne	1
	Pseudomonas viridiflava		2
	Rhizoctonia solani	Rhizoctone commun	1
	Sclerotinia sclerotiorum	Pourriture à sclérotes	1
	Septoria sp.	Tache septorienne	4
	Xanthomonas campestris	Tache bactérienne	10
	Agents non infectieux		3
Maïs sucré	*Longidorus* sp.	Nanisme	1
	Pythium ultimum	Malformation racinaire	1
	Agents non infectieux		2
Melon	*Alternaria alternata*	Tache foliaire	1
	Potyvirus		1
	Pseudomonas syringae	Tache angulaire	1
	Xanthomonas campestris	Tache bactérienne	1
	Agents non infectieux		6
Oignon /	*Botrytis cinerea*	Pourriture du col	2
Échalote /	*Burkholderia gladioli*	Pourriture brunâtre	2
Poireau	*Cladosporium* sp.	Brûlure hétérosporienne	1
	Colletotrichum sp.	Anthracnose	1
	Fusarium moniliforme	Dépérissement	3
	Fusarium oxysporum	Fusariose du plateau	4
	Fusarium solani	Pourriture des racines	2
	Levures	Pourriture des bulbes	3
	Penicillium sp.	Pourriture des bulbes	2
	Peronospora destructor	Mildiou	8
	Pythium ultimum	Pourriture pythienne	2
	Stemphylium sp.	Moisissure noire des feuilles	7
	Agents non infectieux		13
Poivron /	*Alternaria alternata*	Alternariose	1
Piment	*Clavibacter michiganensis* ssp. *michiganensis*	Chancre bactérien	5
	Fusarium oxysporum	Pourridié fusarien	3
	Pseudomonas fluorescens	Anomalie de coloration des fruits	1
	Pseudomonas marginalis	Anomalie de coloration des fruits	1
	Pseudomonas syringae	Moucheture bactérienne	7
	Pythium ultimum	Pourridié pythien	1
	Rhizoctonia solani	Tige noire	2
	Xanthomonas campestris	Tache bactérienne	1
	Agents non infectieux		2

Tableau 1 – suite

Pomme de terre	*Alternaria alternata*	Alternariose	1
	Alternaria solani	Alternariose	4
	Clavibacter michiganensis ssp. *sepedonicus*	Flétrissement bactérien	8
	Colletotrichum coccodes	Dartrose	12
	Erwinia carotovora ssp. *atroseptica*	Jambe noire	2
	Erwinia carotovora ssp. *carotovora*	Pourriture molle bactérienne	13
	Fusarium oxysporum	Pourridié fusarien	6
	Fusarium solani	Pourriture du semenceau	1
	Globodera rostochiensis	Nématode doré	1
	Phytophthora erythroseptica	Pourriture rose	2
	Phytophthora infestans	Mildiou	1
	Potyvirus	Anomalie de coloration feuilles	1
	Pythium ultimum	Pourridié pythien	1
	Rhizoctonia solani	Rhizoctonie	4
	Spongospora sp.	Gale poudreuse	1
	Streptomyces sp.	Gale commune	1
	Verticillium dahliae	Verticillose	14
	Agents non infectieux		13
Rutabaga /	*Plasmodiophora brassicae*	Hernie	1
Radis /	*Rhizoctonia solani*	Rhizoctone commun	1
Roquette	*Xanthomonas campestris* pv. *campestris*	Nervation noire	1
	Agents non infectieux		2
Tomate	*Clavibacter michiganensis* spp. *michiganensis*	Chancre bactérien	9
	Phytophthora sp.	Pourriture des fruits	1
	Pseudomonas syringae	Moucheture bactérienne	4
	Rhizoctonia solani	Rhizoctone commun	1
	Agents non infectieux		7
Zucchini	*Cladosporium cucumerinum*	Gale	2
	Fusarium oxysporum	Pourriture du collet	1
	Phoma sp.	Pourriture noire	1
	Phytophthora capsici	Pourriture des fruits	2
	Pseudomonas syringae	Tache angulaire	1
	Pythium sp.	Pourriture des fruits	1
	Xanthomonas campestris	Tache bactérienne	9
Total			458

Tableau 2. Sommaire des maladies diagnostiquées parmi les petits fruits reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Bleuetier	*Agrobacterium tumefaciens*	Tumeur du collet	3
	Aureobasidium sp.	Tache de tige	1
	Botrytis cinerea	Moisissure grise	3
	Colletotrichum acutatum	Anthracnose	4
	Cytospora sp.	Chancre cytosporéen	1
	Fusicoccum sp.	Chancre	4
	Gibbera vaccinicola	Gale de tige	2
	Microsphaera sp.	Blanc	2
	Monilia sp.	Pourriture sclérotique	3
	Petriella sp.	Saprophyte des fruits	1
	Phomopsis vaccinii	Pourriture des fruits	3
	Pucciniastrum goeppertianum	Rouille balai de sorcière	1
	Ramularia sp.	Tache noire	1
	Septoria sp.	Tache septorienne	3
	Gel hivernal		12
	Phytotoxicité herbicide		5
	Autres agents non infectieux		4
Canneberge	*Albugo candida*	Rouille blanche	1
	Aureobasidium sp.	Saprophyte de feuille	1
	Godronia cassandrae	Brûlure foliaire apicale	1
	Monilia sp.	Pourriture sclérotique	1
	Phyllosticta sp.	Tache foliaire	1
	Pythium splendens	Pourridié pythien	1
	Agents non infectieux		6
Cassissier / Gadellier	*Colletotrichum* sp.	Anthracnose	2
	Gloeosporiella ribis	Anthracnose	3
	Sphaerotheca mors-uvae	Blanc	1
Fraisier	*Botrytis cinerea*	Moisissure grise	4
	Colletotrichum acutatum	Anthracnose	8
	Diplocarpon earlianum	Tache pourpre	2
	Marssonina fragariae	Tache commune	7
	Meloidogyne sp.	Nodosité des racines	1
	Phytophthora cactorum	Pourriture de cuir	6
	Phytophthora fragariae	Stèle rouge	3
	Phytophthora spp.	Pourridiés	21
	Phytoplasme	Fruits difformes	1
	Pratylenchus spp.	Lésions des racines	7
	Pythium/*Rhizoctonia*/*Cylindrocarpon*/*Fusarium*	Pourriture noire des racines	30
	Ramularia brunnea	Tache commune	4
	Sphaerotheca macularis	Blanc	5
	Verticillium albo-atrum	Verticilliose	2
	Verticillium dahliae	Verticilliose	8
	Xanthomonas fragariae	Tache angulaire	8
	Zythia fragariae	Brûlure des pétioles et feuilles	7
	Gel hivernal		9
	pH acide du sol		5
	Phytotoxicité herbicides		10
	Autres agents non infectieux		5

Tableau 2 – suite

Framboisier rouge	*Agrobacterium tumefaciens*	Tumeur du collet	3
	Armillaria sp.	Pourridié agaric	1
	Didymella applanata	Brûlure des dards	3
	Erwinia amylovora	Brûlure bactérienne	2
	Helicotylenchus sp.	Détection dans le sol	1
	Phytophthora spp.	Pourridié phytophthoréen	18
	Pratylenchus sp.	Détection dans le sol	2
	Pucciniastrum americanum	Rouille jaune tardive	1
	Pythium/*Rhizoctonia*/*Cylindrocarpon*/*Fusarium*	Pourriture noire des racines	22
	RBDV (Virus du nanisme buissonnant du framboisier)	Mosaïque, nanisme	1
	Septoria rubi	Tache septorienne	2
	Sphaceloma necator	Anthracnose	3
	ToRSV (Virus de la nécrose annulaire du tabac)	Fruits grumeleux	4
	Xiphinema spp.	Détection dans le sol	4
	Drainage et sol inadéquats		10
	Gel hivernal		14
	Phytotoxicité herbicides		8
	Autres agents non infectieux		7
Framboisier noir	*Agrobacterium tumefaciens*	Tumeur du collet	1
	Botrytis cinerea	Brûlure de tige	1
	Coniothyrium sp.	Brûlure de tige	1
	Cytospora sp.	Chancre cytosporéen	1
Vigne	*Agrobacterium tumefaciens*	Tumeur du collet	1
	Phoma spp.	Tache de feuille et tige	4
	Phomopsis viticola	Excoriose	1
	Phyllactinia sp.	Pourriture de baies	1
	Phyllosticta ampelicida	Pourriture noire des baies	6
	Plasmopara viticola	Mildiou	2
	Sphaceloma ampelinum	Anthracnose	3
	Uncinula necator	Blanc	2
	Xanthomonas sp.	Tache foliaire	1
	Gel hivernal		7
	Phytotoxicité pesticides		8
	Autres agents non infectieux		11
Total			381

Tableau 3. Sommaire des maladies diagnostiquées parmi les céréales reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Avoine	*Alternaria alternata*	Fumagine	2
	Cladosporium spp.	Fumagine	1
	Colletotrichum graminicola	Anthracnose	2
	Drechslera sp.	Tache brune	3
	Epicoccum sp.	Fumagine	1
	Fusarium sp.	Piétin commun	1
	Puccinia coronata	Rouille couronnée	1
	Pythium sp.	Piétin brun	1
	Stagonospora avenae	Tache ovoïde	3

Tableau 3 – suite

Orge	*Bipolaris sorokiniana*	Tache helminthosporienne	7
	Drechslera sp.	Rayure réticulée	8
	Fusarium spp.	Brûlure des semis	4
	Phaeosphaeria sp.	Tache ovoïde	1
	Puccinia spp.	Rouilles	4
	Pythium sp.	Piétin brun	1
	Rhizoctonia sp.	Rhizoctone commun	1
	Ustilago sp.	Charbon	2
Total			43

Tableau 4. Sommaire des maladies diagnostiquées parmi les cultures industrielles reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Canola	*Fusarium oxysporum*	Brûlure des semis	1
	Plasmodiophora brassicae	Hernie	1
	Agents non infectieux		1
Kenaf	*Sclerotinia sclerotiorum*	Pourriture sclérotique	1
Lin	*Septoria linicola*	Pasmo	1
	Phytotoxicité herbicide		1
Maïs	*Cladosporium* spp.	Fumagine	2
	Phoma terrestris	Pourriture des racines	2
	Fusarium spp.	Pourr.des racines/fusariose de l'épi	2
	Longidorus sp.	Nanisme	1
	Pratylenchus sp.	Lésions des racines	1
	Pythium sp.	Piétin brun	2
	Agents non infectieux		8
Moutarde	*Alternaria brassicicola*	Tache noire	1
Soja	*Ascochyta* sp.	Ascochytose	1
	Colletotrichum sp.	Anthracnose	5
	Corynespora cassiicola	Pourriture des racines	2
	Fusarium spp.	Syndrome de la morte subite	9
	Peronospora manshurica	Mildiou	2
	Phomopsis sp.	Brûlure phomopsienne	3
	Phytophthora megasperma	Pourriture phytophthoréenne	3
	Potyvirus		7
	Pseudomonas viridiflava	Pourriture molle	1
	Pythium spp.	Pourriture pythienne	5
	Rhizoctonia solani	Rhizoctone commun	4
	Septoria glycines	Tache brune	6
	Phytotoxicité herbicide		8
	Sol inadéquat		3
	Autres agents non infectieux		2
Total			86

Tableau 5. Sommaire des maladies diagnostiquées parmi les plante fourragères reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Brome	*Bipolaris sorokiniana*	Bipolariose	1
	Asphyxie racinaire		1
Luzerne	*Leptosphaerulina trifolii*	Tache de poivre	1
	Pythium spp.	Brûlure des semis	2
Panic	*Drechslera* sp.	Tache réticulée	1
Total			6

Tableau 6. Sommaire des maladies diagnostiquées parmi les arbres et arbustes fruitiers reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Amélanchier	*Entomosporium mespili*	Entomosporiose	2
	Gymnosporangium spp.	Rouille	3
	Microsphaera penicillata	Blanc	1
	Phytotoxicité pesticide		1
Argousier	*Cytospora* sp.	Chancre cytosporéen	1
	Levures	Pourriture des baies	1
	Phomopsis sp.	Brûlure phomopsienne	4
	Verticillium dahliae	Verticilliose	1
	Agents non infectieux		2
Aronia	*Cytospora* sp.	Chancre cytosporéen	1
	Gymnosporangium sp.	Rouille	1
	Tubercularia sp.	Dépérissement	1
Cerisier	*Monilinia* sp.	Pourriture brune	1
	Podosphaera clandestina	Blanc	1
	Septoria sp.	Septoriose	1
	Thielaviopsis sp.	Dépérissement	1
Poirier	*Agrobacterium tumefaciens*	Tumeur du collet	1
	Erwinia amylovora	Brûlure bactérienne	1
Pommier	*Alternaria mali*	Alternariose	1
	Basidiomycètes	Chancre de tige	3
	Erwinia amylovora	Brûlure bactérienne	8
	Nectria cinnabarina	Maladie du corail	1
	Pseudomonas syringae	Chancre bactérien	1
	Sphaeropsis malorum	Chancre des rameaux	1
	Spilocea pomi	Tavelure	2
	Agents non infectieux		3
Total			45

Tableau 7. Sommaire des maladies diagnostiquées parmi les gazons reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Vert de golf	*Colletotrichum graminicola*	Anthracnose	6
	Curvularia sp.	Tache foliaire	6
	Drechslera sp.	Tache helminthosporienne	1
	Fusarium equiseti	Tache fusarienne	1
	Gaeumannomyces graminis	Piétin échaudage	9
	Magnaporthe sp.	Racine brune	1
	Myrothecium sp.	Brûlure foliaire	1
	Pythium sp.	Piétin brun	22
	Rhizoctonia sp.	Rhizoctone brun	5
	Agents non infectieux		2
Total			54

Tableau 8. Sommaire des maladies diagnostiquées parmi les arbustes ornementaux reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Abies sp.	*Fusarium* sp.	Pourriture des racines	1
	Uredinopsis sp.	Rouille des aiguilles	1
Caragana	*Phloeospora* sp.	Tache foliaire	1
Cornus sp.	*Phoma* sp.	Chancre	1
	Phomopsis sp.	Chancre	1
Fraxinus sp.	*Discula fraxinea*	Anthracnose	1
Hydrangea	*Sphaeropsis* sp.	Brûlure des anneaux	1
Magnolia	*Oïdium* sp.	Blanc	1
Picea sp.	*Chrysomyxa* sp.	Rouille des aiguilles	1
	Pythium splendens	Fonte des semis	1
	Rhizosphaera kalkhoffii	Rouge	1
Pinus sp.	*Mycosphaerella* sp.	Brûlure des aiguilles	1
	Sphaeropsis sapinea	Brûlure des rameaux	1
Populus sp.	*Pollacia* sp.	Brûlure des pousses	1
Quercus sp.	*Discula umbrinella*	Anthracnose	1
Sambucus sp.	*Microsphaera penicillata*	Blanc	1
	Potyvirus		4
Spirea	*Cercospora* sp.	Tache cercosporéenne	1
Thuja sp.	*Kabatina* sp.	Brûlure des aiguilles	2
	Pestalotiopsis funerea	Brûlure des aiguilles	1
	Agents non infectieux		16
Total			40

Tableau 9. Sommaire des maladies diagnostiquées parmi les légumes d'entrepôt reçus au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Carotte	*Botrytis cinerea*	Moisissure grise	1
Chou	*Alternaria brassicicola*	Tache noire	1
	Erwinia carotovora	Pourriture molle	1
	Phytophthora brassicae	Pourriture de la tige	1
	Phytophthora porri	Pourriture des feuilles	3
	Agents non infectieux		2
Chou-fleur	*Cladosporium* sp.	Taches du capitule	1
Oignon	*Botrytis* sp.	Pourriture du bulbe	3
	Fusarium solani	Pourriture rose	1
	Levures	Pourriture du bulbe	2
	Penicillium sp.	Pourriture du bulbe	1
Pomme de terre	*Clavibacter michiganensis* subsp. *sepedonicus*	Flétrissement bactérien	1
	Colletotrichum coccodes	Dartrose	5
	Erwinia carotovora subsp. *carotovora*	Pourriture molle	1
	Fusarium oxysporum	Pourriture sèche	1
	Geotrichum sp.	Pourriture de tubercule	1
	Helminthosporium solani	Tache argentée	4
	Phytophthora infestans	Mildiou	1
	Potyvirus		1
	Pseudomonas fluorescens	Pourriture molle	1
	Rhizoctonia solani	Rhizoctonie	4
	Spongospora sp.	Gale poudreuse	1
	Verticillium dahliae	Verticilliose	2
	Cœur creux		1
	Cœur noir		2
	Froid		2
	Pelure rugueuse		8
	Autres agents non infectieux		2
Rutabaga	Carence en bore	Malformation racinaire	1
Soja	*Fusarium graminearum*	Pourriture des graines	1
	Potyvirus	Anomalie de coloration des grains	1
Total			58

Tableau 10. Sommaire des maladies diagnostiquées parmi les plantes maraîchères de serres reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Tomate	*Botrytis cinerea*	Résistance aux fongicides	70
	Clavibacter michiganensis subsp. *michiganensis*	Chancre bactérien	28
	Absence de *Clavibacter michiganensis*. subsp. *michiganensis*		23
	Erysiphe orontii	Blanc	1
	Erwinia carotovora subsp. *carovotora*	Pourriture molle	1
	Fusarium oxysporum	Fusariose vasculaire	5
	Fusarium solani	Chancre de tige	19
	Penicillium sp.	Pourriture des fruits	5
	Phytophthora sp.	Pourriture des racines	3
	Pythium spp.	Pourriture pythienne	9
	Pseudomonas syringae	Moucheture bactérienne	2
	Rhizoctonia solani	Rhizoctone	2
	Sclerotinia sclerotiorum	Pourriture sclérotique	1
	Carences minérales (K, P, Ca)		11
	Déséquilibre hydrique et chaleur		6
	Phytotoxicité pesticide		4
	Toxicité minérale (Mn, Zn)		6
	Autres agents non infectieux		9
Concombre	*Erwinia tracheiphila*	Flétrissement bactérien	6
	Fusarium oxysporum	Fusariose vasculaire	2
	Phoma cucurbitacearum	Chancre gommeux	1
	Pseudoperonospora cubensis	Mildiou	2
	Pythium spp.	Pourriture du collet	8
	Sclerotinia sclerotiorum	Sclérotiniose	2
	Septoria cucurbitacearum	Tache septorienne	1
	Agents non infectieux		2
Total			229

Tableau 11. Sommaire des maladies diagnostiquées parmi les plantes ornementales de serres reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Acalypha	Phytoplasme	Feuilles difformes	1
	Pythium sp.	Pourriture pythienne	1
	Rhizoctonia solani	Rhizoctone	1
Alcea	*Pythium ultimum*	Pourriture pythienne	1
	Rhizoctonia solani	Rhizoctone	1
Alyssum	*Rhizoctonia solani*		1
Antirrhinum	*Botrytis* sp.	Moisissure grise	1
	Pythium ultimum		1

Tableau 11 – suite

Begonia	*Botrytis cinerea*	Moisissure grise	1
	Colletotrichum sp.	Anthracnose	2
	Oïdium sp.	Blanc	3
	Phytophthora cinnamomi	Pourriture des racines	1
	Pythium ultimum	Pourriture des racines	2
Bolbitis	*Cercospora* sp.	Tache cercosporéenne	1
Bracteantha	*Botrytis cinerea*	Moisissure grise	1
	Bremia sp.	Mildiou	1
Brugmansia	Potyvirus	Mosaïque	7
Calamagrostis	*Puccinia* sp.	Rouille	1
Calibrachoa	CbMV (Virus de le marbrure du calibrachoa)	Marbrure	1
	Phytophthora sp.	Pourriture des racines	1
	Pythium irregulare	Pourriture pythienne	1
	Thielaviopsis basicola	Pourriture noire des racines	1
	TMV (Virus de la mosaïque du tabac)	Mosaïque	1
Canna	Potyvirus	Mosaïque	3
Chrysanthemum	*Fusarium sp.*		
	Pythium spp.	Pourriture des racines	4
Clematis	*Colletotrichum* sp.	Anthracnose	1
Cymbidium	CyMV (Virus de la mosaïque du cymbidium)	Mosaïque	1
Dahlia	*Oïdium* sp.	Blanc	1
Dendrobium	CyMV	Mosaïque	2
Dianthus	*Phytophthora* sp.	Pourriture des racines	1
	Puccinia sp.	Rouille	1
Dracaena	*Fusarium oxysporum*	Pourriture des racines	2
Echinacea	*Pythium ultimum*	Fonte des semis	1
Euphorbia	*Phytophthora nicotiana*	Pourriture des racines	1
pulcherrima	*Pythium* spp.	Pourriture des racines	3
Fougères	*Verticillium albo-atrum*	Verticilliose	1
Gaillardia	*Entyloma compositarum*	Charbon foliaire	1
Gerbera	*Myrothecium roridum*	Pourriture des feuilles	1
Helenium	Potyvirus	Mosaïque	1
Heliotropium	*Fusarium* sp.	Pourriture des racines	2

Tableau 11 – suite

Helichrisum	*Botrytis cinerea*	Moisissure grise	1
Hibiscus	*Rhizoctonia solani*	Rhizoctone	1
	Phomopsis sp.	Brûlure phomopsienne	1
	Phytophthora nicotiana	Pourriture des racines	1
Hosta	HVX (Virus X du hosta)	Mosaïque, tache	28
	Absence du HVX		76
Iris	*Heterosporium* sp.	Tache hétérosporienne	1
Lavendula	*Pythium* sp.	Fonte des semis	1
Lysimachia	*Botrytis cinerea*	Moisissure grise	2
	Puccinia sp.	Rouille	1
Malva	*Puccinia* sp.	Rouille	2
Osteospermum	*Botrytis cinerea*	Moisissure grise	2
Paeonia	*Rhizoctonia solani*	Rhizoctone	1
	Xanthomonas sp.	Tache foliaire	1
Pelargonium	*Fusarium oxysporum*	Pourriture du collet	1
	PFBV (Virus de la panachure florale du du pélargonium)	Tache jaune	1
	Pythium ultimum	Pied noir	3
	Xanthomonas campestris pv. *pelargonii*	Brûlure bactérienne	9
	Agents non infectieux		3
Pennisetum	*Drechslera* sp.	Tache helminthosporienne	2
	Curvularia sp.	Pourriture du collet	1
Penstemon	*Pythium ultimum*	Fonte de semis	1
Pentas	*Agrobacterium tumefaciens*	Tumeur du collet	1
Petunia	*Oïdium* sp.	Blanc	1
	Rhizoctonia solani	Rhizoctone	1
	ToMV (Virus de la mosaïque de la tomate)		1
	Agents non infectieux		4
Polemonium	INSV (Virus des taches nécrotique de l'impatiente)	Tache, mosaïque	2
Salvia	*Myrothecium roridum*	Pourriture des tiges	2
Sanseviera	*Fusarium moniliforme*	Pourriture des racines	1
Scabiosa	*Rhizoctonia solani*	Rhizoctone	1
Scaevola	Potyvirus		1
	Rhizoctonia solani	Rhizoctone	1

Tableau 11 – suite

Solenostemon	*Peronospora* sp.	Mildiou	3
	Pythium sp.	Pourriture pythienne	1
Streptocarpus	*Fusarium* sp.	Pourriture des racines	1
	Pythium sp.	Pourriture pythienne	1
Syngonium	*Verticillium albo-atrum*	Verticilliose	1
Tagetes	*Alternaria zinniae*	Alternariose	1
	Botrytis cinerea	Moisissure grise	1
Vinca	CMV (Virus de la mosaïque du concombre)	Mosaïque	10
	Absence de CMV		6
Zinnia	*Alternaria zinnae*	Alternariose	1
Autres cultures	Agents non infectieux		100
Total			341

Tableau 12. Sommaire des maladies diagnostiquées parmi les plantes ornementales extérieures reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Aruncus	*Pseudomonas viridiflava*	Pourriture molle	1
Epilobium	*Puccinia* sp.	Rouille	1
Gaillardia	*Entyloma* sp.	Charbon foliaire	1
Gladiolus	Potyvirus		1
Hemerocallis	*Aureobasidium* sp.	Tache foliaire	1
Heuchera	*Puccinia* sp.	Rouille	1
Hosta	ToRSV	Tache foliaire	2
Lilium	*Botrytis* sp.	Moisissure grise	2
	Fusarium oxysporum	Pourriture des racines	2
	Rhizoctonia solani	Rhizoctone	1
Lysimachis	*Colletotrichum*	Anthracnose	1
	INSV	Mosaïque	1
Miscanthus	*Stagonospora* sp.	Tache ovoïde	1
Nymphaea	*Pythium* sp.	Pourriture pythienne	1
Phlox	INSV	Tache, mosaïque	1

Tableau 12 – suite

Paeonia	*Oïdium* sp.	Blanc	2
Podophyllum	*Colletotrichum* sp.	Anthracnose	1
Primula	*Rhizoctonia solani*	Rhizoctone	1
Salvia	*Rhizoctonia solani*	Rhizoctone	1
	Sclerotinia sclerotiorum	Sclérotiniose	1
Sedum	*Pythium ultimum*	Pourriture pythienne	1
	Rhizoctonia solani	Rhizoctone	1
Tulipa	*Botrytis cinerea*	Moisissure grise	1
	Penicillium sp.	Pourriture des feuilles	3
Yucca	*Microsphaeropsis* sp.	Tache foliaire	1
Zinnia	*Alternaria zinniae*	Alternariose	1
	Pythium ultimum	Pourriture pythienne	1
Autres cultures	Agents non infectieux		31
Total			64

Tableau 13. Sommaire des maladies diagnostiquées parmi les plantes aromatiques et les fines herbes reçues au Laboratoire de diagnostic en phytoprotection du MAPAQ en 2006.

CULTURE	AGENT PATHOGÈNE/CAUSE	MALADIE/SYMPTÔME	NOMBRE
Basilic	*Botrytis cinerea*	Moisissure grise	1
	Fusarium oxysporum	Fusariose vasculaire	1
	Pythium sp.	Pourriture pythienne	1
	Sclerotinia sclerotiorum	Sclérotiniose	2
	Fusarium solani	Pourriture des racines	2
Persil	*Septoria petroselini*	Tache septorienne	2
Romarin	*Botrytis cinerea*	Moisissure grise	1
Autres cultures	Agents non infectieux		5
Total			15
GRAND TOTAL			**1820**

Cereals / Céréales

CROP / CULTURE: Barley
LOCATION / RÉGION: Saskatchewan

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
M.R. Fernandez[1] and P. G. Pearse[2]
[1] Agriculture and Agri-Food Canada, Semiarid Prairie Agricultural Research Centre, P.O. Box 1030, Swift Current SK, S9H 3X2;
Telephone: (306) 778-7255; **Facsimile:** (306) 778-3188; **E-mail:** fernandezm@agr.gc.ca
[2] Saskatchewan Agriculture and Food, Crop Development Branch, 3085 Albert St., Regina SK, S4S 0B1

TITLE / TITRE: LEAF SPOTTING DISEASES OF BARLEY IN SASKATCHEWAN IN 2006

INTRODUCTION AND METHODS: A survey for leaf spotting diseases of barley was conducted in randomly selected fields spread over all crop districts in Saskatchewan. Fifty flag leaves were collected at random from each of 41 barley crops (30 two-row, 11 six-row) at the late-milk to early-dough stages of development. The leaves were air-dried at room temperature and assessed for percent leaf area with lesions (severity). Mean severities were calculated for each crop, and for all crops sampled in each Soil Zone (SZ) - 1: brown, 2: dark brown, and 3: black/grey. For the 27 fields with over 1% leaf spot severity, surface-disinfested leaf pieces were plated on water agar for fungal identification and quantification of specific diseases. Information on tillage practices was also recorded for most of the fields sampled.

RESULTS AND COMMENTS: Leaf spotting diseases were identified on the flag leaves of most barley crops surveyed (Table 1). The severity for individual crops ranged from 'trace' to 20%. All barley crops sampled in SZ 2 and 3 had leaf spots on the flag leaves. The mean leaf spotting severity was lowest in SZ 1 and highest in SZ 3.

Pyrenophora teres was isolated from all samples plated and had the highest mean percent isolation frequency (Table 1). Other commonly isolated fungi included *Cochliobolus sativus* and *Septoria* spp. which had a similar mean isolation frequency of <20%, although *Septoria* spp. were isolated from more (93%) of the 27 samples tested than *C. sativus* (70%).

The mean isolation frequency of *P. teres* was highest in SZ 2, whereas those of *C. sativus* and *Septoria* spp. were highest in SZ 3 (Table 1).

Classification of the crops grown in SZ 2 and 3 according to tillage practice (conventional, minimum or zero) showed that mean leaf spotting severity tended to be highest under minimum-till (Table 2). Mean isolation frequency of *P. teres* tended to be lower, and that of the other two fungi higher, as tillage intensity decreased.

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

Table 1. Incidence and severity of leaf spotting diseases and mean isolation frequency of leaf spotting pathogens by Soil Zone, for barley crops sampled in Saskatchewan in 2006.

Soil Zone	# Crops affected/ surveyed[1]	Mean severity[2]	*Pyrenophora teres*[3]	*Cochliobolus sativus*[3]	*Septoria* spp.[3]
		%			
Zone 1 (brown)	6/8	1.0	100/1	-	-
Zone 2 (dark brown)	9/9	4.0	83/6	15/5	3/5
Zone 3 (black/grey)	24/24	6.5	65/20	22/14	18/20
Total/mean:	39/41	5.1	71/27	18/19	15/25

[1] Number of barley crops with leaf spots on flag leaves/total number of crops sampled.
[2] Mean percentage flag leaf area with lesions.
[3] Mean % isolation frequency of fungus/number of barley crops from which the fungus was isolated.

Table 2. Incidence and severity of leaf spotting diseases and mean isolation frequency of leaf spotting pathogens by tillage system, for barley crops sampled in Soil Zones 2 and 3 in Saskatchewan in 2006.

Tillage system	# Crops affected/ surveyed[1]	Mean severity[2]	*Pyrenophora teres*[3]	*Cochliobolus sativus*[3]	*Septoria* spp.[3]
		%			
Conventional	3/3	3.0	90/3	9/2	4/3
Minimum	11/11	7.8	71/9	19/7	14/9
Zero	16/16	5.6	63/13	23/9	19/12

[1] Number of barley crops with leaf spots on flag leaves/total number of crops sampled.
[2] Mean percentage flag leaf area with lesions.
[3] Mean % isolation frequency of fungus/number of barley crops from which the fungus was isolated.

CROP / CULTURE: Barley
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
A. Tekauz, J. Gilbert, E. Mueller, M. Stulzer, M. Beyene, R. Kaethler and P. Gozé
Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg MB, R3T 2M9;
Telephone: (204) 983-0944; **Facsimile:** (204) 983-4604; **E-mail:** atekauz@agr.gc.ca

TITLE / TITRE: 2006 SURVEY FOR FUSARIUM HEAD BLIGHT OF BARLEY IN MANITOBA

INTRODUCTION AND METHODS: A total of 31 barley fields (16 two-row, 15 six-row) in southern Manitoba were surveyed for the presence of fusarium head blight (FHB) from July 21 to 27, 2006, when most crops were at the early dough (ZGS 82) stage of growth (range ZGS 70-86). The fields were selected randomly along the survey routes. FHB incidence (the percentage of heads with typical symptoms) was assessed in each crop by sampling 80-100 spikes at 3 locations and averaging the results. The average percentage of the symptomatic spikes affected by FHB was estimated visually in each field. Several affected heads were collected at each survey site and stored in paper envelopes. Subsequently, a total of 50 discoloured and putatively infected kernels, or those of normal appearance to make up the remainder, were removed from five heads per location. The kernels were surface sterilized in 0.3% NaOCl and plated onto potato dextrose agar to quantify and identify *Fusarium* spp. on kernels.

RESULTS AND COMMENTS: Conditions in spring (late April to early June) 2006 were generally favourable for seeding and crop growth, but subsequently, soil moisture levels become depleted, and in general 2006 was regarded as one of the driest growing seasons on record in southern Manitoba. Despite this, most cereal crops fared well and yield and quality levels were normal to above-normal. However, the lack of moisture was not conducive to the renewed saprophytic growth of overwintered fungal pathogens in straw and stubble, and it is likely that inoculum (conidia) of *Fusarium* spp. was considerably reduced. This, combined with the lack of rain when barley was heading and flowering, appeared to result in low levels of infection and subsequent visible FHB development.

Fusarium head blight symptoms were evident in 29 of the 31 fields surveyed. Average incidence of FHB in two-row crops was 4.5% (range 0.1 - 25.3%), while the spike percentage infected (SPI) averaged 5.3% (range 2.0 - 14.0%); in six-row crops incidence was 5.2% (range 0 - 26.8%) and the SPI 6.3% (range 0 - 20.0%). The resulting average FHB Index (% incidence X % SPI) / 100 for 2-row barley was 0.4% (range 0 - 3.6%), and for 6-row barley also 0.4% (range 0 - 2.7%). These severity levels would have resulted in minimal yield losses from FHB. This is the lowest severity of FHB recorded in barley since surveys for FHB in this crop were initiated in 1994; levels were also low in 2004 and 2003 (Tekauz et al. 2005, 2004).

Fusarium colonies grew out from 63% of the kernels plated on potato dextrose agar. The *Fusarium* species isolated are shown in Table 1. In contrast to most years (Tekauz et al. 2006, 2005), in 2006 *F. poae,* not *F. graminearum*, was the most common pathogenic species on kernels. *Fusarium poae* was found in 100% of the fields surveyed. *Fusarium graminearum* and *F. sporotrichioides* both were detected in 3/4 of the fields and constituted about 10% of the *Fusarium* flora. This is the lowest level of *F. graminearum* recorded since surveys for FHB in barley in Manitoba were initiated. The generally very dry conditions during the 2006 growing season appear to have favoured infection or infestation of barley kernels by *F. poae*.

REFERENCES:
Tekauz, A., Gilbert, J., Mueller, E., Stulzer, M. and Beyene, M. 2006. Survey for fusarium head blight of barley in Manitoba in 2005. Can. Plant Dis. Surv. 86: 37-38. (http://www.cps-scp.ca/cpds.htm)

Tekauz, A., Gilbert, J., Mueller, E., Stulzer, M. and Beyene, M. 2005. 2004 Survey for fusarium head blight of barley in Manitoba. Can. Plant Dis. Surv. 85: 19-20. (http://www.cps-scp.ca/cpds.htm)

Table 1. *Fusarium* spp. isolated from fusarium head blight-affected kernels of barley in Manitoba in 2006.

***Fusarium* spp.**	**Percent of fields**	**Percent of kernels**
F. avenaceum	23	1.6
F. equiseti	13	0.5
F. graminearum	74	11.3
F. poae	100	78.1
F. sporotrichioides	77	8.4

CROP / CULTURE: Barley
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
A. Tekauz, J. Gilbert, E. Mueller, M. Stulzer, M. Beyene, R. Kaethler and P. Gozé
Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg MB, R3T 2M9;
Telephone: (204) 983-0944; **Facsimile:** (204) 983-4604; **E-mail:** atekauz@agr.gc.ca

TITLE / TITRE: SURVEY FOR LEAF SPOT DISEASES OF BARLEY IN MANITOBA IN 2006

INTRODUCTION AND METHODS: Foliar diseases of barley in Manitoba were assessed by surveying 31 farm fields (16 two-row, 15 six-row) from July 21 to 27 when most crops were at the early dough (ZGS 82) stage of growth (range ZGS 70-86). Fields were sampled at regular intervals along the survey routes, depending on availability. Disease incidence and severity were recorded by averaging their levels on approximately 10 plants along a diamond-shaped transect of about 50 m per side, beginning near the field edge. 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 (late April to early June) 2006 were generally favourable for seeding and crop growth, but subsequently, soil moisture levels become progressively depleted, and in general, 2006 was regarded as one of the driest growing seasons on record in southern Manitoba. Despite this, most cereal crops fared well and yield and quality were normal to above-normal. However, the lack of moisture was not conducive to the renewed saprophytic growth of overwintered fungal pathogens in straw and stubble, and it is likely that inoculum of leaf spotting pathogens was considerably reduced. The low rainfall likely also resulted in fewer opportunities for foliar infection and subsequent spread of diseases to other parts of the crop canopy. As is typical for barley grown in Manitoba, the field history, i.e., presence or absence of barley stubble from the previous year, also appeared to influence the level of leaf spotting observed.

Leaf spots were observed in the upper or lower leaf canopies of 100% of barley fields surveyed. Disease levels in the upper canopy were nil, trace or very slight in 68% of fields, slight in 19%, moderate in 13%, and severe in 0%. Respective severity categories in the lower canopy were 29%, 32%, 0% and 0%, with 39% being senescent. Since most fields had only trace to slight leaf spotting in the upper canopy, leaf spot diseases likely caused almost no damage to barley in 2006. This level of damage is among the lowest reported in recent years, and considerably lower than the 3-4% loss estimated for 2005 (Tekauz et al. 2006).

Pyrenophora teres (net blotch) was the predominant pathogen in 2006, causing about half the leaf spot damage observed; *Cochliobolus sativus* (spot blotch) was responsible for much of the remaining damage (Table 1). These pathogens were detected in >75% of fields sampled. In the previous five years, *C. sativus* had been either the dominant pathogen or on a par with *P. teres*. *Septoria passerinii* (speckled leaf blotch) was present in some barley fields, as is the case in most years, but its relative contribution to damage remained low. The other pathogens isolated caused little damage to the barley crop.

REFERENCE:
Tekauz, A., Gilbert, J., Mueller, E., Stulzer, M., Beyene, M., Kaethler, R. and Morgan, K. 2006. 2005 Survey for leaf spot diseases of barley in Manitoba. Can. Plant Dis. Surv. 86: 39-40. (http://www.cps-scp.ca/cpds.htm)

Table 1. Incidence and isolation frequency of leaf spot pathogens of barley in Manitoba in 2006

Pathogen	Incidence (% of fields)	Frequency (% of isolations)*
Pyrenophora teres	90	49.4
Cochliobolus sativus	77	34.7
Septoria passerinii	32	11.5
Septoria/*Stagonospora* spp.	23	3.8
Colletotrichum graminicola	3	0.6

*indicative of the relative foliar damage caused

CROP / CULTURE: Barley
LOCATION / RÉGION: Eastern Ontario

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
A.G. Xue, Y. Chen and K.M. Ho
Agriculture and Agri-Food Canada, Eastern Cereal and Oilseed Research Centre, K.W. Neatby Building, 960 Carling Avenue, Ottawa ON, K1A 0C6;
Telephone: (613) 759-1513; **Facsimile:** (613) 759-1926; **E-mail:** axue@agr.gc.ca

TITLE / TITRE: DISEASES OF BARLEY IN EASTERN ONTARIO IN 2006

INTRODUCTION AND METHODS: A survey for diseases of barley was conducted in eastern Ontario in the third week of July when plants were at the soft dough stage of development. Twenty-four fields were chosen at random in regions of eastern Ontario where most of the spring barley is grown. Leaf spot 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 leaf stripe, ergot, covered smut, 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 of the infected spikes), based on approximately 200 spikes sampled at each of three random sites per field. The 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 spikes collected from each field. The spikes were air-dried at room temperature, and subsequently threshed. Ten discolored kernels per sample were chosen at random, surface sterilized in 1% NaOCl for 30 seconds, and plated on modified potato dextrose agar (10 g dextrose per litre) 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 using standard taxonomic keys.

RESULTS AND COMMENTS: The surveyed fields consisted of one two-row and 23 six-row barley crops. Thirteen diseases or disease complexes were observed in the surveyed fields (Table 1). Net blotch (*Pyrenophora teres*) was the most prevalent foliar disease, observed in all fields, and with mean disease severity of 5.8, ranging from 3.0-8.0. Severe infection from net blotch was observed in 14 fields. Average yield reductions due to net blotch were estimated to be at least 10% in the surveyed fields.

Septoria complex [including speckled leaf blotch (*Septoria avenae* f. sp. *triticea),* leaf blotch (*S. passerinii*), and glume blotch (*Stagonospora nodorum*)] and spot blotch (*Cochliobolus sativus*) were observed in 21 and 20 fields at mean severities of 4.1 and 3.2, respectively. Severe infections from these diseases were observed in 4 and 2 fields, respectively. Other leaf diseases observed were leaf rust (*Puccinia hordei*), powdery mildew (*Erysiphe graminis* f. sp. *hordei*), and scald (*Rhynchosporium secalis*). These diseases were observed in 3, 3, and 4 fields, at mean severities of 1.3, 2.4, and 1.4, respectively. Except for a moderate level of powdery mildew found in only one field, all affected fields had only trace to slight infections. None of these diseases caused significant damage.

Take-all (*Gaeumannomyces graminis*) was found in 22 fields (Table 1). The disease was more common in 2006 than in previous years (Xue et al. 2005); however, severity was generally low and only five of the affected fields had incidence levels of more than 1%. Leaf stripe (*Pyrenophora graminea*), ergot (*Claviceps purpurea*), covered smut (*Ustilago hordei*), and loose smut (*Ustilago nuda*) were observed in 8, 8, 1, and 7 fields, at mean incidence levels of less than 1%. These diseases would have resulted in minimal damage.

Fusarium head blight was observed in 10 fields (Table 1). The FHB index ranged from 0.1-5.7%, with a mean of 2.2%. All affected fields had only slight or moderate infestations. Five *Fusarium* species were isolated from the infected kernels (Table 2). *Fusarium graminearum* and *F. poae* were the predominant species, occurring in 33.3 and 25.0% of the fields and on 9.4 and 3.8% of the discolored kernels, respectively. *F. avenaceum*, *F. equiseti*, and *F. sporotrichioides* were found infrequently, occurring on 0.9, 2.6, and 3.0% of the kernels, respectively.

The relative prevalence and severity of foliar diseases and take-all in 2006 were greater than those found in 2005 (Xue et al. 2006), while fusarium head blight and the smuts were similar to those in the previous year. As for the past several years, in 2006 *F. graminearum*, *F. poae*, and *F. sporotrichioides* were the major causal agents of FHB. The levels of *F. graminearum* and *F. equiseti* were greater while *F. poae*, and *F. sporotrichioides* were lower in 2006 than in 2005. The relatively cool and moist conditions in June, followed by the hot and dry July, were likely responsible for the increased leaf spot disease severities in 2006, as well as the shift in frequency of *Fusarium* species causing FHB, compared to 2005.

REFERENCE:

Xue, A.G., Chen, Y. and Ho, K.M. 2006. Diseases of barley in central and eastern Ontario in 2005. Can. Plant Dis. Surv. 86:41-42. (http:www.cps-scp.ca/cpds.htm)

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

	NO. FIELDS	DISEASE SEVERITY IN AFFECTED FIELDS*	
DISEASE	**AFFECTED (n=24)**	**Mean**	**Range**
Leaf rust	3	1.3	1.0-2.0
Net blotch	24	5.8	3.0-8.0
Powdery mildew	3	2.4	1.0-4.3
Scald	4	1.4	1.0-2.0
Septoria complex	21	4.1	1.0-7.0
Spot blotch	20	3.2	1.3-6.0
Leaf stripe	8	0.8	0.3-1.0
Ergot	8	0.5	0.3-1.0
Covered smut	1	0.3	0.3
Loose smut	7	0.7	0.3-2.3
Take-all	22	0.9	0.1-3.0
Fusarium head blight	10		
Incidence		23.5	0.4-40
Severity		8.8	3.3-13.3
FHB index**		2.2	0.1-5.7

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

Table 2. Frequency of *Fusarium* species isolated from discolored kernels of barley in eastern Ontario in 2006.

***FUSARIUM* SPP.**	**% FIELDS**	**% KERNELS**
F. avenaceum	8.3	0.9
F. equiseti	12.5	2.6
F. graminearum	33.3	9.4
F. poae	25.0	3.8
F. sporotrichioides	16.7	3.0

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

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
T.K. Turkington and N.E. Rauhala
Agriculture and Agri-Food Canada, Lacombe Research Centre, 6000 C & E Trail, Lacombe AB, T4L 1W1;
Telephone: (403) 782-8138: **Facsimile:** (403) 782-6120: **E-mail:** turkingtonk@agr.gc.ca

TITLE / TITRE: 2006 CEREAL DISEASE SURVEY IN CENTRAL ALBERTA

INTRODUCTION AND METHODS: A survey to document diseases of barley and wheat was conducted from July 27-29 in central Alberta. Growers were contacted for permission to evaluate their fields, which were traversed in an inverted V pattern, with visual analysis of five plants at each of three locations. Leaf diseases were each scored on a 0-9 scale, with a '4' rating equal to one percent of the 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 sub-crown internodes using a 0-4 rating scale where 1=trace and 4=severe symptom development. After the survey was complete, a representative sub-sample of the diseased material collected was cultured in the laboratory for pathogen identification. To assess fusarium head blight (FHB) in wheat, counts of 300 heads were taken in each wheat field and the percent incidence of FHB determined. Assessments typically were made when crops were at the late milk to dough stage of development by following a diamond-shaped path starting at least 25 m from the edge of the field. At each of three sites along the path, 100 randomly picked heads were evaluated.

RESULTS AND COMMENTS: Results are presented in Table 1. Growing conditions in central Alberta were generally favourable in 2006. A warm dry May was followed by a warm, damp June and a warm, dry first half of July, with high rainfall in the last half of the month.

Eighteen barley fields were examined, 12 two-row and 6 six-row. Overall, barley leaf disease severity in 2006 was higher than observed in 2005 (Turkington et al. 2006). Scald (*Rhynchosporium secalis*) severity was moderate in Central Alberta, with the exception of the Lacombe region where it was severe. Significant levels of the net form of net blotch (*Pyrenophora teres* f. *teres*) were present over the entire survey area. Barley leaf spots, either the spot form of net blotch (*P. teres* f. *maculata*) alone, or in combination with *Alternaria* and *Cladosporium* species, are becoming more prevalent, and this was especially true in 2006. A significant level of physiological leaf spotting was also evident in the region in 2006. The severity of common root rot (*Cochliobolus sativus* and *Fusarium* spp.) was slightly higher than found in 2005.

In 11 fields of wheat examined, septoria/stagnospora leaf blotch (*Septoria tritici, Stagonospora nodorum*) was found at similar levels to those recorded for the previous two years. Common root rot levels were low overall, with the exception of two fields in which the disease was rated as severe. No symptoms of FHB were observed in the wheat fields surveyed in 2006.

REFERENCE:
Orr, D.D., Turkington,T.K. and Rauhala, N.E. 2006. 2005 Cereal disease survey in central Alberta. Can. Plant Dis. Surv. 86: 43-44. (www.cps-scp.ca/cpds/htm)

Table 1. Disease incidence and severity in 18 barley and 11 wheat fields in central Alberta 2006.

		Average disease rating and range (affected fields only)	
Barley Disease	**% Fields Affected**	**Mean**	**Range**
Scald (0-9)	72	3.3	1-8
Net blotch (0-9)	28	3.2	1-5
Spot form of net blotch w/wo *Alternaria* and *Cladosporium* (0-9)*	72	3.6	1-9
Common root rot (0-4)	61	2.4	1-4
Wheat Disease			
Septoria leaf blotch complex (0-9)	100	2.3	1-6
Common root rot (0-4)	36	2	1-4

* w/wo – with or without

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

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
P.G. Pearse[1], G. Holzgang[2], C.N. Weitzel[2] and M.R. Fernandez[3]
[1]Saskatchewan Agriculture and Food, Crop Development Branch, 3085 Albert St., Regina SK, S4S 0B1; **Telephone:** (306) 787-4671; **Facsimile:** (306) 787-0428; **E-mail:** ppearse@agr.gov.sk.ca
[2]Saskatchewan Agriculture and Food, Crop Protection Laboratory, 346 MacDonald Street, Regina SK, S4N 6P6
[3]Agriculture and Agri-Food Canada, Semiarid Prairie Agricultural Research Centre, Box 1030, Swift Current SK, S9H 3X2

TITLE / TITRE: FUSARIUM HEAD BLIGHT IN BARLEY AND OAT IN SASKATCHEWAN IN 2006

INTRODUCTION AND METHODS: Fusarium head blight (FHB) incidence and severity were assessed in a total of 43 barley crops (33 two-row; 10 six-row) and 15 oat crops in Saskatchewan between July 14 and August 13. 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 referred to as 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 and by irrigation agrologists with Saskatchewan Agriculture and Food. Fifty heads 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 spikelets in each spike were recorded. A FHB disease severity rating, also know as the FHB index, was determined for each barley and oat crop (% FHB severity = (% spikes affected x proportion (%) of the spike infected) / 100). Mean FHB severity values 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 and quantification of *Fusarium* species.

RESULTS AND DISCUSSION: The 2006 spring was moist and warm, favouring abundant cereal crop growth and providing suitable conditions for *Fusarium* sporulation on crop residues. However, most regions became dry in July when cereals were flowering; hence the risk of FHB was greatly reduced.

In 2006, FHB occurred in 74% of barley crops surveyed (76% of two-row; 70% of six-row) (Table 1). The provincial mean FHB severity was 0.5% for two-row and 0.2% for six-row barley. These low severity values are similar to those of the past five years; FHB severities in barley have been <1% since the 2001 survey (Pearse et al. 2006). In 2006, the highest FHB severity was 3.7% in a two-row barley field near Melfort (Zone 3).

In 2006, the most commonly isolated *Fusarium* species was *F. poae*, accounting for 47% of total *Fusarium* isolations, followed by *F. sporotrichioides* (26%), *F. avenaceum* (23%), and *F. equiseti* (4%). None of the infections in barley were caused by *F. graminearum*. *Pyrenophora* spp. were isolated from approximately 70% of the samples but C*ochliobolus sativus* was isolated infrequently.

Fusarium head blight was found in 40% of the oat crops surveyed in 2006 (data not 0.1%shown). All crops positive for FHB were in Zones 2 and 3 and had severities. *Fusarium avenaceum* was the most commonly isolated species, accounting for 50% of total *Fusarium* isolations, followed by *F. poae* (30%), *F. sporotrichioides* (10%), and *F. equiseti* (10%). No *F. graminearum* was isolated from infected oat samples.

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

REFERENCE:

Pearse, P.G., Holzgang, G., Harris, C.L. and Fernandez, M.R. 2006. Fusarium head blight in barley and oat in Saskatchewan in 2005. Can. Plant Dis. Surv. 86: 45-46. (http://www.cps-scp.ca/cpds.htm)

Table 1. Prevalence and severity of fusarium head blight (FHB) in barley crops grouped by soil or irrigation zones in Saskatchewan, 2006.

Soil Zone	No. affected crops / total crops (% of crops infected)		% FHB Severity[1] (range of severity)	
	two-row	six-row	two-row	six-row
Zone 1 Brown	5 / 6 (83%)	1 / 1 (100%)	0.3% (0 - 0.8%)	0.3%
Zone 2 Dark Brown	8 / 10 (80%)	-	0.4% (0 - 1.5%)	-
Zone 3 Black/Grey	11 / 15 (73%)	4 / 6 (67%)	0.6% (0 - 3.7%)	0.1% (0 - 0.2%)
Irrigation Zone	1 / 2 (50%)	2 / 3 (67%)	0.2% (0 - 0.4%)	0.3% (0 - 0.8%)
Overall Total/Mean	25 / 33 (76%)	7 / 10 (70%)	0.5%	0.2%

[1] % FHB severity = (% spikes affected x proportion (%) of the spike infected) / 100

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

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
R.A.A. Morrall[1], B. Carriere[2], B. Ernst[3], C. Pearse[4], D. Schmeling[5] and L. Thomson[6]
[1] Department of Biology, University of Saskatchewan, 112 Science Place, Saskatoon, SK, S7N 5E2; **Telephone:** 306-966-4410, **Facsimile:** 306-966-4461, **E-mail:** Robin.Morrall@usask.ca
[2] Discovery Seed Labs Ltd., 450 Melville Street, Saskatoon, SK, S7J 4M2
[3] Prairie Diagnostic Seed Lab, 1105 Railway Avenue, Weyburn, SK, S4H 3H5
[4] Discovery Seed Labs Ltd., Box 1180, 700 Railway Avenue, Nipawin, SK, S0E 1E0
[5] Lendon Seeds Ltd., Weyburn Lab., 108 Elgin Mall, 309 1st Avenue N.W., Weyburn, SK, S4H 1T1
[6] Saskatchewan Wheat Pool, Saskatoon Seed Laboratory, 102-407 Downey Road, Saskatoon, SK, S7N 4L8

TITLE /TITRE: SEED-BORNE FUSARIUM ON CEREALS IN SASKATCHEWAN IN 2006

INTRODUCTION AND METHODS: The results of agar plate tests on cereal seed samples provided by four Saskatchewan companies are summarized. The tests were conducted between early September and either mid- or late December, 2006. It was assumed that the majority of samples were from the 2006 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 from 200 to 400. Thus, the probability of obtaining false negative results varied among tests and companies.

RESULTS AND COMMENTS: In Saskatchewan the 2006 growing season was marked by excellent conditions for timely spring seeding and good or excessive moisture conditions in most areas throughout June. In July and August rainfall was generally below normal and high temperatures prevailed, especially in southern and western areas. Crops ripened early, harvest in the province progressed rapidly under ideal conditions in most regions, and the quality of cereal seed harvested was high. Fusarium head blight was not a conspicuous problem in most regions in mid- to late summer (5,6). However, in central and northern areas (CD 5, 6, 8 and 9), some crops were still in the field in mid-September when fall rains started. Subsequent wet and cool weather delayed combining of the remaining ripe crops and was conducive to saprophytic spread of *Fusarium* spp. and other fungi in the ripened floral tissues. This reduced grain quality in late-harvested crops in those areas.

The data compiled are based on 479 samples (48% wheat [winter and spring combined], 30% durum, 19% barley, 3% oat). Mean levels of *Fusarium graminearum* and of total *Fusarium* varied among CDs (Table 1) and were generally considerably lower than in 2005 (2). *Fusarium graminearum* was found in 12 of 20 districts, although at low levels and usually only in a small percentage of samples tested (Table 1). The only districts in which the mean level of infection with *F. graminearum* was more than 0.1% were CDs 1A, 1B, 2A, 2B and 8A. Thus, *F. graminearum* was most common in several regions close to Manitoba and North Dakota. In contrast to 2005 (2), it did not occur in samples from CD 3BN, a district with a substantial area under irrigation (7).

More than 99% of total *Fusarium* isolates in the tests were either *F. acuminatum*, *F. avenaceum*, *F. culmorum*, *F. equiseti*, *F. graminearum*, *F. poae* or *F. sporotrichioides. Fusarium poae* and *F. avenaceum* were generally the most common species on all cereals. The relatively high frequency of *F. poae* was in marked contrast with most other years, when *F. avenaceum* has been by far the dominant species and

F. poae has been found mainly on barley and oat (2,3,4). Mean levels of total *Fusarium* were below 5% in all CDs except 6A, 8A and 8B (Table 1). Crop districts 8A and 8B were where more crops had been harvested late after fall rains caused harvesting delays. The highest total *Fusarium* levels in samples of different crop types were 26% for durum (from CD 6B), 28% for barley (from CD 8B), 39% for wheat (from CD 2B), and 13.5% for oat (from CD 8A). The samples with high values from CD 2B and 6B may have come from irrigated crops.

The results of the 2006 survey confirm previous studies of the distribution and frequency of *Fusarium* spp. on cereal grains in Saskatchewan (1,2,3,4). *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. In 2006 the species was less common on harvested grain than in 2005 (2), except possibly on winter wheat. In most of the province moisture conditions were conducive to spike infection by *F. graminearum* in June, when winter wheat crops were flowering, but not in July when the majority of spring-sown cereals were in flower. The high levels of total *Fusarium* infection that were general in CD 8A and 8B and found in a few specific samples elsewhere were probably due to saprophytic invasion of the grain in fall caused by wet weather.

REFERENCES:

1. Clear R.M., Patrick S.K., Gaba D., Abramson D., and Smith D.M. 2005. Prevalence of fungi and fusariotoxins on hard red spring and amber durum wheat seed from western Canada, 2000 to 2002. Can. J. Plant Pathol. 27: 528-540.

2. Morrall R.A.A., Carriere B., Ernst B., Pearse C., Schmeling D. and Thomson L. 2006. Seed-borne fusarium on cereals in Saskatchewan in 2005. Can. Plant Dis. Survey 86: 47-49. (http://www.cps-scp.ca/cpds.htm)

3. Morrall R.A.A., Pearse P.G., Carriere B., Schmeling D., and Pearse C. 2004. *Fusarium* spp. from commercial seed samples in Saskatchewan in 2001 and 2002. Can. J. Plant Pathol. 26:217-218. (Abstr.) (www.grainscanada.gc.ca)

4. Morrall R.A.A., Thomson L., and Carriere B. 1999. Distribution of *Fusarium* species in cereal samples from Saskatchewan tested at commercial laboratories in 1998 and 1999. Poster abstracts, Canadian Workshop on Fusarium Head Blight, Winnipeg, MB, Nov. 28-30, 1999. p. 118. (www.grainscanada.gc.ca)

5. Pearse P.G., Holzgang G., Weitzel C.N. and Fernandez M.R. 2007. Fusarium head blight in barley and oat in Saskatchewan in 2006. Can. Plant Dis. Survey 87: 61-62. http://www.cps-scp.ca/cpds.htm)

6. Pearse P.G., Holzgang G., Weitzel C.N. and Fernandez M.R. 2007. Fusarium head blight in common and durum wheat in Saskatchewan in 2006, with comments on irrigated corn. Can. Plant Dis. Survey 87: 92-93. (http://www.cps- scp.ca/cpds.htm)

7. Pearse P.G., Holzgang G., Harris C.L. and Fernandez M.R. 2006. Fusarium head blight in common and durum wheat in Saskatchewan in 2005. Can. Plant Dis. Survey 86: 75-76. (http://www.cps-scp.ca/cpds.htm)

Table 1. Number of cereal seed samples tested from September to mid- or late December, 2006 by four 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	11	0.3	72%	3.0
1B	6	0.5	83%	3.3
2A	37	0.2	76%	3.1
2B	73	0.2	81%	3.8
3AN	7	0	100%	2.3
3AS	27	0	100%	0.2
3BN	21	0	100%	0.5
3BS	-	-	-	-
4A	4	0.1	75%	1.3
4B	5	0	100%	0.2
5A	13	<0.1	85%	3.7
5B	30	0.1	90%	4.1
6A	41	<0.1	95%	5.0
6B	51	<0.1	86%	4.7
7A	25	0	100%	0.7
7B	5	0	100%	2.3
8A	49	<0.1	86%	8.0
8B	38	0.5	47%	7.1
9A	21	<0.1	95%	4.2
9B	15	0	100%	3.1
TOTAL	479	0.1	79%	4.0

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

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
B.D. McCallum[1], P.G. Pearse[2], T. Fetch Jr.[1], D. Gaudet[3], A. Tekauz [1], P. Seto-Goh[1], K. Xi[4] and T.K. Turkington[5]
[1]Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg MB, R3T 2M9; **Telephone:** (204) 983-0771; **Facsimile:** (204) 983-4604; **E-mail:** bmccallum@agr.gc.ca
[2]Saskatchewan Agriculture and Food, 3085 Albert Street, Regina, SK, S4S 0B1
[3]Lethbridge Research Centre, Agriculture and Agri-Food Canada, Box 3000, Lethbridge, AB, T1J 4B1
[4]Alberta Agriculture, Food and Rural Development, c/o Lacombe Research Centre, 6000 C&E Trail, Lacombe AB, T4L 1W1
[5]Agriculture and Agri-Food Canada, Lacombe Research Centre, 6000 C&E Trail, Lacombe AB, T4L 1W1

TITLE / TITRE: STRIPE RUST OF WHEAT AND BARLEY IN MANITOBA, SASKATCHEWAN AND ALBERTA IN 2006

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 2006. 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. In central Alberta, observations were made in commercial fields and at cereal breeding sites in late July and August.

RESULTS AND COMMENTS: A heavy infection of wheat stripe rust (caused by *Puccinia striiformis* f.sp. *tritici*) was observed on June 19 at the University of Manitoba winter wheat breeding plots in Winnipeg. Lines varied in their infection level with some lines having severities of over 50% of the flag leaf area infected. Subsequently, 39 commercial fields of winter wheat in Manitoba were surveyed in July with no infection of stripe rust noticed. The 47 commercial spring wheat fields surveyed in Manitoba throughout July and August had stripe rust that ranged from 0 to 1% with an average infection of 0.9%. In the 33 commercial spring wheat fields surveyed in Saskatchewan, stripe rust severities ranged from 0 to 50% with an average of 10.1%. The most severely affected fields were southeast of Regina. Trace levels of stripe rust were occasionally seen on barley. This was the most widespread and severe epidemic of stripe rust in the eastern prairies since the disease started to appear in this region in 2000 (McCallum et al. 2006).

In central Alberta, trace levels of stripe rust were observed in barley plots. Spring wheat breeding plots at Trochu showed an average infection severity of 50% with a range from 10 to 87% based on the modified Cobb scale (Peterson et al. 1948). At Lacombe, similar levels of stripe rust were found in winter wheat coop trials and severity ratings of 30 - 95% were observed in breeding plots of triticale. Thirteen commercial wheat fields were surveyed in central Alberta with no stripe rust observed in 6 fields and only trace levels in the remaining 7 fields. Moderate levels of stripe rust were reported from commercial fields in the Edmonton area by provincial extension staff.

REFERENCES:
McCallum, B., Fetch, T. Jr., Seto-Goh, P., Xi, K. and Turkington, T.K.. 2006. Stripe rust of wheat and barley in Manitoba, Saskatchewan, and Alberta in 2005. Can. Plant Dis. Surv. 86:50.

Peterson, R. F., Campbell, A. B., and Hannah, A. E. 1948. A diagrammatic scale for estimating rust intensity on leaves and stems of cereals. Can. J. Res. 26:496-500.

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

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
T. Fetch and K. Dunsmore
Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg MB, R3T 2M9;
Telephone: (204) 983-1462; **Facsimile:** (204) 983-4604; **E-mail:** tfetch@agr.gc.ca

TITLE / TITRE: STEM RUSTS OF CEREALS IN WESTERN CANADA IN 2006

INTRODUCTION AND METHODS: Surveys of producer fields and trap nurseries of barley, oat and wheat for incidence and severity of stem rust *(Puccinia graminis* Pers. f. sp. *tritici* Eriks. & E. Henn. and *P. graminis* Pers. f. sp. *avenae* Eriks. & E. Henn.) were conducted in July, August, and September 2006. Infected stem tissue samples were collected from fields and trap nurseries. Urediniospores were obtained from collections and evaluated for virulence specialization on appropriate sets of host differential lines.

RESULTS AND COMMENTS: Above average temperatures and below average precipitation occurred across the Prairie region during the 2006 growing season. These environmental conditions were highly unfavorable for stem rust infection. On susceptible lines in trap nurseries and in commercial oat and barley fields stem rust 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, cultivated barley, and on wild barley (*Hordeum jubatum*) in 2006. Rye stem rust (*P*. *graminis* f. sp. *secalis*) was predominantly obtained from the survey samples (81.4%). The dominant race of *P*. *graminis* f. sp. *tritici* in 2006 was QFCSH (94%).

Stem rust in cultivated and wild oat was at trace levels in western Canada in 2006. All oat cultivars recommended for production in Canada are susceptible to stem rust races TJG, TJJ, and TJS. Race TJJ (NA67) was predominant in Manitoba (50% of samples from wild oat and 56% from cultivated oat) and on cultivated oat (63%) in Saskatchewan. Race TGD (NA29) was predominant on wild oat in Saskatchewan (37%) and commonly found in Manitoba (19% on wild, 17% on cultivated oat). The most interesting occurrence in 2006 was the extremely high prevalence of oat stem rust in field nurseries in Louisiana, USA and the development of new races first detected in that area. Those races apparently migrated into Canada, because three new races with virulence never previously found were identified in 2006. The virulence patterns of the three races were similar to races TGD, TJD, and TJJ, but were all high on Kyto (gene *Pg12*), mesothetic on the Pg-a complex, and low on the lines Alpha and Omega (source of Pg-a resistance). This may indicate the existence of the first races that can be used to identify a second recessive resistance gene that is postulated in the lines Alpha, Omega, and Pg-a. Additionally, race TJS (virulent on the Pg-a+Pg13 combination) increased in prevalence in 2006 to 4% on wild oat and 13% on cultivated oat in Manitoba, and was detected for the first time in Saskatchewan. Virulence in *P. graminis* f. sp. *avenae* is accumulating, resulting in strains with higher virulence than previously seen. This is most likely from continued mutation of races in the asexual population of *P*. *graminis* f. sp. *avenae*, through single-step accumulation of virulence genes.

REFERENCES:
Fetch, T.G. Jr. 2005. Races of *Puccinia graminis* on wheat, barley, and oat in Canada in 2002 and 2003. Can. J. Plant Pathol. 27:572-580.

Fetch, T. G. Jr., and Jin, Y. 2007. Letter code system of nomenclature for *Puccinia graminis* f. sp. *avenae*. Plant Dis. 91: (in press).

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

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
S. Haber[1] and R. Kurtz[2]
[1]Agriculture and Agri-Food Canada, Cereal Research Centre, 195 Dafoe Road, Winnipeg MB, R3T 2M9; **Telephone:** (204) 983-1467; **Facsimile:** (204) 983-4604; **E-mail:** shaber@agr.gc.ca
[2]Manitoba Agriculture, Food and Rural Initiatives, Plant Pathology Laboratory, 201-545 University Crescent, Winnipeg MB, R3T 5S6

TITLE / TITRE: **CEREAL VIRUS DISEASES IN MANITOBA AND SASKATCHEWAN IN 2006**

INTRODUCTION AND METHODS: Virus diseases on cereals in Manitoba monitored in 2006 were barley yellow dwarf (BYD), wheat streak mosaic (WSM) and oat necrotic mottle (ONM).

Collaborators identified and collected samples from mid May to early September in cereal crops in Manitoba and parts of eastern Saskatchewan (1). The proportion of plants with suspected virus symptoms in surveyed fields was estimated and specimens with and without symptoms collected for testing. Infection with BYDV, WSMV and ONMV (2) was further evaluated by transmission to indicator hosts. Transmission was used to confirm virus identity as well as assess virulence against historical benchmarks. For WSMV, transmission was by mechanical inoculation to a range of susceptible spring bread and durum wheat hosts. Oat specimens with symptoms that resembled those of ONM or of WSM on oat were assayed by mechanical inoculation to a differential set of susceptible bread wheat and oat hosts. For BYDV, transmission was by cereal aphids to seedlings of susceptible oat hosts.

RESULTS AND COMMENTS:
Barley Yellow Dwarf (BYD) - In 2006, seeding was timely in all the principal cereal-producing regions of the eastern Prairies but viruliferous aphid inoculum also arrived fairly early (early to mid-June) on southerly winds. Local outbreaks of disease were noted particularly in barley in south-central and SW Manitoba. Although oat and wild oat with BYD symptoms were widely and frequently observed, economic losses due to the disease did not appear to be extensive. All isolates collected from cereal crops were similar to the PAV strain (non-specifically transmitted by the oat bird-cherry aphid).

Wheat Streak Mosaic (WSM) - Continuing the trend of recent years, severe outbreaks of WSM in spring wheat in Manitoba were observed in 2006. These were notable both for their local severity and for occurring at sites where the disease had previously been observed at only trace levels. Although WSM outbreaks that destroy or severely damage a crop are still localized and sporadic, the disease is now sufficiently widespread that it is found in almost all winter and spring wheat fields in southern Manitoba at trace levels or higher. As recently as five years ago, by contrast, almost all fields were disease-free. At present economic losses due to WSM occur only on wheat, but naturally-occurring outbreaks of WSM on oat were observed in 2006. Oat as an additional WSMV host will need to be monitored, as the virus might mutate and become more virulent not only on wheat but also on other cereals.

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

REFERENCES:
1. Haber, S. and Kurtz, R. 2004. Cereal virus disease outbreaks in Manitoba in 2003. Can. Pl. Dis. Surv. 84: 54. (http:www.cps-scp.ca/cpds.htm)

2. Gill, C.C. and Westdal, P.H. 1966. Virus diseases of cereals and vector populations in the Canadian prairies during 1965. Can. Pl. Dis. Surv. 46: 18-19. (http:www.cps-scp.ca/cpds.htm)

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

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
J.G. Menzies, F. Matheson and C. Saramaga
Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg MB, R3T 2M9;
Telephone: (204) 983-5714; **Facsimile:** (204) 983-4604; **E-mail:** jmenzies@agr.gc.ca

TITLE / TITRE: CEREAL SMUT SURVEYS, 2006

INTRODUCTION AND METHODS: In July 2006, 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 routes from Winnipeg - Estevan - Moose Jaw - Watrous - Wakaw - Yorkton - Roblin - Russell - Miniota - Brandon - 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 (<0.01%) were estimated by counting plants in a 1-m^2 area at a minimum of two sites on the path.

An isolate of the pathogen 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. This was done using the teliospore germination assay of Leroux (1986) and Leroux and Berthier (1988) 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 and 1.0 µg ml^{-1} of carboxin. The cultures were incubated at 20^{o}C in a controlled environment chamber and examined for teliospore germination after 24 h.

RESULTS AND COMMENTS: Loose smut (*Ustilago tritici*) was found in 43 (34%) of the 126 fields of common wheat surveyed. One field had an incidence of 0.5% infection, while the incidence of smutted plants in the rest of the fields was at trace levels. In durum wheat, loose smut was found in 3 (25%) of the 12 fields surveyed at trace levels.

One (3%) of 29 fields of oat had smutted plants at a trace level. The oat smut sample was identified as *Ustilago kolleri*.

A high incidence of loose smut was found in 6-row barley with 10 (46%) of the 24 fields surveyed containing infected plants. Most fields had trace levels of infection, but two fields had 0.2%, one field had 0.5% and two fields had 1% smutted plants. In 2-row barley, 5 (13%) of 40 fields had smutted plants. The incidence of smutted plants in the fields was at trace levels in all but one field, which had an incidence of 1%. False loose smut (*Ustilago nigra*) and covered smut (*U. hordei*) of barley were not found in 2006.

Three isolates of *U. nuda* collected from two-row barley fields were able to germinate and grow on the agar medium amended with carboxin. These data suggest that the isolates may be resistant to the fungicide carboxin, but further tests must be done to confirm these preliminary findings.

REFERENCES:
Leroux, P. 1986. Caractéristiques des souches d'*Ustilago nuda*, agent du charbon nu de l'orge, résistantes à la carboxine. Agronomie 6:225-226.

Leroux, P. and Berthier, G. 1988. Resistance to carboxin and fenfuram in *Ustilago nuda* (Jens) Rostr., the causal agent of barley loose smut. Crop Protection 7:16-19.

Newcombe, G. and Thomas, P.L. 1991. Incidence of carboxin resistance in *Ustilago nuda*. Phytopathology 81:247-250.

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

NOMS et ÉTABLISSEMENTS / NAMES AND AGENCIES :
Rioux, S.[1], Comeau, A.[2]
[1] Centre de recherche sur les grains inc. (CÉROM), 2700, rue Einstein, Québec (Québec), G1P 3W8; **Téléphone:** (418) 528-7896; **Télécopieur:** (418) 644-6855; **Courriel:** sylvie.rioux@cerom.qc.ca
[2] Agriculture et Agroalimentaire Canada, Centre de recherche et de développement sur les sols et les grandes cultures, 2560, boul. Hochelaga, Québec (Québec), G1V 2J3

TITRE / TITLE: MALADIES DES CÉRÉALES AU QUÉBEC – OBSERVATIONS 2006

INTRODUCTION et MÉTHODES: Les essais d'enregistrement et recommandation d'avoine, d'orge et de blé de printemps ont été visités une fois durant la saison afin d'y noter les symptômes des maladies du feuillage et des épis. Ces essais conduits par le Réseau grandes cultures du Québec sont réalisés dans huit localités réparties dans les trois zones agroclimatiques du Québec : zone 1, la plaine de Montréal; zone 2, zone intermédiaire; et zone 3, zone périphérique (CÉROM, 2007). Le stade de développement de la céréale lors de la visite se situait entre laiteux moyen et pâteux moyen. Les symptômes de 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 les maladies de l'épi du blé (0 = absence de symptôme; 9 = 90 % des épillets atteints par la maladie).). L'intensité des symptômes foliaires est considérée faible pour les cotes variant de 0 à 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 situés dans différentes localités au Québec ont aussi été visités afin d'y déceler des maladies de racines.

RÉSULTATS et COMMENTAIRES: Les pluies printanières ont été fréquentes et abondantes dans la plaine de Montréal retardant ainsi les semis de quelques semaines, alors qu'elles ont été plus près des moyennes de saison pour les autres régions. Cet excès d'eau sans doute combiné à l'action des *Pythium* spp. est probablement responsable de la plupart des dommages qui ont été causés aux racines. Les racines endommagées ont eu des effets chroniques réduisant le rendement et la qualité des grains. De tels dommages ont été observés un peu partout au Québec; l'orge a été un peu plus touchée que le blé et l'avoine.

Chez l'avoine, la tache ovoïde (*Stagonospora avenae*) s'est manifestée avec une intensité moyenne dans tous les essais. La rouille couronnée (*Puccinica coronata*) a aussi été assez répandue; elle a été présente dans toutes les régions visitées. L'intensité des symptômes a été faible pour la majorité des lignées/cultivars et moyenne pour quelques autres. Quant à la jaunisse nanisante de l'orge (VJNO), elle a été observée dans les localités de la zone périphérique et à Saint-Augustin dans la zone intermédiaire. L'intensité des symptômes a été faible.

Chez le blé, les taches foliaires (*Cochliobolus sativus*, *Drechslera tritici-repentis* et *Stagonospora nodorum*) ainsi que la rouille des feuilles (*Puccinia triticina*) ont touché tous les essais. L'intensité des symptômes a varié selon les lignées/cultivars de moyenne à élevée pour les taches foliaires et de faible à moyenne pour la rouille des feuilles. L'oïdium (*Blumeria graminis* f. sp. *tritici*, syn. *Erysiphe graminis*) était présent à Princeville et à Saint-Augustin, deux localités de la zone intermédiaire. Certains cultivars et lignées n'ont montré aucun symptôme, alors que d'autres ont été beaucoup plus affectés obtenant une note 5 à l'échelle 0-9. C'est dans la plaine de Montréal que les symptômes de fusariose de l'épi (*Fusarium* spp.) ont été les plus notables lors de la visite alors qu'environ 10 à 20 % des épillets de la parcelle étaient atteints par la maladie. La jaunisse nanisante a été peu présente.

Chez l'orge, le fait marquant de la saison 2006 a été la présence de la rouille des feuilles (*P. hordei*). Les symptômes ont pu être notés dans deux essais de la zone 1 et à Princeville en zone 2. L'intensité des symptômes variait de faible à moyenne selon les essais et les lignées/cultivars. Les taches foliaires (*Cochliobolus sativus*, *Drechslera teres*, *Rhynchosporium secalis*) se sont manifestées, comme à l'habitude, dans tous les essais. Les symptômes ont été d'intensité moyenne à élevée. Quant à l'oïdium (*B. graminis* f.sp. *hordei*, syn. *E. graminis*) et à la jaunisse nanisante de l'orge, ils n'ont pas été notés.

RÉFÉRENCE :

CÉROM. 2007. Recommandations de cultivars de céréales à paille 2007. Dans: Résultats des essais de maïs-grain et de cultivars de plantes oléoprotéagineuses 2006 et Recommandations de cultivars de céréales 2007. CÉROM, pp. 39-54.
[http://www.agrireseau.qc.ca/grandescultures/documents/Resultats_WA034.pdf]

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

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
X. Zhu[1], L. M. Reid[1], T. Woldemariam[1] and A. Tenuta[2]
[1] Agriculture and Agri-Food Canada, Central Experimental Farm, Ottawa, Ontario, K1A 0C6;
Telephone: (613) 759-1616; **Facsimile:** (613) 952-9295; **E-mail:** zhuxyz@agr.gc.ca
[2] Ontario Ministry of Agriculture, Food and Rural Affairs, P.O. Box 400, Ridgetown College, Ridgetown ON, N0P 2C0

TITLE / TITRE: SURVEY OF CORN DISEASES AND PESTS IN ONTARIO AND QUÉBEC IN 2006

INTRODUCTION AND METHODS: A survey for the presence of corn pests was conducted in Ontario and Québec from August 17 to September 11, 2006. As previously [1, 2, 3, 4, 5, 6, 7], the emphasis of the 2006 survey was to determine the distribution and severity of the bacterial disease Stewart's wilt (*Pantoea stewartii* = *Erwinia stewartii*). The distribution and severity of other diseases and insects including eyespot (*Aureobasidium zeae*), common rust (*Puccinia sorghi*), northern leaf blight (Exserohilum *turcicum*), anthracnose leaf blight (*Colletotrichum graminicola*), common smut (*Ustilago maydis*), head smut (*Sporisorium holci-sorghi* = *Sphacelotheca reiliana*), ear rot (*Fusarium* spp.), stalk rot (*Fusarium* spp. and *C. graminicola*), European corn borer (*Ostrinia nubilalis*), corn rootworm (*Diabrotica longicornis* and/or *D. virgifera*), and corn flea beetle (*Chaetocnema pulicaria*) were also recorded. In addition, scouting for any newer pests and diseases in Canada was conducted, especially for grey leaf spot (*Cercospora zeae-maydis*) in Ontario.

At each of the 164 fields in Ontario and 96 fields in Québec surveyed, the incidence of each pest and the severity of the predominant pest(s) were recorded. Thirty-one Stewart's wilt-like leaf samples were collected from crops surveyed in southern Ontario. An ELISA test, using reagent sets, protocols, and antibodies provided by AGDIA Inc. (Elkhart, Indiana 46514, USA), was employed to detect the pathogen, *P. stewartii.*

RESULTS AND COMMENTS:
Fungal leaf diseases: Eyespot was found in 69 fields in Ontario and 86 fields in Québec (Table 1). Eyespot was rarely found in fields surveyed in southern Ontario. Fourteen fields in Québec and three fields in eastern Ontario were rated as having intermediate disease severity. In most cases, yield losses caused by eyespot were limited; however, in two fields the leaves were drying prematurely because of eyespot alone, and in five fields the leaves were drying because of both eyespot and anthracnose leaf blight infection. Yield losses in these fields were estimated to be 5-15%. Some hybrids entered in the Ontario Corn Committee (OCC) trial at Winchester and Lancaster, Stormont Dundas and Glengarry County, ON were moderately susceptible to eyespot.

Common rust was found in 102 fields in Ontario and 31 fields in Québec (Table 1); only three grain corn fields and one sweet corn field showed intermediate severity. Southern rust (*Puccinia polysora*) was found in one field at Elgin, Ontario this year.

Typical symptoms of grey leaf spot were found in 78 fields in 14 counties in Ontario (Table 1). As in 2004 and 2005, most grey leaf spot was found only on lower leaves and symptoms were not severe. Grey leaf spot was one of the most common leaf diseases in Essex, Chatham-Kent, Elgin, and Middlesex counties, ON in 2006. Moreover, grey leaf spot was found to have spread to eastern Ontario in Ottawa-Carleton, and Stormont, Dundas and Glengarry counties. In 2006, the levels of grey leaf spot observed in four fields were sufficient to caused significant yield loss. No grey leaf spot was found in Québec.

Anthracnose leaf blight (ALB) was found in 131 fields in Ontario and 83 in Québec (Table 1). In contrast to 2005 [7], there were 15 corn fields with intermediate to severe levels of ALB in eastern Ontario and Québec, while only two fields had intermediate severities in southern Ontario. ALB was the most important leaf disease in Québec in 2006. Northern leaf blight (NLB) was found in 91 fields in Ontario and 31 fields in Québec. These numbers were higher than recorded in 2004 [6] and 2005 [7]. Seventeen

fields in Ontario were rated as having intermediate or severe levels of NLB, including two grain corn fields in Huron, and Stormont Dundas and Glengarry counties in which all of the plants were dying by the end of August. Yield losses in some fields were estimated to be up to 20%. This was the fourth year since 2003 in which severe NLB was found at Erie Beach, Chatham-Kent County, ON. Of five seed corn crops surveyed 3-5 km from Erie Beach, three were almost dead on August 18, while in the other two the female parent appeared to contain a gene resistant to NLB. In Québec, three fields planted with the same highly susceptible corn hybrid exhibited an intermediate severity to NLB. The results of the 2004 [6], 2005[7], and 2006 corn disease surveys indicated that northern leaf blight is becoming a more serious problem in Canada, that losses are increasing, and that this disease may pose a significant risk in future.

Fungal ear and stalk diseases: Gibberella/fusarium ear rots were observed in 34 fields in Ontario and 21 fields in Québec (Table 1). Unlike 2005, when ear rot symptoms appeared earlier than usual because of a warm season [7], ear rot symptoms in 2006 progressed more slowly but were very noticeable by late September and early October, especially in southern Ontario. Surveys done after the end of August indicated that 2006 was an outbreak year for ear rot damage and mycotoxin (deoxynivalenol or DON) production.

Common smut was widely distributed across 101 fields in Ontario and 61 fields in Québec (Table 1). Four fields with more than a 2% incidence of common smut were recorded in Ontario, including one hybrid having 40% incidence at the Ottawa-Carleton experimental farm. Deer damage could have had an impact on the incidence of common smut on this hybrid since the incidence of damaged plants located 2-3 rows from the field borders was 80-90%, while the incidence inside the field was 'reduced' to 40%. In Québec, there were four fields with a relatively high incidence of common smut, ranging from 5-20%. Head smut was found in only three fields at a very low (<1%) incidence, one in Ontario and two in Québec (Table 1). Head smut could not be found in some fields which had had head smut in 2004 and 2005; this may be attributed to the warmer month of May in 2006, resulting in fast germination. As was the case in 2005, only a few ears with aspergillus ear rot or cladosporium ear rot were found at the time of harvest in Ottawa-Carleton county, ON in 2006. Many ears had black mold/spores on kernels that had been damaged by birds or insects.

Stalk rot, including anthracnose stalk rot/top-die back, fusarium stalk rot, and pythium stalk rot was detected in 60 fields in Ontario and 47 fields in Québec (Table 1). None of the occurrences appeared to have resulted in serious damage in southern Ontario at the time of surveying; however, seven fields in Québec and two fields in eastern Ontario had incidences of top-die back of 50-90%.

Bacterial diseases: Stewart's wilt was much more common in 2006 compared to 2003, 2004, and 2005 [5, 6, 7]; however yield losses were limited because of generally low severity. Of the 31 Stewart's wilt samples tested using ELISA, all were positive for *P. stewartii*. Stewart's wilt was found in 21 fields in southern Ontario, in the counties of Essex, Chatham-Kent, Elgin, Huron, Lambton, Middlesex, Perth, and Lennox and Addington (Table 1). Stewart's wilt was also found in 10 fields in eastern Ontario in the counties of Leeds and Grenville, Lanark, Renfrew, Ottawa-Carleton, and Stormont, Dundas and Glengarry. The same corn hybrid from one seed company displayed Stewart's wilt symptoms at three demonstration sites, in Renfrew, Lanark, and Ottawa-Carleton counties. Populations of the corn flea beetle remained very low in southern Ontario in 2006 as was the case in 2003, 2004, and 2005 [5, 6, 7]. No Stewart's wilt was found in Québec.

Holcus leaf spot (*Pseudomonas syringae*) was found in a single field in Stormont, Dundas and Glengarry county, ON.

Viral diseases: Maize dwarf mosaic symptoms were observed in one seed corn field in Chatham-Kent county, ON. No other viral disease was observed in 2006, even in late-seeded sweet corn fields which were at the silk stage at the time of surveying.

Insects: European corn borer (ECB) damage was observed at 127 fields in Ontario and 72 fields in Québec (Table 1). As is usual, ECB damage was higher in eastern Ontario and Québec than in southern Ontario. ECB damage ranged from 10-25% incidence in some hybrids at OCC trials in Waterloo county,

ON. Corn rootworm (CRW) damage was observed at 123 fields in Ontario and 88 fields in Québec (Table 1). As observed in other years, in most fields the main damage from CRW resulted from leaf feeding and silk pruning; however, western corn rootworm was found causing 85-90% root lodging and heavy silk pruning in one field in Oxford county, ON; grain yield losses in this field were estimated to be near 35%.

Aphid populations were lower than usual, as was also the case in 2004 and 2005, but aphids were numerous in three fields in Québec and one field in eastern Ontario. Corn blotch leaf miner (*Agramyza parvicornis*), the most common insect of corn in Canada, was found in all fields surveyed in both Ontario and Québec, but damage from this pest was very slight. Reduced populations of grasshoppers, most likely red-legged grasshopper (*Melanoplus femur-rubrum*), were seen in both Ontario and Québec in 2006, as was also the case in 2005. Brown stink bug (*Euschistus servus*) was found in a few fields in both Ontario and Québec, but numbers of this insect were very low.

Three kinds of black beetles were found to be damaging corn kernels. Picnic Beetle (*Glischrochilus quadrisignatus*) was found in one field in Lambton county, ON. Milk weed beetle (*Labidomera trimaculata*) was recorded once in Maskinonge county, QC, as was red head flea beetle (*Systena frontalis*) in D'Argenteuil county, QC.

Mites: Two-spotted spider mite (*Tetranychus urticae* = *T. bimaculatus*) populations were relatively low in 2006 and no severe damage was observed in either Ontario and Québec.

Other: Bird and other animal damage were severe in many fields in both Ontario and Québec.

Summary: 2006 was a warm and moist corn season from May to October. The corn germinated quickly and grew normally. The warm season was detrimental to smut disease development and we observed fewer instances of common smut and head smut in 2006. However, conditions in 2006 were favourable for leaf disease development. Northern leaf blight continued to increase and sporadic NLB outbreaks were observed in Ontario. The damage from anthracnose leaf blight and eyespot increased in Québec. Grey leaf spot was one of the most common leaf diseases in southern Ontario and has now spread and is established in eastern Ontario. Stewart's wilt was found more often in southern and eastern Ontario than elsewhere, but it was related to specific hybrids and may, therefore, have been seed-borne. Common rust was not as prevalent as in other years. Excess rain from mid-September on slowed grain dry-down, creating gibberella ear rot outbreaks in southern Ontario. There were substantial differences in the severity of gibberella ear rot symptoms amongst commercial corn hybrids. Stalk rot, European corn borer, corn rootworm, mites, and grasshoppers were less problematic than normal in both Ontario and Québec in 2006.

ACKNOWLEDGEMENTS:
This survey was supported in part by the Ontario Seed Corn Growers' Association, which obtained funding from Agriculture and Agri-Food Canada through the Agricultural Adaptation Council's 'CanAdvance Program'. We thank Dr. François Meloche at the Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada, who helped to identify three black beetle species. We would also like to thank the seed corn companies and growers for providing access to their fields.

REFERENCES:
[1]. Zhu, X., Reid, L.M., Presello, D. and Woldemariam, T. 2000. Survey of corn pests in Ontario and Québec. Can. Plant Dis. Surv. 80: 48-50. (http://www.cps-scp.ca.cpds.htm)

[2]. Zhu, X., Reid, L.M., Presello, D. and Woldemariam, T.2001. Survey of corn pests in Ontario and Québec in 2000. Can. Plant Dis. Surv. 81: 75-78. (http://www.cps-scp.ca.cpds.htm)

[3]. Zhu, X., Reid, L.M., Woldemariam, T., Tenuta, A. and Lachance, P. 2002. Survey of corn pests in Ontario and Québec in 2001. Can. Plant Dis. Surv. 82: 71-74. (http://www.cps-scp.ca.cpds.htm)

[4]. Zhu, X., Reid, L.M., Woldemariam, T., Tenuta, A., Jay S. and Lachance, P. 2003. Survey of corn diseases and pests in Ontario and Québec in 2002. Can. Plant Dis. Surv. 83: 81-84. (http://www.cps-scp.ca.cpds.htm)

[5]. Zhu, X., Reid, L.M., Woldemariam, T., Tenuta, A. and Lachance, P. 2004. Survey of corn diseases and pests in Ontario and Québec in 2003. Can. Plant Dis. Surv. 84: 61-64. (http://www.cps-scp.ca.cpds.htm)

[6]. Zhu, X., Reid, L.M., Woldemariam, T., Tenuta, A., Lachance, P. and Pouleur, S. 2005. Survey of corn diseases and pests in Ontario and Québec in 2004. Can. Plant Dis. Surv. 85: 31-34. (http://www.cps-scp.ca.cpds.htm)

[7]. Zhu, X., Reid, L.M., Woldemariam, T., Tenuta, A., Lachance, P. and Pouleur, S. 2006. Survey of corn diseases and pests in Ontario and Québec in 2005. Can. Plant Dis. Surv. 86: 56-61. (http://www.cps-scp.ca.cpds.htm)

Table 1: Distribution of pests in corn fields in Ontario and Québec in 2006

County	# of fields	Eyespot	Common rust	Grey leaf spot	ALB	NLB	Stewart's Wilt	Common smut	Head smut	Ear rot	Stalk rot	ECB	CRW	Corn flea beetle
Ontario														
Chatham-Kent	34	5	20	31	27	23	12	26		6	5	25	19	8
Dufferin	4	3	2		4	2		1		1	1	2	3	
Elgin	8	2	7	8	8	6		5		2	2	6	7	1
Essex	7		3	6	6	3	3	4				2	6	
Frontenac	3	1	1		3	1					2	3	1	
Hastings	3	1	1		3	1		2			1	2	2	
Huron	5	3	3	3	4	3	1	4		1	2	4	5	2
Lambton	6	2	4	3	3	4	2	5				6	2	2
Lanark	5	3	2	1	2	2	3	4		1	5	5	4	
Leeds and Grenville	5	3	2		5	2	1	1		1	2	4	3	
Lennox and Addington	2	2			2	1	1	1		1	2	2	1	
Middlesex	8	1	8	8	7	6	1	7		2	2	7	6	1
Norfolk	5	2	4	1	5			2				3	3	
Northumberland	2	2	2		2	1						2	1	
Ottawa-Carleton	12	9	8	4	9	4	3	8	1	7	8	9	12	
Oxford	8	5	5	4	7	6		5		1		5	8	1
Peel	1		1		1						1	1	1	
Perth	6	2	1	1	5	4	1	2			2	5	5	
Prescott and Russell	3	3	1		2	2		1		1	3	3	2	
Renfrew	12	3	7		5	2	2	5		2	6	11	8	
Simcoe	1		1			1		1				1	1	
Stormont Dundas and Glengarry	9	9	8	2	7	9	1	8		6	9	8	9	
Waterloo	5	2	3	3	5	2		3			2	5	5	
Wellington	7	6	6	3	6	6		5		1	4	4	7	
York	3		2		3			1		1	1	2	2	
Total	**164**	**69**	**102**	**78**	**131**	**91**	**31**	**101**	**1**	**34**	**60**	**127**	**12**	**15**
Québec														
Acton	6	6	1		6	3		3		1	3	3	6	
Argenteuil	5	5			5	4		4		2	3	5	3	
Bas-Richelieu	4	4	1		2	2		3		1	3	2	4	
Becancour	5	3	1		5			4		2	2	5	5	
Brome-Missisquoi	6	6	3		6	1		5			1	5	6	
D'Autray	3	3	1		2	2		2	1			1	3	
Drummond	3	3	1		3			1		1	2	2	3	
Joliette	2	2			1			2		1	2	2	2	
Lajemmerais	4	3			4			1		1	2	2	3	
La Haute-Yamaska	3	1	2		3	2		3				1	3	
La Vallée-Du-Richelieu	5	4	1		5	2		3		1	3	5	5	
Le Haut-Richelieu	4	3	2		3			1			3	2	4	
Les Maskoutains	5	4	2		2	1		3		2	2	4	5	
Longueul	2	2	2		2			2		1		2	1	
Maskinongé	5	5	1		5	2		2	1	1	2	4	5	
Mirabel	4	4			4	1		1		1	1	4	4	
Montcalm	5	5	1		4			3			4	4	4	
Moulins	2	2			2	1		1			2	1	1	
Nicolet-Yamaska	5	5	1		5			4		1	3	3	4	
Roussillon	2	2	2		2			2				2	2	
Rouville	4	3			4	2		3		1	3	4	4	
Thérese-De-Blainville	2	2			2			1		1	2	2	1	
Trois-Rivières	3	2	2		2	2		1		1	2	2	3	
Vaudreuil-Soulanges	7	7	7		4	6		6		2	2	5	7	
Total	**96**	**86**	**31**		**83**	**31**		**61**	**2**	**21**	**47**	**72**	**88**	

ALB = Anthracnose leaf blight, NLB = northern leaf blight, Ear rot: gibberella & fusarium ear rot. Stalk rot: fusarium & anthracnose stalk rot and top-die back. ECB = European corn borer. CRW = western and northern corn rootworm.

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

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
J. Chong, J. Gruenke, R. Dueck and W. Mayert
Cereal Research Centre, Agriculture and Agri-Food Canada195 Dafoe Road, Winnipeg MB, R3T 2M9;
Telephone: (204) 983-0932; **Facsimile:** (204) 983-4604; **E-mail:** jchong@agr.agr.ca

TITLE / TITRE: CROWN RUST OF OAT IN WESTERN CANADA IN 2006

INTRODUCTION AND METHODS: Surveys for incidence and severity of oat crown rust (*Puccinia coronata* Cda f. sp. *avenae* Eriks.) were conducted in southern Manitoba from June 30 to August 21 in 2006. Surveys for the rust in SE Saskatchewan were conducted on August 1-2 and 16-17. All locations surveyed 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 (*A. sativa* L.) in farm fields, and susceptible and resistant oat lines and cultivars grown in uniform rust nurseries. The nurseries were located at Brandon, Emerson, and Morden, MB, and 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*, *Pc96,* and *Pc97* were used as supplemental differentials. The cultivar 'Triple Crown' has *Pc48*. Genes *Pc38, Pc39,* and *Pc68* are present in cultivars such as 'AC Assiniboia', 'AC Pinnacle', 'Ronald, and 'Furlong'. The cultivar 'Leggett', which was released in 2004, has *Pc68* and *Pc94*. 'HiFi', which has *Pc91* plus an unidentified *Pc* gene, was released for commercial production in Canada in 2006. This cultivar was developed at the North Dakota State University, Fargo, and was released for commercial production in the United States in 2001.

RESULTS AND COMMENTS: Crown rust was found at trace levels on wild oat and in commercial oat fields in southern Manitoba on June 30. The disease remained mostly at trace to light levels until mid-August in many growing areas across Manitoba and eastern Saskatchewan because of the unusually hot and dry conditions in 2006. By this time, much of the oat crop was near maturity or ripe. In areas where buckthorn, the alternate host, is known to be present, crown rust was found early and was severe. For instance, in areas near Carman, up to 40% or 80% crown rust severities were found on wild oat and in oat fields by July 20. In areas near Portage la Prairie, crown rust severities ranging from 40% to 70% were observed in experimental plots of 'AC Assiniboia' and 'Furlong' on August 16. Only the cultivars 'HiFi' and 'Leggett' were free of rust. On August 17, crown rust infections, ranging from trace to 50% or 80%, were found in commercial oat fields in some locations near Lac du Bonnet, Ladywood, and Tyndall, MB. These fields were near maturity and would likely have escaped heavy rust damage. In eastern Saskatchewan, all the commercial oat fields surveyed on August 1-2, from Carlisle to Weyburn, had only trace levels of crown rust infection. On August 16-17, crown rust severities, ranging from trace to 40%, were observed in commercial oat fields near Indian Head, Balcarres, and Melville, SK.

To date, 191 single-pustule isolates of *P. coronata* f. sp. *avenae* have been established from collections obtained from wild and cultivated oat in Manitoba and eastern Saskatchewan: One hundred and eight of these originated from wild oat and 83 from cultivated oat. Frequencies of the isolates virulent to the 20 single-gene differential oat lines are shown in Table 1. Over 90% of the isolates from wild oat and cultivated oat were virulent to *Pc38* and *Pc39.* Virulences to these two genes continued to be selected in the rust population because they are present in all the cultivars that have *Pc68* (81% of the oat area in Manitoba in 2006), as well as in older cultivars such as 'Dumont', 'Riel', 'Robert', and 'AC Preakness', that are still grown (totaling 4% of the area in 2006). Virulence to *Pc68* in isolates from wild oat has increased from 42.0% in 2005 to 63.9% in 2006, and in isolates from cultivated oat from 71.1% in 2005 to 81.9% in 2006. The 2006 virulence data confirm observations from the previous year that *Pc68* has lost its effectiveness. With a continued declining area of 'Triple Crown', virulence to the crown rust resistance gene in 'Triple Crown' (*Pc48*) also declined; only 3.7% of the isolates were virulent to this gene in 2006, compared to 11.4% in 2005.

In 2006, no virulence was detected to *Pc91* in isolates from wild oat and cultivated oat. However, previous virulence studies in 2002, 2003, and 2005 showed that virulence to this gene already occurred at low levels in the rust population in the eastern prairie region. Virulence to *Pc94* was detected in one isolate from cultivated oat and not in isolates from wild oat in 2006. The cultivar 'Leggett' contains both *Pc94* and *Pc68*. This cultivar basically was protected by a single gene *Pc94*, as *Pc68* is no longer effective. One isolate from wild oat and one from cultivated oat were found to have virulence to *Pc96* in 2006. One isolate from wild oat and two isolates from cultivated oat have virulence to a new gene, temporarily designated *tempPc97*, recently transferred from an accession of *Avena sterilis*.

Genes *Pc91, Pc94, Pc96, tempPc97,* as well the resistance in the cultivar 'Vista', developed at the University of Wisconsin, are being used as resistance sources in the oat breeding program at the Cereal Research Centre, Winnipeg. However, as none of the genes conferring hypersensitive form of resistance has been shown to be durable, it is difficult to predict the durability of these genes, even when they are deployed in two-gene combinations. The *Pc38* and *Pc39* gene combination was a good example. 'Dumont', released in 1982, has this gene combination, which provided complete control of crown rust for several years until 1987, when two isolates virulent to this gene combination appeared in the eastern prairie region. By 1992, over 87% of the isolates had virulence to this gene combination. Partial resistance (also known as slow-rusting, horizontal or general resistance) is generally considered to be more durable than major seedling resistance (hypersensitive) and was identified in oat several decades ago. More recently, the highly effective partial resistance in an oat line MN841801 holds promise to provide durable resistance based on performance history in tests done at the St. Paul buckthorn nursery. Incorporating effective partial resistance into adapted cultivars could provide more stable control of crown rust, and is attainable in the near future, particularly when resistance is tightly linked to molecular markers.

Table 1. Frequencies (%) of *Puccinia coronata* f. sp. *avenae* isolates from western Canada in 2006 with virulence to 20 single-gene differential oat (*Avena sativa*) lines.

	Wild oat		**Cultivated oat**	
***Pc* gene line**	No. of isolates	%	No. of isolates	%
38	103	95.4	78	94.0
39	101	93.5	75	90.4
40	55	50.9	27	32.5
45	0	0	2	2.4
46	39	36.1	31	37.3
48	4	3.7	8	9.6
50	6	5.6	7	8.4
51	39	36.1	28	33.7
52	4	3.7	8	9.6
54	2	1.9	2	2.4
56	37	34.3	39	47.0
58	0	0	1	1.2
59	12	11.1	11	13.3
62	3	2.8	1	1.2
64	23	21.3	12	14.5
68	69	63.9	68	81.9
91	0	0	0	0
94	0	0	1	1.2
96	1	1.0	1	1.2
97	1	1.0	2	2.4
Total no. of isolates	108		83	

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
A. Tekauz, E. Mueller, M. Stulzer, M. Beyene and P. Gozé
Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg MB, R3T 2M9;
Telephone: (204) 983-0944; **Facsimile:** (204) 983-4604; **E-mail:** atekauz@agr.gc.ca

TITLE / TITRE: SURVEY FOR FUSARIUM HEAD BLIGHT OF OAT IN MANITOBA IN 2006

INTRODUCTION AND METHODS: The occurrence of fusarium head blight (FHB) in oat in southern Manitoba was assessed by surveying 27 commercial fields from July 17 to 31, when most crops were at the late milk (ZGS 79) stage of growth (range ZGS 71-86). Fields were sampled at regular intervals along the survey routes, depending on availability. Fusarium head blight in each field was assessed by sampling a minimum of 80-100 plants at each of 3 locations for the percentage of infected panicles (disease incidence), and for the average panicle proportion infected (PPI) among the panicles putatively affected by FHB. Fusarium head blight severity was calculated as the 'FHB Index' (% incidence x % PPI) / 100. Several affected panicles closest to each of the 3 plant clumps sampled were collected from each location, placed in plastic bags and frozen. Subsequently, 50 putatively infected seeds per field were surface-sterilized in 0.3% NaOCl for 3 min., air-dried, and plated onto potato dextrose agar to identify and quantify the *Fusarium* spp. present.

RESULTS AND COMMENTS: Conditions in spring (late April to early June) 2006 were generally favourable for seeding and crop growth, but subsequently, soil moisture levels become progressively depleted, and in general 2006 was regarded as one of the driest growing seasons on record in southern Manitoba. Despite this, most cereal crops fared well and yield and quality levels were normal to above-normal. However, the lack of moisture was not conducive to the renewed saprophytic growth of overwintered fungal pathogens in straw and stubble, and it is probable that inoculum (conidia) of *Fusarium* spp. was considerably reduced. This, combined with the lack of rain when oats were heading and flowering, likely led to low levels of infection.

Sixteen of the 27 fields surveyed had visible symptoms of FHB. However, because of the open inflorescence (panicle) in oat, and the generally low levels of disease, FHB was difficult to assess in this crop, as is normally the case. Overall, incidence of FHB was estimated as 0.2% (range 0 - 1.3%), PPI as 2.7% (range 0 - 7.0%) and the FHB Index as 0.01% (range 0 - 0.1%). As such, FHB was estimated to have caused no yield loss in Manitoba oat crops. This level of disease was among the lowest found since surveys for FHB in oat were initiated in 2002; however, visual estimates of FHB in oat are always low compared to wheat or barley, and the FHB index has never been above 0.1% (Tekauz et al. 2006).

Fusarium colonies developed from 14.4% of the oat kernels plated on potato dextrose agar. The *Fusarium* spp. isolated and their occurrence in fields and on kernels are listed in Table 1. While normally common, *F. poae* was particularly dominant in 2006, and was found in most fields and on most kernels. This is similar to what was found in barley crops in Manitoba in 2006 (Tekauz et al., 2007). *Fusarium graminearum* was detected in only a low proportion of fields, and at the lowest proportion in the last five years (Tekauz et al. 2006, 2005). Environmental conditions in 2006 appear to have favoured oat kernel infection or infestation by *F. poae*.

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

Tekauz, A., Mueller, E., Beyene, M. and Stulzer, M. 2006. Fusarium head blight of oat in Manitoba in 2005. Can. Plant Dis. Surv. 86: 68-69. (http://www.cps-scp.ca/cpds.htm)

Tekauz, A., Gilbert, J., Mueller, E., Beyene, M., Stulzer, M. and Ludevine, L. 2005. Fusarium head blight of oat in Manitoba in 2004. Can. Plant Dis. Surv. 85: 36-37. (http://www.cps-scp.ca/cpds.htm)

Table 1. *Fusarium* spp. isolated from fusarium head blight affected oat kernels from Manitoba in 2006.

***Fusarium* spp.**	**Percent of fields**	**Percent of kernels**
F. avenaceum	15	2.1
F. equiseti	7	1.5
F. graminearum	19	7.2
F. poae	96	82.5
F. sporotrichioides	33	6.7

CROP / CULTURE: Oat
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
A. Tekauz, E. Mueller, M. Beyene, M. Stulzer and P. Gozé
Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg MB, R3T 2M9;
Telephone: (204) 983-0944; **Facsimile:** (204) 983-4604; **E-mail:** atekauz@agr.gc.ca

TITLE / TITRE: LEAF SPOT DISEASES DETECTED IN MANITOBA OAT FIELDS IN 2006

INTRODUCTION AND METHODS: Leaf spot diseases of oat in Manitoba were assessed in 27 commercial fields during surveys done from July 21 to 27, 2006 when most crops were at the late milk stage (ZGS 79) of growth (range ZGS 71-86). Fields were sampled at regular intervals along the survey routes, depending on availability. Disease incidence and severity were recorded by averaging their levels 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 and dried and stored in paper envelopes. Surface-sterilized pieces of infected leaf tissue were placed in moist chambers for 3-5 days to identify the causal agent(s) and disease(s) present, and assess their relative importance.

RESULTS AND COMMENTS: Conditions in spring (late April to early June) 2006 were generally favourable for seeding and crop growth, but subsequently, soil moisture levels become progressively depleted, and in general, 2006 was regarded as one of the driest growing seasons on record in southern Manitoba. Despite this, most cereal crops fared well and yield and quality levels were normal to above-normal. However, the lack of moisture was not conducive to the renewed saprophytic growth of overwintered fungal pathogens in straw and stubble, and it is likely that inoculum of leaf spotting pathogens was considerably reduced. The low rainfall likely also resulted in fewer opportunities for foliar infection and subsequent spread of disease(s) to other parts of the crop canopy.

Leaf spots were observed in the upper or lower leaf canopies in 26 of the 27 fields surveyed. Disease levels in the upper canopy were nil, trace or very slight in 85% of fields, and slight in 15%. Respective severity categories in the lower canopy were 26% and 11%, with 63% being non-estimable due to senescence. On the basis of all fields having nil to slight levels of disease in the upper leaf canopy, leaf spot diseases in oat caused most likely caused nil to negligible damage in 2006.

Pyrenophora avenae, (pyrenophora leaf blotch) occurred in most fields and was the pathogen isolated most frequently from infected leaf tissue, indicating that it caused most, albeit minor, damage (Table 1). *Phaeosphaeria avenaria f.sp avenaria* (anamorph: *Stagonospora avenae*), (stagonospora leaf blotch) was less frequently isolated in 2006 than previously (Tekauz et al. 2006), while *Cochliobolus sativus* was unimportant as a leaf spot pathogen of oat in 2006.

REFERENCE:
Tekauz, A., Kutcher, H.R, Mueller, E., Beyene, M. and Stulzer, M. 2006. Leaf spots of oat in Manitoba and eastern Saskatchewan in 2005. Can. Plant Dis. Surv. 86: 70-71. (http://www.cps-scp.ca/cpds.htm)

Table 1. Incidence and isolation frequency of leaf spot pathogens of oat in Manitoba in 2006

Pathogen	Incidence (% of fields)	Frequency (% of isolations)*
Pyrenophora avenae	89	82.2
Cochliobolus sativus	11	1.8
Stagonospora avenae	37	16.0

*indicative of the relative amount of foliar damage observed

CROP / CULTURE: Oat
LOCATION / RÉGION: Ontario

NAME AND AGENCY/ NOM ET ÉTABLISSEMENT:
L. Tamburic-Ilincic
Ridgetown Campus, University of Guelph, Ridgetown ON, N0P 2C0;
Telephone: (519) 674-1557; **Fascimile:** (519) 674-1600; **E-mail:** ltamburi@ridgetownc.uoguelph.ca

TITLE/ TITRE: 2006 SURVEY FOR FUSARIUM HEAD BLIGHT OF OAT IN ONTARIO

INTRODUCTIONS AND METHODS: Twenty oat fields were randomly selected at harvest on farms across Ontario to assess fusarium head blight (FHB) levels. Mature oat spikes were hand-harvested and threshed with an Almaco stationary plot thresher (model VPT-OSC). The objective was to determine levels of deoxynivalenol (DON) and *Fusarium*-infected kernels. DON content was assessed on a 20g sub-sample of harvested seed using a quantitative fluorometric test-FluoroQuan (Romer® Labs, Inc, Union MO). To determine the percent seeds infected by *Fusarium,* 60 kernels per field were surface-sterilized in 0.16% NaOCl (diluted commercial bleach) for three minutes, air dried and placed on acidified potato dextrose agar in four replications of 15 seeds per replicate. The kernels and agar plates were then incubated for seven days with a 12:12 hr light/dark photoperiod at room temperature. *Fusarium* species were identified according to Nelson et al. (1983).

RESULTS AND COMMENTS: *Fusarium sporotrichioides, F. graminearum* and *F. poae* were the predominant species identified on oat kernels in 2006 (Table 1). Tamburic-Ilincic and Schaafsma (2006) isolated the same species from oat in Ontario in 2005. The highest level of DON (averaging 0.3 ppm) was found in Middlesex County (Table 1). A similar level of DON was observed in winter wheat in Ontario in 2006.

REFERENCES:
Nelson, P., Toussoun, T. and Marasas, W. 1983. Fusarium Species. An Illustrated Manual for Identification. The Pennsylvania State University Press, University Park. 193 pp.

Tamburic-Ilincic, L. and Schaafsma, A. W. 2006. 2005 survey for fusarium head blight of oat in Ontario. Can. Plant Dis. Surv. 86:72. (http://www.cps-scp.ca/cpds.htm)

Table 1. Means of deoxynivalenol (DON) and percent oat kernels infected with *Fusarium* species in Ontario in 2006.

County	No. of fields	DON (ppm)	% *Fusarium graminearum*	% *Fusarium sporotrichioides*	% *Fusarium poae*
Wellington	4	0.2	1.7	16.2	11.7
Waterloo	4	0.1	0.4	25.0	9.2
Perth	5	0.1	3.7	23.7	13.7
Huron	5	0.1	11.3	18.3	4.7
Middlesex	2	0.3	2.5	13.3	7.5
Mean		**0.2**	**3.9**	**19.3**	**9.4**

CROP / CULTURE: Oat
LOCATION / RÉGION: Eastern Ontario

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
A.G. Xue, Y. Chen and W.K. Yan
Agriculture and Agri-Food Canada, Eastern Cereal and Oilseed Research Centre, K.W. Neatby Building, 960 Carling Avenue, Ottawa ON, K1A 0C6;
Telephone: (613) 759-1513; **Facsimile:** (613) 759-1926; **E-mail:** axue@agr.gc.ca

TITLE / TITRE: FOLIAR DISEASES OF OAT IN EASTERN ONTARIO IN 2006

INTRODUCTION AND METHODS: A survey for diseases of oat was conducted in eastern Ontario in the third week of July when plants were at the late milk to soft dough stage of development. Thirteen fields were chosen at random in regions of eastern Ontario where most of the oat crop 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 levels of infection, respectively.

RESULTS AND COMMENTS: Three leaf diseases were observed in the fields surveyed (Table 1). Crown rust (*Puccinia coronata* f.sp. *avenae*) was the most prevalent disease and was observed in all fields at severities ranging from 2.0-8.3, and with a mean of 4.8. Severe infestations of crown rust were observed in 6 fields. Stagonospora leaf blotch (*Stagonospora avenae* f.sp. *avenaria*) was also observed in all surveyed fields but at a lower average disease severity of 3.6. Severe levels of stagonospora leaf blotch was not observed. Pyrenophora leaf blotch (*Pyrenophora avenae*) was the least important foliar disease in 2006; it was observed in 7 fields at a severity range of 2.4-4.0 with a mean of 2.9 Yield reductions resulting from the three leaf diseases were estimated to average at least 20% in the surveyed fields.

Although there have been no systematic surveys conducted for foliar diseases of oat in eastern Ontario for the past decade, crown rust severity was considered to be greater in 2006 than in previous years. Based on limited field observations, stagonospora leaf blotch likely has been the major disease of oat in eastern Ontario for the past several years.

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

	NO. FIELDS	DISEASE SEVERITY IN AFFECTED FIELDS*	
DISEASE	**AFFECTED (n=13)**	**Mean**	**Range**
Crown rust	13	4.0	2.0-8.3
Pyrenophora leaf blotch	7	2.9	2.0-4.0
Stagonospora leaf blotch	13	3.6	2.7-5.0

*Leaf spot disease severity rated on a scale of 0 (no disease) to 9 (severely diseased).

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

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
M.R. Fernandez[1] and P. G. Pearse[2]
[1] Agriculture and Agri-Food Canada, Semiarid Prairie Agricultural Research Centre, P.O. Box 1030, Swift Current SK, S9H 3X2;
Telephone: (306) 778-7255; **Facsimile:** (306) 778-3188; **E-mail:** fernandezm@agr.gc.ca
[2] Saskatchewan Agriculture and Food, Crop Development Branch, 3085 Albert St., Regina SK, S4S 0B1

TITLE / TITRE: **LEAF SPOTTING DISEASES OF COMMON AND DURUM WHEAT IN SASKATCHEWAN IN 2005 AND 2006**

INTRODUCTION AND METHODS: A survey for leaf spotting diseases of common and durum wheat grown under dryland or irrigation conditions was conducted between the milk and dough growth stages in 2005 and 2006. The total number of crops sampled was 153 in 20 Saskatchewan crop districts (CD) in 2005 (149 common wheat, 4 durum wheat), and 172 in 15 CDs in 2006 (135 common wheat, 37 durum wheat). In each field, 50 flag leaves were collected at random and air-dried at room temperature. Percent leaf area affected by leaf spots (severity) was recorded for each leaf, and a mean percent leaf area with leaf spots was calculated for each crop and for each CD. For crops with over 1% leaf spot severity, surface-disinfested leaf pieces were plated on water agar for identification and quantification of leaf spotting pathogens.

Information on tillage method was obtained for most of the fields in 2006. Comparison of overall and specific fungal disease levels were made among tillage systems (conventional, minimum, and zero) for dryland crops among Soil Zones (SZ) (1: brown, 2: dark brown, and 3: black/grey).

RESULTS AND COMMENTS: Leaf spots were observed in all of the common and durum wheat crops surveyed in 2005 and in 58% of the crops in 2006 (Table 1). Percent flag leaf area infected ranged from 'trace' to 10% in 2005, and 'trace' to 15% in 2006. Overall leaf spot severities were similar to those in 2004 and 2003 (Fernandez and Pearse 2005, 2004) but lower than in 2002 (Fernandez and Pearse 2003). Mean leaf spot ratings were highest in eastern regions (CDs 2A, 5A, 5B, 8A) in 2005, and eastern (CDs 5A, 5B, 8A), central (CDs 2B, 6A, 6B), and north-western (CD 9A) regions in 2006.

The most prevalent leaf spotting pathogen, as reported in previous years, was *Pyrenophora tritici-repentis* (tan spot), both in the number of fields where it was present and in the percent leaf area colonized (Table 1). This was followed by *Septoria nodorum* and *S. tritici* (septoria leaf complex) which were found at higher levels in 2006 than in the previous three years. *Cochliobolus sativus* (spot blotch) was less common in the percentage of fields where it was found and in its isolation frequency. *Septoria avenae* f. sp. *triticea*, one of the most common pathogenic species in previous years, was isolated from only 5% of the leaf samples plated in 2005 and was absent in 2006 (data by CD not presented).

Judged by mean frequency of isolation, levels of *P. tritici-repentis* were lower, and those of *S. nodorum* and *S. tritici* higher, in eastern (1A, 1B, 5A), central (2B, 6B), and western (3BN, 7A) CDs in 2005, and in north-eastern (8A), central (2B, 6B), and western (3BN) CDs in 2006 (Table 1).

In 2005, a *Pseudoseptoria* species was detected in a total of 6 fields in CDs 5B, 6A, 6B, and 9B, but only at low levels (mean percent isolation of <5%).

When crops grown on dryland in 2006 were classified according to tillage method (conventional, minimum and zero) no consistent differences in disease severity were observed (Table 2). The highest mean levels of leaf spotting were observed under zero-till for SZ1, conventional-till for SZ2, and minimum-till for SZ3. The lowest percent isolation of *P. tritici-repentis*, and highest percent isolation of *S. nodorum*, were observed under conventional-till, whereas *C. sativus* was isolated from a smaller proportion of crops grown under reduced than under conventional tillage.

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

REFERENCES:

Fernandez, M.R. and Pearse, P.G. 2005. Leaf spot diseases of wheat and durum wheat in Saskatchewan in 2004. Can. Plant Dis. Surv. 85: 43-44. (http://www.cps-scp.ca/cpds.htm)

Fernandez, M.R. and Pearse, P.G. 2004. Leaf spot diseases of wheat and durum wheat in Saskatchewan in 2003. Can. Plant Dis. Surv. 84: 72-73. (http://www.cps-scp.ca/cpds.htm)

Fernandez, M.R. and Pearse, P.G. 2003. Leaf spot diseases of wheat and durum wheat in Saskatchewan in 2002. Can. Plant Dis. Surv. 83: 71-72. (http://www.cps-scp.ca/cpds.htm)

Table 1. Prevalence and severity of leaf spotting diseases, and estimate of the percent isolation of the most common leaf spotting pathogens, in common and durum wheat crops sampled in Saskatchewan, 2005 and 2006.

Crop District	No. crops affected/ surveyed[1]	Mean severity[2]	*Pyrenophora tritici-repentis*[3]	*Septoria nodorum*	*Septoria tritici*	*Cochliobolus sativus*
		---------- % ----------				
2005						
1A	10/10	2.9	36/9	41/8	11/8	14/7
1B	5/5	2.0	25/4	31/4	34/4	10/4
2A	4/4	6.0	62/4	29/3	8/4	8/4
2B	11/11	1.0	14/1	48/1	22/1	7/1
3AN	1/1	0.5	-	-	-	-
3AS	9/9	0.5	-	-	-	-
3BN	6/6	1.9	42/2	28/2	29/2	3/1
3BS	4/4	0.6	-	-	-	-
4A	3/3	0.5	-	-	-	-
4B	7/7	0.8	-	-	-	-
5A	9/9	4.1	43/7	26/7	24/7	4/7
5B	15/15	5.7	63/13	17/10	18/13	6/10
6A	14/14	2.1	61/7	18/7	15/6	7/5
6B	11/11	3.3	46/9	22/9	29/9	3/7
7A	9/9	0.8	32/1	47/1	16/1	5/1
7B	5/5	1.2	100/1	-	<1/1	-
8A	3/3	7.7	78/3	9/3	12/3	2/1
8B	6/6	3.5	73/4	13/4	10/4	2/4
9A	15/15	3.0	78/10	14/7	12/9	3/6
9B	6/6	3.0	64/5	29/5	8/3	4/2
Mean/total:	**153/153**	**2.6**	**56/80**	**24/71**	**18/75**	**6/60**

Table 1 – cont'd

2006						
1A	8/8	1.5	79/2	12/2	4/2	-
1B	7/7	2.9	65/4	32/4	2/2	5/2
2A	9/9	1.2	98/3	4/1	2/1	-
2B	9/9	5.6	58/7	42/6	1/4	6/6
3AN	-	-	-	-	-	-
3AS	7/7	0.6	-	-	-	-
3BN	8/8	4.1	44/3	22/3	43/2	8/2
3BS	6/6	0.6	-	-	-	-
4A	6/8	0.7	-	-	-	-
4B	9/9	1.6	89/4	7/2	7/4	2/1
5A	7/7	5.1	68/5	21/3	29/3	3/3
5B	12/12	5.1	70/9	16/9	15/7	4/4
6A	19/19	5.8	63/17	29/13	10/9	10/12
6B	12/12	7.3	49/12	21/10	34/11	5/3
7A	15/17	1.7	85/4	7/3	17/2	5/1
7B	-	-	-	-	-	-
8A	6/6	9.0	55/6	32/6	12/6	1/4
8B	8/8	3.0	70/5	10/4	19/5	5/2
9A	10/10	7.8	67/10	15/6	23/10	4/1
9B	10/10	4.2	82/8	9/7	11/7	2/2
Mean/total:	**99/172**	**4.0**	**67/99**	**21/79**	**17/75**	**6/43**

[1] Number of crops with leaf spot lesions on the flag leaf/total number of crops surveyed in that year.
[2] Mean percent flag leaf area infected.
[3] Mean percent isolation of fungal species/number of crops where the species occurred.

Table 2. Incidence and severity of leaf spotting diseases, and mean percent isolation of the most common leaf spotting pathogens, by tillage system within each Soil Zone for common and durum wheat crops sampled in Saskatchewan in 2006.

Soil Zone/ Tillage system	No. crops affected/ surveyed[1]	Mean severity[2]	*Pyrenophora tritici-repentis*[3]	*Septoria nodorum*	*Septoria tritici*	*Cochliobolus sativus*
		%				
Zone 1 (brown)						
Conventional	4/5	0.6	-	-	-	-
Minimum	11/13	0.8	80/1	12/1	6/1	2/1
Zero	23/24	1.7	85/6	11/4	9/4	7/1
Zone 2 (dark brown)						
Conventional	6/6	5.9	61/5	29/4	11/3	10/4
Minimum	18/18	2.2	78/9	17/7	8/6	5/4
Zero	24/24	3.6	76/14	22/8	8/7	14/8
Zone 3 (black/grey)						
Conventional	7/7	3.6	61/4	24/4	17/3	2/3
Minimum	23/23	7.1	72/20	17/15	16/18	3/9
Zero	34/34	5.0	67/27	17/24	20/23	3/7

[1] Number of wheat crops with leaf spot lesions on the flag leaf/total number of crops surveyed.
[2] Mean percent flag leaf area infected.
[3] Mean percent isolation of fungal species/number of crops where the species occurred.

CROP / CULTURE: Common wheat
LOCATION / RÉGION: Saskatchewan

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
M.R. Fernandez[1], P. G. Pearse[2] and G. Holzgang[3]
[1] Agriculture and Agri-Food Canada, Semiarid Prairie Agricultural Research Centre, P.O. Box 1030, Swift Current SK, S9H 3X2;
Telephone: (306) 778-7255; **Facsimile:** (306) 778-3188; **E-mail:** fernandezm@agr.gc.ca
[2] Saskatchewan Agriculture and Food, Crop Development Branch, 3085 Albert St., Regina SK, S4S 0B1
[3] Saskatchewan Agriculture and Food, Crop Protection Laboratory, 346 McDonald St., Regina SK, S4N 6P6

TITLE / TITRE: **LEAF RUST AND STRIPE RUST OF COMMON WHEAT IN SASKATCHEWAN IN 2005 AND 2006**

INTRODUCTION AND METHODS: A survey for leaf rust and stripe rust of common wheat was conducted in 20 Saskatchewan crop districts (CD) in 2005 and 18 CDs in 2006. In each of the fields surveyed (149 in 2005, 135 in 2006), 50 flag leaves were collected at random at the milk to dough growth stage. Percent leaf area affected by each rust was recorded for each leaf, and a mean percent leaf area affected was calculated for each crop and each CD.

RESULTS AND COMMENTS: Leaf rust was found in 54% of the crops surveyed in 2005 and in 29% of crops in 2006 (Table 1); this compares with a prevalence of 35% in 2002, 72% in 2003, and 3% in 2004 (Fernandez and Pearse 2005). The overall mean severity was similar for 2005 and 2006, with severities for individual crops ranging from 'trace' to 10%. The highest mean severities were observed in CDs 1B, 2A (south-east), 3B-N (south-west) and 5A (east-central) in 2005, and in CDs 1A (south-east), 2B (south-central), 5B (east-central), and 6A (central) in 2006.

Stripe rust was not detected in any of the crops surveyed in 2005. In 2006, stripe rust was observed in 13% of the crops surveyed. The mean severity in those crops where it was observed was higher than that for leaf rust (Table 1). The highest mean severities of stripe rust were detected in CDs 2B (south-central) and 9B (north-west).

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

REFERENCE:
Fernandez, M.R. and Pearse, P.G. 2005. Leaf spot diseases of wheat and durum wheat in Saskatchewan in 2004. Can. Plant Dis. Surv. 85: 43-44. (http://www.cps-scp.ca/cpds.htm)

Table 1. Prevalence and severity of leaf rust and stripe rust in common wheat fields sampled in Saskatchewan in 2005 and 2006.

	Leaf rust				Stripe rust	
	2005		2006		2006	
Crop District	No. crops affected/ surveyed[1]	Mean severity in affected fields[2]	No. crops affected/ surveyed	Mean severity in affected fields[2]	No. crops affected/ surveyed	Mean severity in affected fields[2]
1A	5/10	1.6	3/8	4.2	0/8	-
1B	4/5	2.8	4/7	0.9	0/7	-
2A	3/4	2.2	2/4	0.5	0/4	-
2B	4/11	0.8	2/7	7.5	2/7	3.0
3AN	1/1	0.5	-	-	-	-
3AS	6/9	0.8	1/3	0.5	1/3	1.0
3BN	5/6	2.8	2/5	1.0	0/5	-
3BS	3/4	0.5	0/4	-	0/4	-
4A	1/3	0.5	0/5	-	2/5	0.8
4B	1/5	2.0	2/2	0.5	0/2	-
5A	8/9	3.8	3/7	0.8	0/7	-
5B	6/15	1.9	3/11	4.0	1/11	1.0
6A	9/12	1.1	5/16	4.2	0/16	-
6B	7/11	1.0	3/11	1.3	2/11	0.5
7A	3/9	1.2	3/12	0.7	4/12	1.1
7B	4/5	1.0	-	-	-	-
8A	0/3	-	0/6	-	0/6	-
8B	4/6	0.9	1/7	1.0	0/7	-
9A	4/15	0.9	2/10	1.0	1/10	1.0
9B	2/6	0.5	3/10	0.7	1/10	5.0
Mean/total:	**80/149**	**1.6**	**39/135**	**2.2**	**17/135**	**3.1**

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

CROP / CULTURE: Wheat
LOCATION / RÉGION: Saskatchewan

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
P.G. Pearse[1], G. Holzgang[2], C.N. Weitzel[2] and M.R. Fernandez[3]
[1]Saskatchewan Agriculture and Food, Crop Development Branch, 3085 Albert St., Regina SK, S4S 0B1; **Telephone:** (306) 787-4671; **Facsimile:** (306) 787-0428; **E-mail:** ppearse@agr.gov.sk.ca
[2]Saskatchewan Agriculture and Food, Crop Protection Laboratory, 346 MacDonald Street, Regina SK, S4N 6P6
[3]Agriculture and Agri-Food Canada, Semiarid Prairie Agricultural Research Centre, Box 1030, Swift Current SK, S9H 3X2

TITLE / TITRE: FUSARIUM HEAD BLIGHT IN COMMON AND DURUM WHEAT IN SASKATCHEWAN IN 2006, WITH COMMENTS ON IRRIGATED CORN

INTRODUCTION AND METHODS: Fusarium head blight (FHB) incidence and severity were assessed in 171 wheat crops in Saskatchewan in 2006: 134 common wheat (Canada Western Red Spring and Canada Prairie Spring classes) and 37 durum wheat (Canada Western Amber Durum class). Crops were surveyed between July 14 and August 13. 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 referred to as the Irrigation Zone (fields located along the South Saskatchewan River in west-central and central regions of the province). In addition to common and durum wheat samples, 25 corn samples were collected from fields in the Irrigation Zone.

Crop adjustors with Saskatchewan Crop Insurance Corporation 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 spikelets in each spike 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 values 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 and quantification of *Fusarium* species.

RESULTS AND DISCUSSION: The 2006 spring was moist and warm, favouring abundant cereal crop growth and providing suitable conditions for *Fusarium* sporulation on crop residues. However, most regions became dry in July when cereals were flowering; hence the risk of FHB was greatly reduced.

In 2006, FHB occurred in 64% of the common wheat and 49% of the durum wheat crops surveyed (Table 1). The provincial mean FHB severity for both common and durum wheat was 0.2%. These low levels are similar to previous years (2005-2002) (Pearse et al. 2006). In 2006, the highest mean severity for common wheat was in the Irrigation Zone (0.3%) and for durum wheat was in Zone 3 (1.0%). The highest FHB severity was 3.4% and was found in an irrigated crop of Canada Prairie Spring wheat near Lucky Lake. Causal species were *F. avenaceum* and *F. graminearum*.

In 2006 the most commonly isolated *Fusarium* species was *F. poae*, accounting for 49% of all isolations, followed by *F. avenaceum* (22%), *F. sporotrichioides* (15%), and *F. equiseti* (5%). *Fusarium graminearum* was isolated from 3 of the 134 wheat crops surveyed; two of these isolations were from the Irrigation Zone and one was from Zone 3. Although the proportion of *Fusarium* species has varied from year to year, the primary species involved in FHB in Saskatchewan over the past five years have been *F. poae*, *F. avenaceum*, and *F. sporotrichioides* (Pearse et al. 2006).

Other fungi were also observed on wheat spikes collected in 2006; these included *Cochliobolus sativus*, *Claviceps purpurea, Stagonospora nodorum*, *Pyrenophora* spp., and *Ustilago tritici.* In addition, wheat midge damage was also observed on some of the samples.

The inclusion of corn samples was new for the 2006 survey and samples were collected only from irrigated fields. The purpose of including corn was to determine if it was infected by *Fusarium* spp., specifically *F. graminearum*, and thus able to serve as an inoculum source for other cereal crops produced under irrigation. There were 25 corn samples collected, of which 48% were infected by *Fusarium* species, but with a mean FHB severity of only 0.3%. *Fusarium avenaceum* was the most commonly isolated species (19% of samples) and *F. graminearum*, *F. equiseti* and *F. moniliforme* each accounted for 16% of isolations.

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

REFERENCE:
Pearse, P.G., Holzgang, G., Harris, C.L. and Fernandez, M.R. 2006. Fusarium head blight in common and durum wheat in Saskatchewan in 2005. Can. Plant Dis. Surv. 86: 75-76. (http://www.cps-scp.ca/cpds.htm)

Table 1. Prevalence and severity of fusarium head blight (FHB) in common wheat and durum crops grouped by soil or irrigation zones in Saskatchewan, 2006.

Zones	Common Wheat		Durum Wheat	
	No. crops affected / total crops (% of crops infested)	**Mean FHB Severity[1] (range of severity)**	**No. crops affected / total crops (% of crops infested)**	**Mean FHB Severity[1] (range of severity)**
Zone 1 Brown	5 / 21 (24%)	T[2] (0 - 0.1%)	3 / 19 (16%)	T (0 - 0.4%)
Zone 2 Dark Brown	13 / 32 (41%)	0.1% (0 - 2.3%)	11 / 13 (85%)	0.4% (0 - 2.5%)
Zone 3 Black/Grey	56 / 67 (84%)	0.3% (0 - 2.0%)	2 / 2 (100%)	1.0% (0.6 - 1.3%)
Irrigation Zone	12 / 14 (86%)	0.5% (0 - 3.4%)	2 / 3 (67%)	0.4% (0 - 1.1%)
Overall Total/Mean	86 / 134 (64%)	0.2%	18 / 37 (49%)	0.2%

[1] % FHB severity = (% spikes affected x mean proportion (%) of the spike infected) / 100
[2] T = Trace values of FHB (<0.1%).

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
J. Gilbert, A. Tekauz, R. Kaethler, E. Mueller, D. Czarnecki, N. Lewis and A. Maurice
Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg MB, R3T 2M9;
Telephone: (204) 983-0891; **Facsimile:** (204) 983-4604; **E-mail:** jgilbert@agr.gc.ca

TITLE / TITRE: 2006 SURVEY FOR LEAF SPOT DISEASES OF SPRING WHEAT IN MANITOBA

INTRODUCTION AND METHODS: Surveys of 33 southern Manitoba spring wheat fields were conducted between July 21 and July 28 , 2006 to assess the prevalence and severity of foliar diseases. The crops sampled were between heading and soft dough stages of development. Severity of diseases on the flag and the flag $^{-1}$ leaves was recorded as percent leaf area 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 flag leaves was 23%; on lower leaves it was 72%. The season was extremely dry for the most part, providing unfavourable conditions for leaf spot development. *Pyrenophora tritici-repentis* was the predominant pathogen, found in 91% of fields (Table 1) and accounting for 62% of isolations (164 pathogen isolations in total, compared to 957 in 2005) (Gilbert et al. 2006). The relative proportions of isolations of *Septoria tritici* and *Cochliobolus sativus* were similar to those of the last three years, although the percentage of crops affected was about half the 2005 levels. *Stagonospora nodorum* was found at much lower levels than in 2005. Although 49% of crops were affected to some degree, *S. nodorum* accounted for just 17% of isolations (Table1).

Table 1. Prevalence and isolation frequency of leaf spot pathogens in 33 fields of hard red spring wheat in Manitoba in 2006.

	Disease			
	S. nodorum blotch *(Stagonospora nodorum*)	**S. tritici blotch *(Septoria tritici)***	**Spot blotch *(Cochliobolus sativus)***	**Tan spot *(Pyrenophora tritici-repentis*)**
Wheat crops affected (%)	49	27	30	91
Isolations (%)	17	9	13	62

REFERENCE:
Gilbert, J., Tekauz, A., Kaethler, R., Kromer, U., Morgan, K., Mueller, E., Slusarenko, K., Barré, M., Stulzer, M. and Beyene, M. 2006. Survey for leaf spot diseases of spring wheat in Manitoba in 2005. Can. Plant Dis. Survey 86:79-80. (http:www.cps-scp.ca/cpds.htm)

CROP / CULTURE: Spring Wheat
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT :
J. Gilbert, A. Tekauz, R. Kaethler, E. Mueller, M. Stulzer, M. Beyene, D. Czarnecki, N. Lewis, A. Maurice, P. Gozé
Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg MB, R3T 2M9;
Telephone: (204) 983-0891; **Facsimile:** (204) 983-4604; **E-mail:** jgilbert@agr.gc.ca

TITLE / TITRE: SURVEY OF FUSARIUM HEAD BLIGHT OF SPRING WHEAT IN MANITOBA IN 2006

INTRODUCTION AND METHODS: Thirty-two spring wheat fields were surveyed between July 21 and July 28, 2006 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 72-84) for incidence and severity, and additional spikes were collected for subsequent pathogen identification. From each field collection, at least 10 spikes were threshed from which 10 putatively infected kernels were selected. These were surface-sterilized and incubated on potato dextrose agar under continuous cool white light for 4-5 days to isolate and identify *Fusarium* species present. When the *Fusarium* species was unknown, single spores were grown on carrot agar or water agar to facilitate identification. The FHB-index was calculated as follows: Average % incidence X Average % severity /100.

RESULTS AND COMMENTS: The disease was present at trace levels in the majority of fields that were post anthesis (28/32 fields) but at severities that were significantly lower than in 2005. The average FHB-index was 0.3%. The highest FHB-index of 3.4% was found in a field near Brandon MB; the index exceeded 1.0% in only two other spring wheat crops. These low levels can be attributed to the overall hot and dry growing season in 2006. However, although visually the levels of FHB were significantly lower than in previous years, and most kernels appeared healthy, *Fusarium* species were still isolated from 83.4% (267/320) of the kernels examined in 2006. Furthermore, when the kernels remaining from the spikes collected for species identification were ground and analysed for DON content, the mycotoxin levels averaged more than 17 ppm for the 28 fields in which FHB was observed. *Fusarium graminearum* was the predominant pathogenic species isolated; three other species were found at low levels, *F. culmorum* (3.7%), *F. sambucinum* (1.5%) and *F. sporotrichioides* (0.4%) (Table 1).

Table 1. Frequency of *Fusarium* species isolated from kernels of spring wheat in southern Manitoba in 2006.

***Fusarium* spp.**	**No. of isolations (n=320)**	**Percentage**
F. graminearum	252	94.4
F. culmorum	10	3.7
F. sambucinum	4	1.5
F. sporotrichioides	1	0.4

CROP / CULTURE: Winter Wheat
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
A. Tekauz, M. Stulzer, E. Mueller, M. Beyene, and P. Gozé
Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg MB, R3T 2M9;
Telephone: (204) 983-0944; **Facsimile:** (204) 983-4604; **E-mail:** atekauz@agr.gc.ca

TITLE / TITRE: FUSARIUM HEAD BLIGHT IN WINTER WHEAT FARM FIELDS IN MANITOBA IN 2006

INTRODUCTION AND METHODS: The prevalence of fusarium head blight (FHB) in winter wheat in Manitoba in 2006 was assessed by surveying 39 farm fields between July 10 and 12, when most crops were at the soft-dough stage (ZGS 85) of growth (range ZGS 82-87). Because winter wheat is not widely grown in Manitoba (in 2006 it was planted on about 9.5% of the total wheat acreage in the province - Statistics Canada, Field Crop Reporting Series #8, December 2006) the fields were not surveyed at random; rather, information on their location was obtained by contacting Manitoba Agriculture extension personnel and producers who normally grow the crop. The fields surveyed were located in southern Manitoba, in an area bounded by Hwys #16 and 67 to the north, the US border in the south, Hwys #21 and 83 in the west and Hwy #12 to the east. Nineteen of the 22 fields for which information on cultivar was available were planted to cv. 'Falcon'.

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 proportion of the spike affected (severity). Overall disease severity levels were expressed as the 'FHB Index' (% incidence x % spike affected / 100). Several affected heads were collected at each survey 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 (mid-April to early June) 2006 were generally favourable for crop growth, but subsequently, soil moisture levels become depleted, and in general 2006 was regarded to be one of the driest growing seasons on record in southern Manitoba. Despite this, most cereal crops fared well and yield and quality levels were normal to above-normal. However, the lack of moisture was not conducive to the renewed saprophytic growth of overwintered fungal pathogens in straw and stubble, and it is likely that inoculum (conidia) of *Fusarium* spp. was considerably reduced. This, combined with the lack of rain when both winter and spring crops were heading and flowering, appeared to result in low levels of infection and subsequent FHB development.

Visible symptoms of FHB were observed in 30 of the 39 winter wheat fields surveyed. Overall, incidence of FHB was 0.4% (range 0 - 5.0%), spike proportion affected (SPI) 41.0% (range 0 - 85.0%) and the FHB Index 0.3% (range 0 - 4.2%). As such, FHB was estimated to have caused minimal yield losses in commercial winter wheat in 2006. The FHB index was the lowest recorded since surveys for FHB in winter wheat in Manitoba were begun in 1998, and some 50x lower than calculated for 2005 (Tekauz et al. 2006). This demonstrates the importance of timely seasonal moisture in the epidemiology of FHB in western Canada.

Fusarium colonies developed from 69.3% of the kernels plated on potato dextrose agar. The *Fusarium* spp. isolated and their occurrence in fields and on kernels are listed in Table 1. As is found regularly for all wheat types grown in Manitoba, *F. graminearum* was the predominant pathogen. *Fusarium poae* was found in a greater proportion of fields in 2006 than usual (Tekauz et al. 2005, 2004), but its presence on kernels remained low.

REFERENCE:
Tekauz, A., Mueller, E., Beyene, M. and Stulzer, M. 2006. 2005 Survey for fusarium head blight of winter wheat in Manitoba. Can. Plant Dis. Surv. 86: 81-82. (http://www.cps-scp.ca/cpds.htm)

Table 1. *Fusarium* spp. isolated from fusarium head blight-affected kernels of Manitoba winter wheat in 2006.

***Fusarium* spp.**	**Percent of fields**	**Percent of kernels**
F. avenaceum	2.6	0.1
F. culmorum	5.1	1.0
F. graminearum	84.6	97.3
F. poae	18.0	1.0
F. sporotrichioides	5.1	0.6

CROP / CULTURE: Winter wheat
LOCATION / RÉGION: Manitoba

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
A. Tekauz, M. Stulzer, E. Mueller, M. Beyene and P. Gozé
Cereal Research Centre, Agriculture and Agri-Food Canada, 195 Dafoe Road, Winnipeg MB, R3T 2M9;
Telephone: (204) 983-0944; **Facsimile:** (204) 983-4604; **E-mail:** atekauz@agr.gc.ca

TITLE / TITRE: LEAF SPOT DISEASES OF WINTER WHEAT IN MANITOBA IN 2006

INTRODUCTION AND METHODS: Foliar diseases in the Manitoba winter wheat crop were assessed by surveying 39 farm fields from July 10 to 12, when most crops were at the soft dough stage (ZGS 85) of growth (range ZGS 82-87). Winter wheat acreage is increasing but still occupies a relatively small proportion in Manitoba (in 2006 it was planted on about 9.5% of the total wheat acreage - Statistics Canada, Crop Reporting Series #8, December 2006), Therefore, the farm fields were not surveyed at random; rather, information on their location was obtained beforehand from Manitoba Agriculture extension personnel and producers who normally grow the crop. The fields surveyed were located in southern Manitoba, in the area bounded by Hwys #16 and 67 to the north, the US border in the south, Hwys #21 and 83 in the west and Hwy #12 to the east. Disease incidence and severity were recorded by averaging their levels 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 (late April to early June) 2006 were generally favourable for crop growth, but subsequently, soil moisture levels become progressively depleted, and in general, 2006 was regarded as one of the driest growing seasons on record in southern Manitoba. Despite this, most cereal crops fared well and yield and quality levels were normal to above-normal. However, the lack of moisture was not conducive to the renewed saprophytic growth of overwintered fungal pathogens in straw and stubble, and it is probable that inoculum of leaf spotting pathogens was considerably reduced. The low rainfall likely also resulted in fewer opportunities for foliar infection and the subsequent spread of disease(s) to other parts of the crop canopy.

Leaf spots were observed in the upper and/or lower leaf canopies of all winter wheat fields surveyed. Disease levels in the upper canopy were nil, trace or very slight in 33% of fields, slight in 26%, moderate in 15%, severe in 3% and non-estimable because of senescence in 23%. Respective severity categories in the lower canopy were 10%, 10%, 3%, 3% and 74%. Based on disease development in the upper canopy (59% of fields with only trace to slight leaf spotting), foliar diseases of winter wheat in 2006 caused relatively little damage, likely a yield loss of 1-2%. The widespread application of foliar fungicide(s) to winter wheat crops and the low moisture levels in 2006 were likely responsible for the low leaf spot severities observed.

Pyrenophora tritici-repentis (tan spot) was the predominant leaf spot pathogen in 2006, and was found in most winter wheat fields surveyed and estimated to have caused >80% of the foliar damage observed (Table 1). The other three pathogens identified caused relatively little damage to the crop in 2006. This is similar to what has been found in winter wheat in other years and was also the case in spring wheat in 2006 (Gilbert et al. 2007). However, the contribution of *Cochliobolus sativus* (spot blotch) to the total damage can sometimes be considerable, as found in 2002 (Tekauz et al. 2003).

REFERENCES:

Gilbert, J., Tekauz, A., Kaethler, R., Mueller, E., Czarnecki, D., Lewis N. and Maurice, A. 2007. 2006 survey for leaf spot diseases of spring wheat in Manitoba. Can. Plant Dis. Surv. 87: 94. (http://www.cps-scp.ca/cpds.htm)

Tekauz, A., Mueller, E., Beyene, M., Stulzer, M., Schultz, D. and Reverchon, F. 2003. Leaf spot diseases of winter wheat in Manitoba in 2002. Can. Plant Dis. Surv. 83: 73-74. (http://www.cps-scp.ca/cpds.htm)

Table 1. Incidence and isolation frequency of leaf spot pathogens of winter wheat in Manitoba in 2006

Pathogen	Incidence (% of fields)	Frequency (% of isolations)*
Pyrenophora tritici-repentis	87	84.2
Cochliobolus sativus	23	7.9
Stagonospora nodorum	15	5.0
Septoria avenae f.sp. *triticea*	8	2.9

* indicative of the relative foliar damage caused

CROP / CULTURE: Winter Wheat
LOCATION / RÉGION: Southwestern Ontario

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
L. Tamburic-Ilincic and A. W. Schaafsma.
Ridgetown Campus, University of Guelph, Ridgetown ON, N0P 2C0;
Telephone: (519) 674-1557; **Facsimile:** (519) 674-1600; **E-mail:** ltamburi@ridgetownc.uoguelph.ca

TITLE / TITRE: 2006 SURVEY FOR FUSARIUM HEAD BLIGHT OF WINTER WHEAT IN SW ONTARIO

INTRODUCTIONS AND METHODS: Seventy winter wheat fields on farms in SW Ontario were randomly selected at harvest to assess fusarium head blight (FHB) levels. The objective was to determine levels of deoxynivalenol (DON), fusarium damaged kernels (FDK) and *Fusarium*-infected kernels. The DON content was assessed on a 20g sub-sample of harvested seed using a quantitative fluorometric test, FluoroQuan (Romer Labs Inc, Union MO). Fusarium damage was assessed from another 25g sub-sample, by removing and weighing the affected kernels, and calculating the percent FDK. To determine the percent seeds infected by *Fusarium*, 60 kernels were surface-sterilized in 0.16% NaOCl (diluted commercial bleach) for three minutes, air dried, and placed on acidified potato dextrose agar in four replications of 15 seeds per replicate. The kernels and agar plates were then incubated for seven days with a 12:12 hr light:dark photoperiod at room temperature.

RESULTS AND COMMENTS: The highest levels of DON (averaging 0.3 ppm) were found in Essex and Kent Counties, followed by Lambton, Middlesex and Elgin Counties (0.1 ppm) (Table 1). The highest level of FDK was 0.4%, and was found in Kent County, while the lowest (0.1%) occurred in Elgin and Middlesex counties. The highest percentage of *Fusarium*-infected kernels (6.2%) was found in Kent County. This level was similar to that found in winter wheat in SW Ontario in 2005 (Tamburic-Ilincic et al. 2006), but lower than in 2004 when significant losses occurred (Tamburic-Ilincic et al. 2005).

Table 1. Means and ranges of deoxynivalenol (DON), percent fusarium damaged kernels (FDK) and percent *Fusarium*-infected kernels for winter wheat in SW Ontario in 2006.

County	No. of fields	DON (ppm)	DON Range	% FDK Mean	% FDK Range	% *Fusarium* spp. Mean	% *Fusarium* spp. Range
Essex	15	0.3	(0.0-1.9)	0.2	(0.0-1.2)	1.9	(0.0-11.7)
Kent	26	0.3	(0.0-2.1)	0.4	(0.0-4.0)	6.2	(0.0-36.7)
Lambton	16	0.1	(0.0-0.2)	0.2	(0.0-1.0)	2.4	(0.0-8.3)
Elgin	9	0.1	(0.0-0.2)	0.1	(0.0-0.2)	1.3	(0.0-3.3)
Middlesex	4	0.1	(0.0-0.3)	0.1	(0.0-0.3)	2.1	(0.0-5.0)

REFERENCES:
Tamburic-Ilincic, L., Schaafsma, A. W. and Falk, D. E. 2006. 2005 Survey for fusarium head blight of winter wheat in Ontario. Can. Plant Dis. Surv. 86: 87. (http://www.cps-scp.ca/cpds.htm)

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

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

NAMES AND AGENCY / NOMS ET ÉTABLISSEMENT:
A.G. Xue, Y. Chen, and H.D. Voldeng
Agriculture and Agri-Food Canada, Eastern Cereal and Oilseed Research Centre, K.W. Neatby Building, 960 Carling Avenue, Ottawa ON, K1A 0C6;
Telephone: (613) 759-1513; **Facsimile:** (613) 759-1926; **E-mail:** axue@agr.gc.ca

TITLE / TITRE: DISEASES OF SPRING WHEAT IN EASTERN ONTARIO IN 2006

INTRODUCTION AND METHODS: A survey for diseases of spring wheat was conducted in eastern Ontario in the third week of July when plants were at the soft dough stage of development. Twenty-seven 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 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 to be trace, slight, moderate, and severe infections, 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. The FHB index (%incidence x %severity)/100 was determined for each field. Index values of <1, <10, <20, and ≥20 were considered to be slight, moderate, severe, and very severe infections, respectively.

Determination of the causal species of FHB was based on 10 infected heads collected from each field. The heads were air-dried at room temperature, and subsequently threshed. 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 examined microscopically and identified using standard taxonomic keys.

RESULTS AND COMMENTS: Eleven diseases were observed in the 27 fields surveyed (Table 1). Septoria/stagonospora leaf blotch (normally associated with infection by *Septoria tritici* and *Stagonospora* spp.) and tan spot (*Pyrenophora tritici-repentis*) were the most prevalent leaf spot diseases, observed in 27 and 22 fields with mean severities of 4.3 and 2.6, respectively. Severe infections from these diseases were recorded in 6 and 1 fields, respectively. Average yield reductions due to Septoria/stagonospora leaf blotch and tan spot were estimated to be at least 10%.

Stagonospora glume blotch (*Stagonospora nodorum*) and spot blotch (*Cochliobolus sativus*) were observed in 19 and 20 fields, respectively. Although the two diseases were commonly observed, severe levels of infection were not found in the affected fields. Other foliar diseases observed included bacterial leaf blight (*Pseudomonas syringae* pv. *syringae*), leaf rust (*Puccinia triticina*), and powdery mildew (*Erysiphe graminis* f. sp*. tritici*). These diseases were found in 7, 6, and 4 fields, respectively. Except for a severe infection of bacterial leaf blight in one field, all affected fields had only trace to slight severities of these diseases.

Ergot (*Claviceps purpurea*), loose smut (*Ustilago tritici*), and take-all (*Gaeumannomyces graminis* var. *tritici*) were observed in 7, 1, and 19 fields, at mean severities of 0.8, 0.3, and 1.3%, respectively. These diseases did not appear to cause significant damage.

Fusarium head blight was observed in all surveyed fields at a mean incidence of 42.1% and with a range of 18.3-88.3% (Table 1). Infected spikes had a mean severity of 25.6%, with a range of 8.3-41.7%. The FHB index ranged from 1.7-30.7%, with a mean of 11.1%. Severe (index values of 10- 19%) and very severe (index values of ≥20%) FHB levels were observed in 9 and 4 of the affected fields, respectively.

Five *Fusarium* species were isolated from the infected kernels (Table 2). *Fusarium graminearum* was the predominant species, occurring in all fields and on 86.0% of the infected kernels. The other species found were *F. avenaceum, F.equiseti, F. poae*, and *F. sporotrichioides.* These species were isolated from less than 3% of the kernels.

The disease profile and relative prevalence of spring wheat diseases in 2006 were similar to those found in 2005 (Xue et al. 2006). However, severities of diseases were greater in 2006 than in 2005, except for take-all, which was less severe in 2006. Fusarium head blight was observed in all fields surveyed and the average FHB Index of 11.1% was greater than that recorded in 2005 (Xue et al. 2006). Fusarium head blight was the most damaging disease and caused significant yield and quality reductions to Ontario spring wheat in 2006. Compared to 2005, total precipitation was higher and mean temperatures were lower across eastern Ontario in June, but it was warmer and drier in July. The relatively cool and wet conditions in June were likely responsible for the increased severity of foliar diseases and FHB in Ontario spring wheat in 2006.

REFERENCE:

Xue, A.G., Chen, Y. and Voldeng, H.D. 2006. Diseases of spring wheat in eastern Ontario in 2005. Can. Plant Dis. Surv. 86: 83-84. (http:www.cps-scp.ca/cpds.htm)

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

DISEASE	NO. FIELDS AFFECTED (n=27)	DISEASE SEVERITY IN AFFECTED FIELDS*	
		Mean	Range
Bacterial blight	7	4.0	1.0-7.7
Leaf rust	6	2.6	1.7-4.0
Powdery mildew	4	1.7	1.0-2.3
Stagonospora glume blotch	19	2.9	1.0-5.0
Septoria/stagonospora leaf blotch	20	3.0	1.0-5.0
Spot blotch	27	4.3	1.3-8.0
Tan Spot	22	2.6	1.0-7.0
Ergot (%)	7	0.8	0.1-1.3
Loose smut (%)	1	0.3	0.3
Take-all (%)	19	1.3	0.3-3.0
Fusarium head blight	27		
Incidence		41.2	18.3-83.3
Severity		25.6	8.3-41.7
FHB index**		11.1	1.7-31.7

*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

Table 2. Frequency of *Fusarium* species isolated from Fusarium damaged kernels of spring wheat in eastern Ontario in 2006.

***FUSARIUM* SPP.**	**% FIELDS**	**% KERNELS**
F. avenaceum	11.1	1.2
F. equiseti	3.7	0.4
F. graminearum	100.0	86.0
F. poae	7.4	1.2
F. sporotrichioides	14.8	2.3

Forages / Plantes Fourragères

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

NAMES AND AGENCY:
K.A. Bassendowski, B.D. Gossen and J.J. Soroka
Agriculture & Agri-Food Canada, Saskatoon Research Centre,
107 Science Place, Saskatoon, SK S7N 0X2
Telephone: (306) 956-7618; **Facsimile:** (306) 956-7247; **E-mail:** BassendowskiK@agr.gc.ca

TITLE: FOLIAR DISEASE SEVERITY OF ALFALFA IN SASKATCHEWAN, 2006

METHODS: Foliar disease severity (% leaf area affected) was assessed in 34 hay fields of alfalfa (*Medicago sativa*) throughout Saskatchewan from late June to mid July. Plants were collected at several sites along a teardrop-shaped circuit into each field and brought back to the lab for assessment. Disease identification was based on visual symptoms, with occasional isolation (where required) to confirm the identity of the pathogen.

RESULTS AND COMMENTS: In Saskatchewan in 2006, most regions received above normal rainfall in spring, but experienced dry conditions in July and August. Disease levels were low, but generally slightly higher than in 2003-2005 [1, 2, 3]. Spring black stem [*Phoma medicaginis*] was the dominant disease in every region (Table 1) and was present in all 34 fields surveyed. Common leaf spot [*Pseudopeziza medicaginis*] was also observed in all fields sampled, followed by yellow leaf blotch [*Leptotrochila medicaginis*], which occurred in 20 fields. Lepto leaf spot [*Leptosphaerulina trifolii*] was found at trace to low levels in 1/3 of the fields surveyed.

REFERENCES:
1. Gossen, B.D., Soroka, J.J., and Bassendowski, K.A. 2004. Foliar diseases and blossom blight of alfalfa in Saskatchewan, 2003. Can. Plant Dis. Surv. 84: 86-87. (http://www.cps-scp.ca/cpds.htm)

2. Bassendowski, K.A., Soroka, J.J., and Gossen, B.D. 2005. Foliar disease severity of alfalfa in Saskatchewan, 2004. Can. Plant Dis. Surv. 85: 62. (http://www.cps-scp.ca/cpds.htm)

3. Bassendowski, K.A., Gossen, B.D., and Soroka, J.J. 2006. Foliar disease severity of alfalfa in Saskatchewan, 2005. Can. Plant Dis. Surv. 86: 88. (http://www.cps-scp.ca/cpds.htm)

Table 1. Foliar disease severity (range in brackets) in commercial alfalfa fields in Saskatchewan, 2006.

Region & Dominant disease	No. of fields	Leaf area affected (%)	Other diseases [a]
Northeast			
- spring black stem (SBS)	11	3% (1 - 6%)	CLS, LLS, YLB
- common leaf spot (CLS)	5	3% (2 - 5%)	SBS, LLS, YLB
Central			
- common leaf spot	2	4% (2-6%)	SBS, YLB
- spring black stem	1	3%	CLS, LLS, YLB
East-Central			
- spring black stem	2	2%	CLS, YLB, LLS
Southeast			
- spring black stem	8	3% (1 - 5%)	CLS, YLB, LLS
- common leaf spot	1	2%	SBS, YLB
- yellow leaf blotch (YLB)	1	trace	SBS, CLS
Southwest			
- spring black stem	3	1%	CLS, YLB
Total	34		

[a] Occurred at low levels, and listed in order of prevalence. LLS = lepto leaf spot.

Oilseeds and Special Crops / Oléagineux et Cultures Spéciales

CROP: Field bean
LOCATION: Manitoba

NAMES AND AGENCY:
Robert L. Conner[1], Debra L. McLaren, Waldo C. Penner[1] and Daniel J. Hausermann[2]
[1]Agriculture and Agri-Food Canada Research Station, Unit 100-101, Route 100,
Morden, Manitoba, R6M 1Y5;
Telephone: (204) 822-7245; **Facsimile:** (204) 822-7207; **E-mail**: conner@agr.gc.ca
[2]Agriculture and Agri-Food Canada Research Centre, Box 1000 A, RR#3, Brandon, Manitoba R7A 5Y3

TITLE: DISEASES OF FIELD BEAN IN MANITOBA IN 2006

METHODS: Crops of field bean were surveyed for root diseases at 32 different locations and for foliar diseases at 51 locations in Manitoba. During the root disease survey, the severity of halo blight (*Pseudomonas syringae* pv. *phaseolicola*) also was assessed at 25 field locations. The survey for root diseases and halo blight was conducted in the second week of July when plants were at the early stages of pod formation and the survey for foliar diseases from August 15 to August 23 when the plants were at the pod-fill to late 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 suspected 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: Weather conditions during the growing season were generally hot and dry, so not conducive for the development of foliar diseases. Two root diseases were observed (Table 1). Fusarium root rot (*Fusarium solani*) was observed in all the 32 crops surveyed for root disease, making it the most prevalent root disease of dry bean. Rhizoctonia root rot (*Rhizoctonia solani*) was detected in only 11 of the 32 crops surveyed. Halo blight was observed in 7 of the 25 crops, but it was present at only low levels.

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 51 crops surveyed. Anthracnose was not detected in any of the field bean crops. White mould (*Sclerotinia sclerotiorum*) symptoms were detected in 27 crops at low levels of severity. Bean rust (*Uromyces appendiculatus*) was observed in only one crop at a low severity rating, which suggests that it had little effect on yield.

Table 1. Prevalence and severity of root diseases and halo blight in 32 crops of field bean in Manitoba in 2006.

Disease	No. crops affected	Disease Severity	
		Mean[1]	Range
Fusarium root rot[2]	32	3.8	1.3-5.4
Rhizoctonia root rot[2]	11	3.9	2.5-5.4
Pythium root rot	0	0	0
Halo blight[3]	7	1.4	1.0-2.0

[1]Means are based on an average of the crops in which the diseases were observed.
[2]Root diseases were rated on a scale of 0 (no disease) to 9 (death of plant, seedlings did not emerge or died back soon after emergence).
[3]Estimates of halo blight severity were based on the percentage of infected plant tissue observed in 25 dry bean crops.

Table 2. Prevalence and severity of foliar diseases in 51 crops of field bean in Manitoba in 2006.

Disease	No. crops affected	Disease Severity[1]	
		Mean[2]	Range
Common bacterial blight	51	3.8	3-4
Anthracnose	0	0	0
Rust	1	2.0	2.0
White mould	27	3.0	1.0-2.0

[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: Dry Bean
LOCATION: Alberta

NAMES AND AGENCY:
H.C. Huang, R.S. Erickson, H.-H. Mündel, K.H. Rasmussen and C.A. Chelle
Agriculture and Agri-Food Canada, Lethbridge Research Centre, P.O. Box 3000, Lethbridge, Alberta, T1J 4B1;
Telephone: (403) 327-4561; **Facsimile:** (403) 382-3156; **E-mail:**: ericksons@agr.gc.ca

TITLE: DISTRIBUTION OF SEED-BORNE DISEASES OF DRY BEAN IN SOUTHERN ALBERTA IN 2005

METHODS: Seed samples from nine irrigated dry bean crops (8 great northern, 1 pinto) grown in the Bow Island, Alberta region in 2005 were obtained from a seed cleaning plant in Bow Island and examined for the presence of seed-borne pathogens. Each seed sample was sorted into the categories of healthy seeds and diseased seeds caused by *Alternaria* spp., *Curtobacterium flaccumfaciens* pv. *flaccumfaciens* (yellow, orange, or purple variants), *Erwinia rhapontici*, *Rhizoctonia solani* or *Sclerotinia sclerotiorum*. Separation of the seven disease categories depended on seed discoloration and comparison with diseased seed samples collected and tested in previous years. The seeds in each category were weighed to determine their percent weight of the total sample. Identity of the pathogens was confirmed by plating a subsample of 20 seeds from each category onto potato dextrose agar in petri dishes, incubating at room temperature (20±2˚C) for 3 days (bacterial pathogens) or 14 days (fungal pathogens), and examining for presence of the pathogens.

RESULTS: Bacterial wilt of bean caused by *C. flaccumfaciens* pv*. flaccumfaciens* (1), is a new disease of common bean in western Canada (2,5). Two of the three known variants of the pathogen (yellow and orange) were found in all nine samples surveyed while the remaining variant (purple) was found in five samples (Table 1). The frequency of seeds with bacterial wilt ranged from 0 to 25%.

Pink seed, a new disease of common bean caused by *E. rhapontici* (3), was found in four of the nine samples surveyed (Table 1). The frequency of pink seeds was low, ranging from 0 to 0.1%.

Other pathogens found in all nine seed samples of dry bean crops produced in Alberta in 2005 included *Alternaria* spp., *S. sclerotiorum*, and *R. solani*.

DISCUSSION: This survey of seed samples reveals that bacterial wilt of bean is persistent in the bean production regions of southern Alberta. All three variants (yellow, orange, and purple) of *C. flaccumfaciens pv. flaccumfaciens* were found in commercial bean fields in 2005. While yellow and orange variants of the bacterial wilt pathogen were first reported in western Canada in 2002 (2, samples from 2001 crop), the purple variant was reported for the first time in 2006 (5, samples from 2005 crop).

Although pink seed of bean was found only at low levels in four of the nine crops sampled in southern Alberta, the disease has been reported on other pulse crops in western Canada such as chickpea (4), lentil (4), and dry pea (6). The continued presence of the two bacterial pathogens, *C. flaccumfaciens* pv. *flaccumfaciens* and *E. rhapontici*, emphasizes the need for vigilance regarding these pathogens, and for further research on their biology and control in dry bean crops.

REFERENCES:

1. Hall, R. (*Editor*). 1994. Compendium of bean diseases. APS Press: St. Paul, MN.
2. Hsieh, T.F., Huang, H.C., Erickson, R.S., Yanke, L.J., and Mündel, H.-H. 2002. First report of bacterial wilt of common bean caused by *Curtobacterium flaccumfaciens* pv. *flaccumfaciens* in western Canada. Plant Dis. 86: 1275.
3. Huang, H.C., Erickson, R.S., Yanke, L.J., and Mündel, H.-H. 2002. First report of pink seed of common bean caused by *Erwinia rhapontici*. Plant Dis. 86: 921.
4. Huang, H.C., Erickson, R.S.Yanke, L.J., Hsieh, T.F., and Morrall, R.A.A. 2003. First report of pink seed of lentil and chickpea caused by *Erwinia rhapontici* in Canada. Plant Dis. 87: 1398.
5. Huang, H.C., Erickson, R.S., Yanke, L.J., Chelle, C.A., and Mündel, H.-H. 2006. First report of the purple variant of *Curtobacterium flaccumfaciens* pv. *flaccumfaciens*, causal agent of bacterial wilt of common bean, in Canada. Plant Dis. 90: 1262.
6. Huang, H.C., and Phillippe, R.C., 1990. Pink seed of pea: A new disease caused by *Erwinia rhapontici*. Can J. Plant Pathol. 12: 445-448.

Table 1. Seedborne pathogens of dry bean in southern Alberta in 2005.

	Frequency (%, weight basis) of seeds infected by						
	Bacterial diseases				**Fungal diseases**		
Sample	*C. flaccumfaciens* pv. *flaccumfaciens*			*Erwinia rhapontici*	*Alternaria* spp.	*Rhizoctonia solani*	*Sclerotinia sclerotiorum*
	yellow variant	orange variant	purple variant				
1	1.1	8.5	0.2	0.1	0.5	0.3	0.9
2	2.0	0.2	0.1	0.1	1.4	0.6	0.3
3	25.4	0.8	0.0	0.1	5.4	1.4	0.1
4	1.6	0.1	0.1	0.0	2.1	0.7	0.1
5	4.0	0.1	0.0	0.1	1.8	1.4	0.4
6	1.2	0.1	0.1	0.0	9.9	1.0	0.4
7	4.9	3.5	0.0	0.0	1.1	1.1	0.6
8	3.2	0.1	0.0	0.0	1.5	1.6	0.3
9	0.3	2.3	0.1	0.0	1.8	1.2	0.9

CROP: Canola
LOCATION: Alberta

NAMES AND AGENCIES:
S.E. Strelkov[1], V.P. Manolii[1], T. Cao[1], S.F. Hwang[2] and D. Orchard[3]
[1]Department of Agricultural, Food and Nutritional Science, University of Alberta, 410 Agriculture/Forestry Centre, Edmonton, AB T6G 2P5
Telephone: (780) 492-1969; **Facsimile:** (780) 492-4265; **E-mail:** stephen.strelkov@ualberta.ca
[2]Alberta Agriculture, Food and Rural Development, 17507 Fort Road, Edmonton, AB T5Y 6H3
[3]Sturgeon Valley Fertilizer Ltd., P.O. Box 292, Station Main, St. Albert, AB T8N 1N3

TITLE: INCIDENCE OF CLUBROOT ON CANOLA IN ALBERTA IN 2006

METHODS: In August and September 2006, a total of 250 commercial canola (*Brassica napus* L.) fields were surveyed in Sturgeon County (52 fields), Parkland County (63 fields), Strathcona County (24 fields), Flagstaff County (30 fields), Leduc County (46 fields), the County of Wetaskiwin (22 fields), and northeast Edmonton (13 fields), Alberta, for the incidence of clubroot, caused by the obligate parasite *Plasmodiophora brassicae* Woronin. Fields were surveyed after swathing. Since previous surveys indicated that the disease occurred most commonly at field entrances (3, 4), the focus of this year's survey was on the entrance to each field. The roots of all plants within a 1 m^2 area at nine sampling points were inspected for disease development. The sampling points were at the field entrance and 150 and 300 m distant along each of four lines radiating from the entrance. The presence of conspicuous galls on the roots was taken as an indication of clubroot infection. 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. The survey was conducted with a particular emphasis on areas where there had been reports of clubroot or clubroot-like symptoms, although many fields within those areas were randomly selected.

RESULTS AND COMMENTS: A total of 71 clubroot-infested canola fields were identified in 2006. The majority of these fields were located in Sturgeon, Parkland and Leduc counties, although a number of fields were also identified in a rural area of northeast Edmonton, as well as in Strathcona County (Fig. 1). No new cases of the disease were found in Flagstaff County or the County of Wetaskiwin in 2006. However, infected canola volunteer plants were found in a field in the County of Wetaskiwin, which had previously been identified as clubroot-positive (3). The number of infested fields per region surveyed is summarized in Table 1. In most fields, disease distribution was patchy and severity was light to moderate. However, at least 13 fields were heavily infested, including one in which clubroot was so severe that the canola crop was not harvested, and hence a 100% loss occurred.

Prior to 2006, nearly all clubroot-infested canola fields had been identified in Sturgeon County and northeast Edmonton, with only isolated cases reported in Leduc, Strathcona, Wetaskiwin and Flagstaff counties, and none in Parkland County. This year's survey indicates that the disease is more widely distributed, with many infested fields found in Leduc, Strathcona and Parkland counties, in addition to Sturgeon County and Edmonton. Nevertheless, clubroot does not appear to be widespread in Wetaskiwin and Flagstaff counties, and the outbreak remains centered mainly in the Edmonton region. A total of 113 fields are now known to be clubroot-infested, and the longevity of the resting spores of the pathogen (1) suggests that they will remain so for the foreseeable future. Additional surveys are planned for 2007, in central Alberta and other canola growing areas of the province, in order to continue to evaluate pathogen distribution and spread.

ACKNOWLEDGEMENTS: We would like to thank Tara Prefontaine (Sturgeon County), Erin Brock (Parkland County), Chad Jarvis (Cargill) and Emile deMilliano (Agricore United) for their assistance in surveying several fields, and all of the canola growers who allowed us access to their land. 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.

REFERENCES:

1. Karling, J.S. 1968. The Plasmodiophorales. Hafner Publishing Co. New York.

2. Kuginuki, Y., Hiroaki, Y., and Hirai, M. 1999. Variation in virulence of *Plasmodiophora brassicae* in Japan tested with clubroot-resistant cultivars of Chinese cabbage (*Brassica rapa* L. spp. *pekinensis*). Eur. J. Plant Pathol. 105:327-332.

3. Strelkov, S.E., Cao, T., Manolii, V.P., Lange, R.M., Smith-Degenhardt, E., Orchard, D., and Tewari, J.P. 2006. Incidence of clubroot on canola in Alberta in 2005. Can. Plant Dis. Surv. 86:91-93. (http://www.cps-scp.ca/cpds.htm)

4. Strelkov, S.E., Tewari, J.P., Hartman, M., and Orchard, D. 2005. Clubroot on canola in Alberta in 2003 and 2004. Can. Plant Dis. Surv. 85:72-73. (http://www.cps-scp.ca/cpds.htm)

Table 1. Distribution of clubroot-infested canola fields identified in Alberta as of September 2006.

Region	Number of Infested Fields (New Cases, 2006)	Total Number of Infested Fields (2005 + 2006)
Sturgeon County	28	55
Leduc County	21	22
Parkland County	15	15
Northeast Edmonton	4	15
Strathcona County	3	4
County of Wetaskiwin	0	1
Flagstaff County	0	1

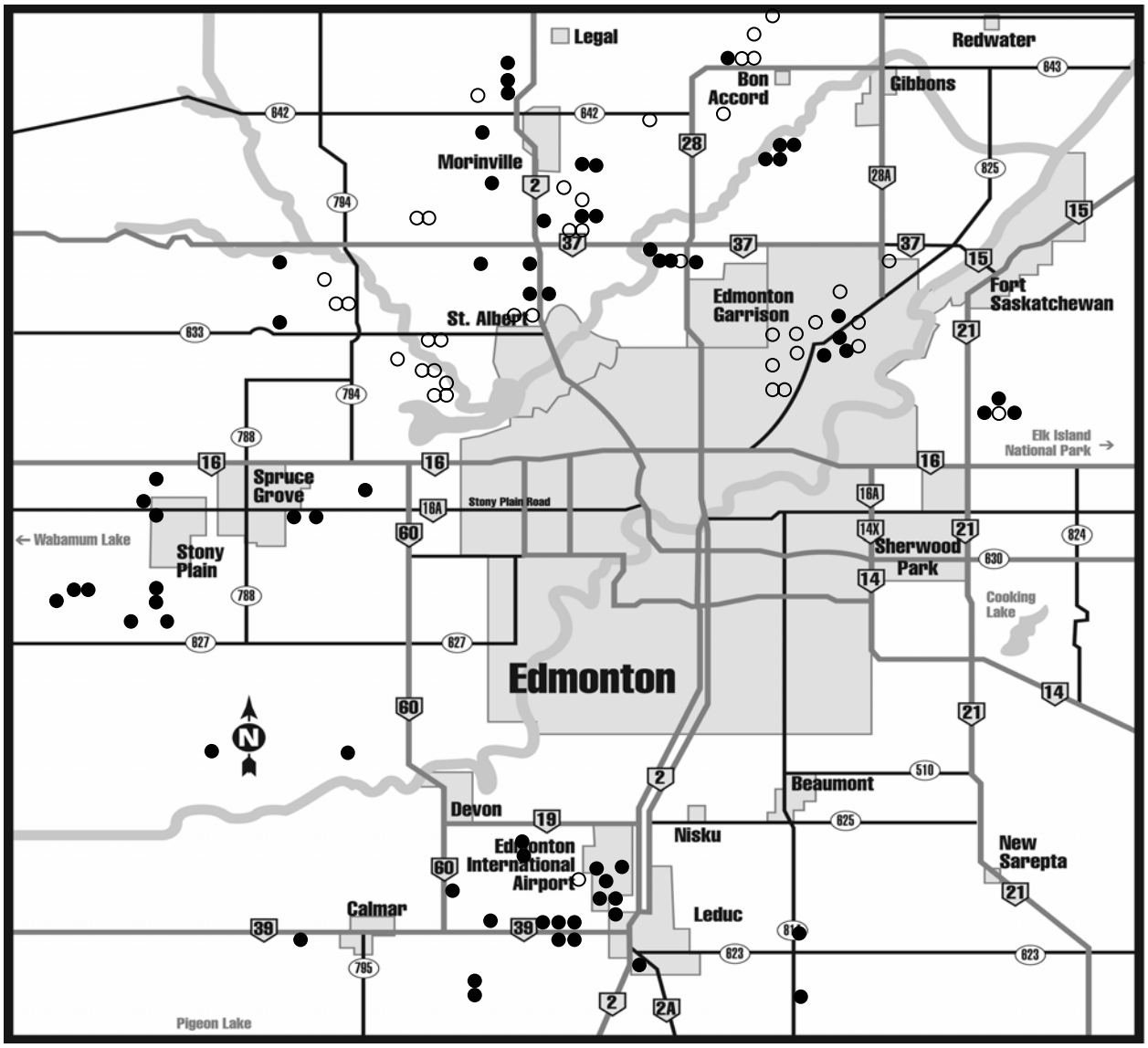

Figure 1. Incidence of clubroot on canola (*Brassica napus* L.) in the Edmonton, Alberta region. Each circle represents the approximate location of an infested canola field. Open circles represent fields identified in 2005, and solid circles represent fields identified in 2006. A total of 111 fields are indicated on the map. Two other infested fields found in Wetaskiwin and Flagstaff counties in 2005 are not shown.

CROP: Canola
LOCATION: Saskatchewan

NAMES AND AGENCIES:
P.G. Pearse[1], K.A. Bassendowski[2], R.K. Gugel[2], C. Kirkham[3] and J.M. Yasinowski[1]
[1] Saskatchewan Agriculture and Food, 3085 Albert St., Regina, Saskatchewan S4S 0B1
Telephone: (306) 787-4671; **Facsimile:** (306) 787-0428; **Email:** ppearse@agr.gov.sk.ca
[2] Agriculture and Agri-Food Canada, 107 Science Place, Saskatoon, Saskatchewan S7N 0X2
[3] Agriculture and Agri-Food Canada, Box 1240, Melfort, Saskatchewan S0E 1A0

TITLE: SURVEY OF CANOLA DISEASES IN SASKATCHEWAN, 2006

METHODS: A total of 101 fields of *Brassica napus* were surveyed between August 9 and 25 in the major canola production regions of Saskatchewan including the north-west (22 fields), north-central (19), north-east (20), east-central (20) and south-east (20). 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: Early spring moisture conditions were generally adequate across most of the province and in excess in the north-east and east-central regions. Favourable growing conditions were seen throughout June with hot drier weather conditions in July, decreasing the risk of canola diseases such as sclerotinia stem rot. The hot dry weather continued into August, advancing crop development and causing drought stress in some areas. As a result, canola crops were harvested ahead of normal. Overall, the 2006 canola crop experienced average yields and slightly above average quality.

Sclerotinia stem rot was observed in 34 of the 101 fields surveyed and incidences ranged from 0 to 16% for main stem lesions and from 0 to 7% for upper branch/pod lesions. Mean total incidence was highest in the north-east region and sclerotinia stem rot was not found in the south-east and east-central regions (Table 1). The overall total incidence for the province in 2006 was similar to that in previous years with low rainfall, including 2005 (3%), 2003-2002 (<1%) and 2001 (1%) (Pearse et al. 2006). In years with more rainfall during the bloom stage, sclerotinia incidence values were higher, including 2004 (13%), 2000 (14%) and 1999 (22%).

Blackleg was observed in 38 of the 101 fields surveyed. Incidences ranged from 0 to 48% for basal stem cankers and from 0 to 100% for lesions occurring elsewhere on the stem. The fields with the highest values had received hail damage. Mean total incidence was highest in the north-central region (Table 1). Overall blackleg incidence values for the province were similar to previous years (Pearse et al. 2006).

Aster yellows was observed in 36 of the 101 fields surveyed, with incidence values ranging from 0 to 1%. Overall aster yellows incidence values for the province have remained less than 1% since 2000. Foot rot was observed in 13 of the 101 fields, with incidence values ranging from 0 to 20%. The overall incidence value for the province in 2006 was less than 1% and was similar to previous years (Pearse et al. 2006). Alternaria pod spot was reported in 94 of the 101 fields surveyed. The highest mean severity was in the

north-central region and all other regions had trace levels (Table 1). No fusarium wilt, staghead, or brown girdling root rot were observed in the surveyed fields

REFERENCES:

Canola Council of Canada. (http://www.canola-council.org/portal.html)

Pearse, P.G., Morrall, R.A.A., Kutcher, H.R., Yasinowski, J.M., Harris, C.L., Gugel, R.K., and Bassendowski, K.A. 2006. Survey of canola diseases in Saskatchewan, 2005. Can. Plant Dis. Surv. 86: 94-95. (http://www.cps-scp.ca/cpds.htm)

Table 1. Canola diseases in Saskatchewan, 2006.

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 (22)	T[4]	2	0	4	T	T	T
North-central (19)	T	T	8	8	T	T	2
North-east (20)	2	1	T	2	T	T	T
East-central (20)	0	0	0	5	T	2	1
South-east (20)	0	0	0	0	T	1	T
Overall Mean (101)	1	T	1	4	T	T	T

[1] The Rural Municipalities (RM) in the major canola production regions where fields were surveyed include:
North-west = RM 344-347, 350, 351, 378, 379, 406, 409, 410, 437, 438, 469, 471, 472, 499, 502
North-central = RM 428-430, 458-461
North-east = RM 426-428, 456, 457, 486, 487
East-central = RM 183-185, 211, 213, 214, 216, 241, 243-245, 248, 276-278, 308
South-east = RM 33-36, 61, 63, 65, 123-126, 153-156

[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

NAMES AND AGENCY:
Debra L. McLaren, Tom L. Henderson, Daniel J. Hausermann and Teri J. Kerley
Agriculture and Agri-Food Canada, P.O. Box 1000A, R.R.#3, Brandon, MB R7A 5Y3
Telephone: (204) 726-7650; **Facsimile:** (204) 728-3858; **E-mail:** dmclaren@agr.gc.ca

TITLE: DISTRIBUTION, PREVALENCE AND INCIDENCE OF CANOLA DISEASES IN MANITOBA (2006)

METHODS: In August 2006, 33 canola crops were surveyed in the southwest (24), northwest (5) and central (4) regions. No crops were surveyed in the eastern/interlake region. All crops were *Brassica napus*. They were assessed for the prevalence (percent crops infested) and incidence (percent plants infected per crop) of sclerotinia stem rot (*Sclerotinia sclerotiorum*), aster yellows (phytoplasma), foot rot (*Fusarium* spp. and *Rhizoctonia* sp.), blackleg (*Leptosphaeria maculans*) and fusarium wilt (*Fusarium* spp.). Blackleg lesions that occurred on the upper portions of the stem were assessed separately from basal stem cankers. The prevalence and percent severity of alternaria pod spot (*Alternaria* spp.) were 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 three regions of Manitoba. Sclerotinia stem rot and blackleg were the most prevalent diseases throughout these regions (Table 1). The prevalence of sclerotinia-infested crops ranged from a high of 50% in the southwest region to 25% in the central region, with a provincial mean of 39%. This was similar to the prevalence of 40% in 2005 (4). Mean disease incidence ranged from 3% in the southwest region to 1% in the central region with a provincial mean of 3.1%. The growing season began with adequate moisture for sclerotium germination, but low soil moisture and high air temperatures during flowering significantly reduced the potential for disease development.

Blackleg basal cankers occurred in 39% of the crops surveyed in 2006 with disease incidence ranging from 7% in the southwest region to 6% in the northwest and central regions, with a provincial mean of 6.7%. In 2005, blackleg basal cankers were found in more crops with a prevalence of 60% (4).

The mean prevalence of blackleg stem lesions was 61%. Prior to 2006, 20%, 41%, 35% and 65% of crops were infested with stem lesions in 2002 (1), 2003 (2), 2004 (3) and 2005 (4), respectively. The mean incidence in 2006 was 5%, which was similar to that observed in 2005.

The severity of alternaria pod spot was low (Table 2) at <1% in the southwest, northwest and central regions. Unfortunately, prevalence data were not available for 2006 but the disease was noted as present at a severity level of <1% in the three regions of Manitoba. The mean severity was lower in 2006 than in 2005 (4).

The prevalence of aster yellows in the crops surveyed in 2006 was 4% in the southwest region. This decreased from a prevalence of 17% in the same region in 2005 (4). The average disease incidence in the southwest region was 1% (Table 1). No aster yellows was found in crops surveyed in the central, and northwest regions. Foot rot was not observed in any of the surveyed crops.

Of the 33 canola crops examined in Manitoba, fusarium wilt was observed in 18%, with a mean incidence of 1.2%. No fusarium wilt was observed in the central and northwest regions (Table 1). This disease was found in 2.3%, 0% and 21% of fields in 2003, 2004 and 2005, respectively.

REFERENCES:

1. McLaren, D.L., Platford, R.G., Lamb, J.L. and Kaminski, D.A. 2003. Canola diseases in Manitoba: Distribution, prevalence and incidence in 2002. Can. Plant Dis.Surv. 83: 96-98. (http://www.cps-scp.ca/cpds.htm)

2. McLaren, D.L., Platford, R.G., Lamb, J.L. and Kaminski, D.A. 2004. Canola diseases in Manitoba: Distribution, prevalence and incidence in 2003. Can. Plant Dis.Surv. 84: 98-99. (http://www.cps-scp.ca/cpds.htm)

3. McLaren, D.L., Graham, A.D., Kaminski, D.A. and Lange, R. 2005. Canola diseases in Manitoba: Distribution, prevalence and incidence in 2004. Can. Plant Dis. Surv. 85: 77-78. (http://www.cps-scp.ca/cpds.htm)

4. McLaren, D.L., Graham, A.D., Kaminski, D.A. and Lange, R. 2006. Canola diseases in Manitoba: Distribution, prevalence and incidence in 2005. Can. Plant Dis. Surv. 86: 96-97. (http://www.cps-scp.ca/cpds.htm)

ACKNOWLEDGEMENTS: We thank the Manitoba Canola Producers for their continued support of our survey work.

Table 1. Number of canola crops surveyed and disease prevalence in Manitoba in 2006.

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	4	25	1	25	6	50	3	n/a	<1	0	0	0	0
Northwest	5	0	0	20	6	20	1	n/a	<1	0	0	0	0
Southwest	24	50	3	46	7	71	6	n/a	<1	4	1	25	1

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

Table 2. Distribution of incidence (sclerotinia, blackleg, aster yellows, and fusarium wilt) classes in 33 crops of *Brassica napus* in Manitoba in 2006.

	Percent crops with				
	Sclerotinia stem rot	Blackleg basal cankers	Blackleg stem lesions	Aster yellows	Fusarium wilt
0	61	61	39	99	82
1-5%	36	30	46	1	18
6-10%	0	6	9	0	0
11-20%	3	0	3	0	0
21-50%	0	0	3	0	0
>50%	0	3	0	0	0

CROP: Chickpea
LOCATION: Saskatchewan

NAMES AND AGENCIES:
R.A.A. Morrall[1], B. Carriere[2], B. Ernst[3], C. Pearse[4], D. Schmeling[5] and L. Thomson[6]
[1] Department of Biology, University of Saskatchewan, 112 Science Place, Saskatoon, SK, S7N 5E2. **Telephone:** 306-966-4410, **Facsimile:** 306-966-4461, **E-mail:** Robin.Morrall@usask.ca
[2] Discovery Seed Labs Ltd., 450 Melville Street, Saskatoon, SK, S7J 4M2
[3] Prairie Diagnostic Seed Lab, 1105 Railway Avenue, Weyburn, SK, S4H 3H5
[4] Discovery Seed Labs Ltd., Box 1180, 700 Railway Avenue, Nipawin, SK, S0E 1E0
[5] Lendon Seeds Ltd., Weyburn Lab., 108 Elgin Mall, 309 1st Avenue N.W., Weyburn, SK, S4H 1T1
[6] Saskatchewan Wheat Pool, Saskatoon Seed Laboratory, 102-407 Downey Road, Saskatoon, SK, S7N 4L8

TITLE: SEED-BORNE PATHOGENS OF CHICKPEA IN SASKATCHEWAN IN 2006

METHODS: The results of agar plate tests conducted by four Saskatchewan companies on seed samples mainly from the 2006 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 desi chickpea samples, kabuli and desi data were combined; over 90% of the samples were kabuli chickpea. For *Ascochyta* mean % seed infection and % samples free of infection were calculated for each crop district [CD] in Saskatchewan (1). Similar values were not calculated for *Botrytis* and *Sclerotinia* because all levels were 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: In Saskatchewan the 2006 growing season was marked by excellent conditions for timely spring seeding and good moisture conditions in most chickpea-growing areas throughout June. In July and August rainfall was generally below normal and high temperatures prevailed, especially in the chickpea-growing areas in central, southern and western areas (CDs 2,3,4,6 and 7A). Harvest started and was completed very early under ideal conditions and the quality of seed was high. However, the overall mean yield per acre of chickpea crops in Saskatchewan was only 89% of that in 2005 and 1% below the 5-year average (4).

Data on seed infection were compiled on samples tested between early September and mid-December 2006. In that period 251 samples were tested by the four companies, 80% more than reported in 2005 (3) and 290% more than in 2004 (2). The increases reflect a tripling in provincial chickpea acreage since 2004 (4) and future market prices for chickpea that are encouraging.

The mean % *Ascochyta* infection for the province was 0.8% (compared with 2.0% in 2005 and 2.6% in 2004). The percentage of samples free of infection was 52%, considerably higher than in 2005 and 2004. High mean levels in some crop districts (Table 1) reflected a small number of samples in CD 7B and a single sample with over 20% infection in CD 3BS and were not representative of the state of harvested seed in general. Overall, about 75% of samples had *Ascochyta* infection levels between 0% and 1% (data not shown). The levels of *Botrytis* and *Sclerotinia* in all crop districts were negligible because of the warm dry weather and very early harvest; these pathogens are most common in years when wet weather delays maturity by promoting late-season growth

REFERENCES:
1. Morrall R.A.A., Carriere B., Cronje. S., Schmeling D. and Thomson L. 2001. Seed-borne pathogens of lentil in Saskatchewan in 2000. Can. Plant Dis. Survey 81: 126-129. (http://www.cps-scp.ca/cpds.htm)

2. Morrall R.A.A., Carriere B., Ernst B., Pearse C. and Schmeling D. 2005. Seed-borne pathogens of chickpea in Saskatchewan in 2004. Can. Plant Dis. Survey 85: 80-81.(http://www.cps-scp.ca/cpds.htm)

3. Morrall R.A.A., Carriere B., Ernst B., Pearse C., Schmeling D. and Thomson L. 2006. Seed-borne pathogens of chickpea in Saskatchewan in 2005. Can. Plant Dis. Survey 85: 100-101. (http://www.cps-scp.ca/cpds.htm)

4. Saskatchewan Agriculture, Food and Rural Revitalization. 2007. 2006 Specialty Crop Report. Regina, SK. 20 p. (http://www.agr.gov.sk.ca/)

Table 1. Number of chickpea seed samples (kabuli and desi combined) tested from September to mid-December, 2006 by four commercial companies, and levels of infection with *Ascochyta* in relation to Saskatchewan Crop Districts.

Crop District	No. of samples tested	Mean % infection	% samples with 0% infection
1A	3	0	100
1B	0	-	-
2A	20	1.2	30
2B	19	1.6	16
3AN	33	0.4	55
3AS	56	0.4	57
3BN	35	0.7	40
3BS	10	2.2	80
4A	7	<0.1	86
4B	1	0.3	0
5A	0	-	-
5B	0	-	-
6A	9	0.5	67
6B	19	0.7	84
7A	37	0.6	57
7B	2	8.3	0
8A	0	-	-
8B	0	-	-
9A	0	-	-
9B	0	-	-
TOTAL	251	0.8	52

CROP: Flax
LOCATION: Manitoba

NAMES AND AGENCIES:
K. Y. Rashid[1], M.L. Desjardins[2], S. Duguid[1] and D. A. Kaminski[3]
[1] Agriculture and Agri-Food Canada, Research Station
Unit 100-101, Route 100, Morden, Manitoba R6M 1Y5.
Telephone: (204) 822-7220; **Facsimile**: (204) 822-7207; **E-mail**: krashid@agr.gc.ca
[2] Manitoba Agriculture, Food and Rural Initiatives, Crop Diagnostic Centre.
201-545 University Crescent, Winnipeg, Manitoba R3T 5S6.
[3] Manitoba Agriculture, Food and Rural Initiatives, Soils and Crops Branch
Box 1149, Carman, Manitoba R0G 0J0.

TITLE: DISEASES OF FLAX IN MANITOBA AND SASKATCHEWAN IN 2006

METHODS: A total of 87 flax crops were surveyed in 2006, 42 in southern Manitoba, 41 in southern and eastern Saskatchewan, and four in southern Alberta. Nine crops were surveyed during the second week of August and 78 in the third week of August. Ninety six percent of the crops were the brown seed-colour linseed flax and only 4% were low linolenic acid or yellow seed-colour solin flax. Crops surveyed were selected at random along pre-planned routes in the major areas of flax production. Each crop was sampled by two persons walking 100 m in opposite directions in the field following an "M" pattern. Diseases were identified by symptoms and the incidence and severity of fusarium wilt (*Fusarium oxysporum lini*), pasmo (*Septoria linicola*), powdery mildew (*Oidium lini*), and rust (*Melampsora lini*) were recorded. Stand establishment, vigour, and maturity were rated on a scale of 1 to 5 (I = very good/early, and 5 = very poor/very late).

In addition, 17 samples of flax plants were submitted for analysis to the Crop Diagnostic Centre of Manitoba Agriculture, Food and Rural Initiatives by agricultural representatives and growers.

RESULTS AND COMMENTS: Eighty three percent of the flax crops surveyed in 2006 were rated excellent for stand and the remaining 17% were good. Ninety four percent of the crops surveyed were maturing early with excellent to good vigour. Only 4% of the crops were late-seeded and were expected to mature and be harvested late, thereby reducing yield and seed quality. The 2006 growing season started early with abundant moisture and good growing conditions for the first part of the season. Dry and above-normal temperature conditions in July, August and September created various stresses on the flax crops in different regions, thus hastening maturity and resulting in low yields in most crops. However such conditions were not favourable for early disease infections or development of pasmo and powdery mildew.

Pasmo, the most prevalent disease in 2006, was observed in 92% of all crops surveyed (Table 1). The prevalence and severity on stems were lower in 2006 than in previous years (1,2,3), due perhaps to the abnormal dry conditions in July and August, which resulted in late infections and slow disease development. In most infested crops, pasmo severity ranged from trace to 5% of the stem area affected, and only in 13% of the crops was pasmo severity 20% or above (Table 1).

Some root infections and fusarium wilt were observed in 85% of flax crops in 2006. The incidence was very low (trace to 1% level) in most crops and only 17% of the crops showed over 5% infected plants (Table 1). The prevalence of root infections and fusarium wilt in 2006 were higher than in previous years, perhaps due to the hot dry conditions in July and August which stressed the crops and were favourable for the pathogens (1,2,3).

Powdery mildew was observed in only three crops in 2006 with a severity range from trace in one crop to 5% leaf area affected in two crops (Table 1). The incidence and severity in 2006 were the lowest since this disease was first observed in western Canada in 1997 (1,2,3,4), due perhaps to the hot dry conditions in July and August which did not favour early onset and disease development.

Rust (*Melampsora lini*) was not observed in any of the 87 crops surveyed in 2006, nor in the rust-differential flax nurseries planted at Morden, Portage la Prairie, Saskatoon, and Indian Head.

No signs of aster yellows (phytoplasma) or stem infection by *Sclerotinia sclerotiorum* were observed in this survey. Trace areas of leaves infected by *Alternaria* spp. were observed in some crops. Lodging was found in only a few crops, and this is the lowest observed in the last 10 years (1,2,3,4). Aphid infestation was also low in several flax crops, and very low grasshopper infestations were observed in a few fields.

Of the 17 flax samples submitted to the Crop Diagnostic Centre, four samples were identified as wilt caused by *F. oxysporum*, one as stem blight caused by *A. linicola*, 11 as chemical injuries, and three as environmental stress.

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

REFERENCES:

1. Rashid, K. Y., Desjardins, M.L., Duguid, S. and Kaminski, D. A. 2006. Diseases of flax in Manitoba and Saskatchewan in 2005. Can. Plant Dis. Surv. 86:102-103 . (http://www.cps-scp.ca/cpds.htm)

2. Rashid, K. Y., Desjardins, M.L., Duguid, S. and Kaminski, D. A. 2005. Diseases of flax in Manitoba and Saskatchewan in 2004. Can. Plant Dis. Surv. 85: 82-83 . (http://www.cps-scp.ca/cpds.htm)

3. Rashid, K. Y., Desjardins, M.L., Duguid, S. and Kaminski, D. A. 2004. Diseases of flax in Manitoba and Saskatchewan in 2003. Can. Plant Dis. Surv. 84:100-101. (http://www.cps-scp.ca/cpds.htm)

4. Rashid, K. Y., Desjardins, M.L., Duguid, S. and Kaminski, D. A. 2003. Diseases of flax in Manitoba and Saskatchewan in 2002. Can. Plant Dis. Surv. 83:117-118. (http://www.cps-scp.ca/cpds.htm)

Table 1. Incidence and severity of fusarium wilt, pasmo, and powdery mildew in 87 crops of flax in Manitoba and Saskatchewan in 2006.

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%	12	14	0%	0%	7	8	0%	0%	84	97
1-5%	1-5%	60	69	1-10%	1-5%	46	53	1-10%	1-5%	1	1
5-20%	5-10%	15	17	10-30%	5-10%	23	26	10-30%	5-10%	2	2
2-40%	10-20%	0	0	30-60%	10-20%	10	12	30-60%	10-20%	0	0
>40%	10-40%	0	0	>60%	20-50%	1	1	>60%	20-50%	0	0

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

CROP: Lentil
LOCATION: Saskatchewan

NAMES AND AGENCIES:
R.A.A. Morrall[1], B. Carriere[2], B. Ernst[3], C. Pearse[4], D. Schmeling[5] and L. Thomson[6]
[1] Department of Biology, University of Saskatchewan, 112 Science Place, Saskatoon, SK, S7N 5E2. **Telephone:** 306-966-4410, **Facsimile:** 306-966-4461, **E-mail:** Robin.Morrall@usask.ca
[2] Discovery Seed Labs Ltd., 450 Melville Street, Saskatoon, SK, S7J 4M2
[3] Prairie Diagnostic Seed Lab, 1105 Railway Avenue, Weyburn, SK, S4H 3H5
[4] Discovery Seed Labs Ltd., Box 1180, 700 Railway Avenue, Nipawin, SK, S0E 1E0
[5] Lendon Seeds Ltd., Weyburn Lab., 108 Elgin Mall, 309 1st Avenue N.W., Weyburn, SK, S4H 1T1
[6] Saskatchewan Wheat Pool, Saskatoon Seed Laboratory, 102-407 Downey Road, Saskatoon, SK, S7N 4L8

TITLE: SEED-BORNE PATHOGENS OF LENTIL IN SASKATCHEWAN IN 2006

METHODS: The results of agar plate tests conducted by four Saskatchewan companies on seed samples mainly from the 2006 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 *Ascochyta* mean % seed infection and % samples free of infection were calculated for the province. For *Colletotrichum* the % samples infected were calculated for the province. However, in contrast with previous years (3,4) mean % infections with *Ascochyta* or *Botrytis* were not calculated for each provincial crop district [CD] (2) because levels of both pathogens were very low and comparisons between CDs would be valueless. As in previous years (3,4,5), levels of seed infection with *Colletotrichum* and *Sclerotinia* were also very low.

The seed samples could not be classified according to cultivar or whether the lentil crop had been treated with registered seed treatments or foliar fungicides. However, the use of ascochyta-resistant cultivars and routine spraying with foliar fungicides to control ascochyta blight and anthracnose are common practices in lentil cultivation in Saskatchewan.

RESULTS AND COMMENTS: In Saskatchewan the 2006 growing season was marked by excellent conditions for timely spring seeding and good or excessive moisture conditions in most areas throughout June. In July and August rainfall was generally below normal and high temperatures prevailed, especially in major lentil-growing areas. As a result harvest started under ideal conditions and was completed very early and the quality of lentil seed harvested was high. The overall mean yield per acre of lentil crops in Saskatchewan was only 84% of that in 2005 but 3% above the 10-year average (6).

Data on seed infection were compiled on samples tested between early September and mid-December 2006. During this time 319 samples were tested by the four companies, only about 70% of the number reported for 2005 and 26% of the number for 2004 (3,4). This low number probably mainly reflects the obvious high quality of lentil seed harvested in 2006, but also the overproduction of lentil and low prices from 2004 to 2006, leading to continued uncertainty among farmers about planting intentions in 2007.

Levels of seed-borne *Ascochyta* in individual samples ranged from 0% to 56.5% (in a sample from CD 2B) with a provincial mean level of 0.5%. The mean was greatly influenced by the sample with 56.5% which, although produced in 2006, came from a crop that suffered from an exceptional July rainstorm and was not sprayed with a fungicide. With this value excluded, the provincial mean was only 0.3%. This value is close to the provincial mean of 0.1% in 2003 (5), also a year with hot dry weather and ideal conditions for early harvest. A more accurate indication of the similarity between *Ascochyta* levels in 2003 and 2006 is probably given by the fact that the % samples testing 0% ascochyta was 91% in 2003 (5) and 88% in 2006.

Mean provincial levels of *Colletotrichum*, *Botrytis* and *Sclerotinia* were all well below 1%. The percentage of samples in which *C. truncatum* was found was 7.5%. This value is the smallest since 2003 (3,4). Anthracnose mainly affects lentil stems and spreads to the upper leaves and pods only when wet weather in late summer prolongs growth and delays harvest. In addition to the seed-borne pathogens which laboratories normally evaluate in lentil, tests in 2006 also commonly revealed a low level of *Stemphylium* sp., the cause of stemphylium blight, and traces of *Fusarium avenaceum,* a cause of seedling blight (1).

REFERENCES:

1. Bailey K.L., Gossen B.D., Gugel R.K. and Morrall R.A.A. (*Editors*) 2003. Diseases of Field Crops in Canada. 3rd ed. Canadian Phytopathological Society, Saskatoon, SK. 290 pp.

2. Morrall R.A.A., Carriere B., Cronje. S., Schmeling D. and Thomson L. 2001. Seed-borne pathogens of lentil in Saskatchewan in 2000. Can. Plant Dis. Survey 81: 126-129. (http://www.cps-scp.ca/cpds.htm)

3. Morrall R.A.A., Carriere B., Ernst B., Pearse C., Schmeling D. and Thomson L. 2005. Seed-borne pathogens of lentil in Saskatchewan in 2004. Can. Plant Dis. Survey 85: 84-86. (http://www.cps-scp.ca/cpds.htm)

4. Morrall R.A.A., Carriere B., Ernst B., Pearse C., Schmeling D. and Thomson L. 2006. Seed-borne pathogens of lentil in Saskatchewan in 2005. Can. Plant Dis. Survey 86: 104-106. (http://www.cps-scp.ca/cpds.htm)

5. Morrall R.A.A., Carriere B., Pearse C., Schmeling D. and Thomson L. 2004. Seed-borne pathogens of chickpea, lentil and pea in Saskatchewan in 2003. Can. Plant Dis. Survey 84: 109-110. (http://www.cps-scp.ca/cpds.htm)

6. Saskatchewan Agriculture, Food and Rural Revitalization. 2007. 2006 Specialty Crop Report. Regina, SK. 20 pp. (http://www.agr.gov.sk.ca/)

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

NAMES AND AGENCIES:
K.F. Chang[1], R. Bowness[1], S.F. Hwang[2], G.D. Turnbull[2], D.J. Bing[3], E. DeMilliano[4] and R.J. Howard[5]
[1]Field Crop Development Centre, Alberta Agriculture, Food & Rural Development (AAFRD), 5030-50 Street, Lacombe, AB T4L 1W8
Telephone: (403) 782-8596; **Facsimile:** (403) 782-6120; **E-mail:** kan.fa.chang@gov.ab.ca
[2]Crop Diversification Centre North, AAFRD, 17507 Fort Road, Edmonton, AB T5Y 6H3
[3]Agriculture, and Agri-Food Canada, 6000 C & E Trail, Lacombe, AB T4L 1W1
[4]Agronomic Products and Services, Agricore United, 2833 Broadmoor Blvd., Sherwood Park, AB T8H 2H3
[5]Crop Diversification Centre South, AAFRD, 301 Horticultural Station Rd. E., Brooks, AB T1R 1E6

TITLE: OCCURRENCE OF PEA DISEASES IN CENTRAL ALBERTA IN 2006

METHODS: Seventy-eight commercial fields of dry pea in central Alberta were sampled in mid-July and mid-August for mycosphaerella blight (*Mycosphaerella pinodes*) and downy mildew (*Peronospora viciae*). The leaves were assessed for severity of the two foliar diseases based on a 0-9 scale (1, 2). Fifty plants were selected at five equally spaced sites along the arms of a "W" sampling pattern in each field. For root rot, plants showing stunting or yellowing symptoms were dug from fields near Fort Saskatchewan, Namao, Vermilion, Mannville and Penhold. Roots were washed and surface sterilized in a 1% NaOCl solution for 2 minutes, rinsed three times in sterile distilled water, and plated onto acidified potato dextrose agar to determine the types of microorganisms present.

RESULTS AND COMMENTS: Mycosphaerella blight was prevalent in all areas of central Alberta with severity ranging from 0 to 3.6 (Table 1). The incidence and severity were lower in 2006 than in 2003 and 2004 (1, 2).

Downy mildew occurred in 34 of the 78 fields surveyed, and showed a low disease incidence and an uneven distribution throughout the fields. In most cases, mycelia formed on the lower leaf surfaces. Many infections occurred on the middle and upper leaves, while milder symptoms appeared on the lower leaves. Crops in fields near Camrose, Ponoka and Namao were heavily infected. The pea cultivars Nitouche, SW Midas, Eiffel and Miami are susceptible to downy mildew. One grower sprayed his pea crops with Headline to control downy mildew.

Root rot was severe near Penhold, Manville and Vermilion despite dry field conditions. In one pea field near Vermilion, a 10-15 acre area showed severe root rot disease. Affected plants were stunted and yellow with short, brown roots that had little or no nodulation. The majority of these diseased plants produced only 1-2 pods each as compared to 7-8 pods on healthy plants. The average yield in the diseased field was 36 bu/ac, 24% lower than in a nearby healthy pea field (47.5 bu/ac). A similar situation occurred in a pea field near Mannville where approximately 5 acres were severely affected by root rot. *Fusarium* spp. were the microorganisms most commonly isolated from diseased roots, although a substantial number of *Rhizoctonia solani* isolates were collected from one field near Namao (Table 2).

In conclusion, mycosphaerella blight and downy mildew were less severe in 2006 than in 2003 and 2004. Severe root rot outbreaks may warrant further investigation.

ACKNOWLEDGEMENTS: This survey was financially supported, in part, by the Alberta Pulse Growers Commission. We gratefully acknowledge the technical assistance of Ms. Trina Dubitz and Ms. Lindsay Benoit, and Mr. Devin Pendree, from Webb's Crop Services Ltd., for providing information on field locations near Vermilion.

REFERENCES:

1. Chang, K.F., Bowness, R., Hwang, S.F., Turnbull, G., Howard, R.J. and Blade, S.F. 2004. The occurrence of field pea diseases in central and southern Alberta in 2003. Can. Plant Dis. Surv. 84: 104-106. (http://www.cps-scp.ca/cpds.htm)

2. Chang, K.F., Bowness, R., Hwang, S.F., Turnbull, G.D., Howard, R.J., Lopetinsky, K., Olson, M. and Bing, D.J. 2005. Pea diseases occurring in central Alberta in 2004. Can. Plant Dis. Surv. 85: 89-90. (http://www.cps-scp.ca/cpds.htm)

Table 1. Incidence and severity of mycosphaerella blight and downy mildew in 78 pea fields from 14 locations in central Alberta in 2006.

Location	No. fields surveyed	Mycosphaerella blight				Downy mildew			
		Incidence (%)		Severity (0-9)		Incidence (%)		Severity (0-9)	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean
Bashaw	6	0-12	6.7	0-0.6	0.3	0-16	5.3	0-0.8	0.3
Camrose	2	16-72	44.0	0.8-3.6	2.2	32-52	42.0	1.6-2.6	2.1
Daysland	10	16-80	44.4	0.8-3.6	2.2	0-40	9.6	0-1.4	0.5
Ft. SK[a]	3	0-24	11.0	0-1.0	0.4	0-10	3.0	0-1.0	0.2
Joffre	4	0-20	6.0	0-1.0	0.3	0	0	0	0
Kelsey	4	4-8	7.0	0.2-0.4	0.4	0	0	0	0
Lacombe	7	0-36	16.0	0-1.8	0.8	0-20	8.6	0-1.0	0.4
Namao	4	0-100	25.0	0-5.0	0.9	0-90	19.3	0-4.0	0.7
New Norway	8	0-28	12.0	0-1.4	0.6	0	0	0	0
Penhold	5	0-12	7.2	0-0.6	0.4	0-8	1.6	0-0.4	0.1
Ponoka	11	44-56	48.0	2.2-2.8	2.4	12-56	34.7	0.6-2.8	1.7
Red Deer	5	0-32	8.8	0-1.6	0.4	0-20	5.6	0-1.0	0.3
Vermilion	5	0-40	11.0	0-3.0	0.7	0-10	8.0	0-1.0	0.7
Wetaskiwin	4	8-36	18.0	0.4-1.8	0.9	0-32	14.0	0-1.6	0.7
Total	78								

[a]Fort Saskatchewan

Table 2. Major microorganisms isolated from root samples from pea fields in central Alberta in 2006.

Field Location	No. roots sampled	Microorganisms isolated from root samples (%)									
		Fusarium spp.	*Rhizoctonia solani*	*Pythium* spp.	*Alternaria* spp.	*Aspergillus* spp.	*Rhizopus* spp.	Bacteria	*Sclerotinia* spp.	*Trichoderma* spp.	Unknown[a]
Ft. SK[b]	24	75.0	0	0	0	4.2	12.5	0	0	0	8.3
Mannville	16	87.5	0	0	0	0	0	0	0	0	12.5
Namao	20	55.0	30.0	5.0	0	5.0	0	5.0	0	0	0
Penhold	36	88.9	2.8	0	19.4	19.4	19.4	16.7	0	0	0
Vermilion	53	62.3	0	0	7.5	0	5.7	0	1.9	7.5	22.6

[a]Isolates did not produce conidia.
[b] Fort Saskatchewan

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

NAMES AND AGENCIES:
H. Wang[1], S.F. Hwang[2], P.R. Watson[1], P.D. Kharbanda[1] and K.F. Chang[3]
[1]Alberta Research Council, Vegreville, Alberta T9C 1T4
Telephone: (780) 632-8610; **Facsimile:** (780) 632-8612; **E-mail:** wangh@arc.ab.ca
[2]Crop Diversification Centre North, Edmonton, Alberta T5Y 6H3
[3]Field Crop Development Centre, Lacombe, Alberta T4L 1W1

TITLE: DISEASE SURVEY OF POWDERY MILDEW ON FIELD PEA IN CENTRAL ALBERTA IN 2006

METHODS: Twenty-two commercial fields of pea were surveyed in early August for powdery mildew (*Erysiphe pisi* L.). The survey was conducted in 12 counties (Co) and one municipal district (MD) in central Alberta, namely Two Hills, Vermilion, Smoky Lake, Lamont, Minburn, Camrose, Wetaskiwin, Lacombe, Red Deer, Ponoka, Sturgeon, Thorhild, and Westlock. Four plants were sampled at each of five random sites in each field, and powdery mildew was assessed according to the severity key developed by Falloon et al. (1995), in which 0 = 0 %, 1 = 1-5 %, 2 = 6-10 %, 3 = 11-15 %, 4 = 16-20 %, 5 = 21-33 %, 6 = 33-45 %, 7 = 46-60 %, 8 = 61-73 %, 9 = 74-86 %, and 10 = 87-100 % of surface area of leaves infected.

RESULTS AND COMMENTS: Powdery mildew was observed in all surveyed fields. Severity scores in the fields (names of the nearest towns are given in parentheses) were as follows: Two Hills Co (Myrnam) 8.4 and 6.3; Vermilion Co (Vermilion) 4.3; Smoky Lake Co (Smoky Lake) 3.0; Lamont Co (Star) 5.6 and (Chipman) 2.7; Minburn Co (Vegreville) 3.4; Camrose Co (Camrose) 1.2 and 1.7; Wetaskiwin Co (Wetaskiwin) 2.3; Lacombe Co (Lacombe) 1.9 and 1.6; Red Deer Co (Red Deer) 2.3 and 1.8; Ponoka Co (Ponoka) 1.2 and 1.0; Sturgeon MD (Morinville) 2.8 and 2.4, (Legal) 2.3; Westlock Co (Westlock) 2.7 and 2.3; Thorhild Co (Thorhild) 3.7. Most fields had relatively low severity scores ranging from 1.0 to 4.3 (equivalent to 5 -22 % of leaves infected). More severe infection was found in only three fields with severity scores ranging from 5.6 - 8.4 (37 - 77 % of surface areas of leaves infected). Powdery mildew development in 2006 was less severe than in previous years (Chang et al., 2005, 2004; Su et al., 2002), largely because of the prolonged hot, dry summer. The cultivars grown in most fields were probably mildew-resistant; however, low levels of infection could still occur in some low-lying areas in the field, especially at the end of growing season when conditions were favourable.

REFERENCES:
Chang, K.F, Bowness, R., Hwang, S.F., Turnbull, G.D., Howard, R.J., and Blade, S.F. 2004. The occurrence of field pea diseases in central and southern Alberta in 2003. Can. Plant Dis. Surv: 84: 104- 106. (http://www.cps-scp.ca/cpds.htm)

Chang, K.F, Bowness, R., Hwang, S.F., Turnbull, G.D., Howard, R.J., Lopetinsky, K. Olson, M., and Bing, D.J. 2005. Pea disease in central Alberta in 2004. Can. Plant Dis. Surv: 85 : 89-90. (http://www.cps-scp.ca/cpds.htm)

Falloon, R.E., Viljanen-Rollinson, S.L.H., Coles, G.D., and Poff, J.D. 1995. Disease severity keys for powdery and downy mildews of pea, and powdery scab of potato. New Zealand J. Crop & Hort. Sci: 23 : 31-37.

Su, H., Hwang, S.F., Turnbull, G.D., Chang, K.F, Howard, R.J., Bjorklund, R., Buss, T., and Blade, S.F. 2002. Survey of powdery mildew and ascochyta blight on field pea in central Alberta in 2001. Can. Plant Dis. Surv: 82 : 112-113. (http://www.cps-scp.ca/cpds.htm)

CROP: Pea
LOCATION: Saskatchewan

NAMES AND AGENCIES:
R.A.A. Morrall[1], B. Carriere[2], B. Ernst[3], C. Pearse[4], D. Schmeling[5] and L. Thomson[6]
[1] Department of Biology, University of Saskatchewan, 112 Science Place, Saskatoon, SK, S7N 5E2. **Telephone:** 306-966-4410, **Facsimile:** 306-966-4461, **E-mail:** Robin.Morrall@usask.ca
[2] Discovery Seed Labs Ltd., 450 Melville Street, Saskatoon, SK, S7J 4M2
[3] Prairie Diagnostic Seed Lab, 1105 Railway Avenue, Weyburn, SK, S4H 3H5
[4] Discovery Seed Labs Ltd., Box 1180, 700 Railway Avenue, Nipawin, SK, S0E 1E0
[5] Lendon Seeds Ltd., Weyburn Lab., 108 Elgin Mall, 309 1st Avenue N.W., Weyburn, SK, S4H 1T1
[6] Saskatchewan Wheat Pool, Saskatoon Seed Laboratory, 102-407 Downey Road, Saskatoon, SK, S7N 4L8

TITLE: SEED-BORNE PATHOGENS OF PEA IN SASKATCHEWAN IN 2006

METHODS: The results of agar plate tests conducted by four Saskatchewan companies on seed samples mainly from the 2006 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 *Ascochyta* mean % seed infection and % samples free of infection were calculated for each crop district [CD] in Saskatchewan (3). However, in contrast to previous years (5) this was not done for *Botrytis*, nor for *Sclerotinia* because infection levels were 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 foliar protectants or seed treatments against one or more seed- or soil-borne diseases. However, use of foliar fungicides on pea in Saskatchewan is uncommon, except in seed crops, because of economic factors.

RESULTS AND COMMENTS: In Saskatchewan the 2006 growing season was marked by excellent conditions for timely spring seeding and good or excessive moisture conditions in most areas throughout June. In July and August rainfall was generally below normal and high temperatures prevailed, especially in central and southern areas. As a result harvest started under ideal conditions and was completed very early and the quality of pea seed harvested was high. The overall mean yield per acre of pea crops in Saskatchewan was 84% of that in 2005 but only 3% below the 10-year average (6).

Data on seed infection were compiled on samples tested between early September and mid-December 2006. By this time 343 samples had been tested by the four companies, similar to the number in 2005 and only about 50% of that reported for 2004 (5,4). The low numbers probably reflect the high production and stocks in recent years, low market prices, uncertainty about planting intentions in 2007, and the obvious high quality of seed harvested in 2006.

Levels of seed-borne ascochyta in individual samples varied from 0% to 24.5% (in a sample from CD 9A) and mean levels for crop districts varied from 0 to 4.7% (Table 1). Some mean ascochyta values for CDs are based on too few samples to be meaningful, but generally levels were lower in the south and central areas (CDs 1-7) and higher in the north (CDs 8-9). This pattern of infection correlated with a trend towards later harvesting in the north and greater exposure of the ripe crops to fall rains, which started in mid-Sepember. The overall provincial mean level of infection of 2.2% was considerably lower than in 2005 (5) and 2004 (4). However, the percentage of samples in which no *Ascochyta* was detected was only 27% in contrast to 17-19% in the two previous years.

For the sixth consecutive year (5) *A. pisi* was more commonly isolated from samples from southern Saskatchewan than from central or northern areas. Overall, *A. pinodes* was by far the dominant species in seed but in some samples *A. pisi* was found more frequently than *A. pinodes*. There appears to be an association between *A. pisi* and specific pea cultivars (1,2).

Botrytis and *Sclerotinia* were detected in a small percentage of pea samples tested and at low levels in all cases. As in previous years, *Botrytis* was not a problem on pea crops in Saskatchewan in 2006. *Sclerotinia sclerotiorum* is not highly internally seed-borne, even in pea crops where stem and pod rot are common and sclerotia contaminate the harvested seed.

REFERENCES:

1. Dokken F.L., Banniza S., Warkentin T. and Morrall R.A.A. 2007. Occurrence of *Ascochyta pisi* on field pea in Saskatchewan. Can. J. Pathol. 29: (Abstr.) (in press).

2. Morrall R.A.A. 2006. Are thresholds of seed-borne inoculum to manage ascochyta diseases worthless? Conf. Handbook,1st Internat. Ascochyta Workshop on Grain Legumes, Le Tronchet, FR, July 2-6, 2006. D-4. (Abstr.) (http://www.grainlegumes.com/maxi_bibli/front_internet_essai/frame_bas.asp?requete_sommaire=350&id_doc=982&requet=)

3. Morrall R.A.A., Carriere B., Cronje. S., Schmeling D. and Thomson L. 2001. Seed-borne pathogens of lentil in Saskatchewan in 2000. Can. Plant Dis. Surv. 81: 126-129. (http://www.cps-scp.ca/cpds.htm)

4. Morrall R.A.A., Carriere B., Ernst B., Pearse C., Schmeling D. and Thomson L. 2005. Seed-borne pathogens of pea in Saskatchewan in 2004. Can. Plant Dis. Survey 85: 91-93. (http://www.cps-scp.ca/cpds.htm)

5. Morrall R.A.A., Carriere B., Ernst B., Pearse C., Schmeling D. and Thomson L. 2006. Seed-borne pathogens of pea in Saskatchewan in 2005. Can. Plant Dis. Survey 86: 109-111. (http://www.cps-scp.ca/cpds.htm)

6. Saskatchewan Agriculture, Food and Rural Revitalization. 2007. 2006 Specialty Crop Report. Regina, SK. 20 pp. (http://www.agr.gov.sk.ca/)

Table 1. Number of pea seed samples tested from September to mid-December, 2006 by four commercial companies, and levels of infection with *Ascochyta* in relation to Saskatchewan Crop Districts.

Crop District	No. of samples tested	Mean % infection	% samples with 0% infection
1A	4	3.4	50
1B	4	1.8	50
2A	8	0.4	63
2B	29	1.3	38
3AN	6	0	100
3AS	28	0.6	50
3BN	14	1.1	21
3BS	5	0.7	60
4A	1	0	100
4B	2	0	100
5A	13	1.1	23
5B	33	1.4	21
6A	27	2.5	11
6B	44	1.9	32
7A	7	0.4	43
7B	11	1.5	18
8A	20	4.0	15
8B	35	3.2	3
9A	28	4.7	14
9B	24	3.9	8
TOTAL	343	2.2	27

CROP: Field pea
LOCATION: Manitoba

NAMES AND AGENCY:
Debra L. McLaren, Daniel J. Hausermann, Tom L. Henderson and Teri J. Kerley
Agriculture and Agri-Food Canada Research Centre, Box 1000 A, RR#3, Brandon, Manitoba R7A 5Y3
Telephone: (204) 578-3561; **Facsimile:** (204) 728-3858; **E-mail:** dmclaren@agr.gc.ca

TITLE: FIELD PEA DISEASES IN MANITOBA IN 2006

METHODS: Field pea crops were surveyed for root and foliar diseases at 39 and 51 different locations in Manitoba, respectively. The survey for root diseases was conducted during the last week of June and the first two weeks of July when most plants were at the early flowering stage. Foliar diseases were assessed in the last two weeks of July when the plants were at the round pod stage. The crops surveyed were randomly chosen from regions in southwest and south-central Manitoba, where field pea is commonly grown. A minimum of thirty plants (10 plants at each of 3 sites) was observed/sampled for each field. 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 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* spp.) was the most prevalent and was observed in 26 fields. Fusarium wilt *(F. oxysporum*) and rhizoctonia root rot (*Rhizoctonia solani*) were observed in 18 and 1 of the fields, respectively. Disease severity means for all root diseases were lower in 2006 than the previous two years (McLaren et al. 2005, 2006). Fusarium root rot is usually most severe when conditions are warm and moist. The 2006 season was warm, but very dry, resulting in reduced severities of many root diseases.

Four foliar diseases were observed (Table 2). Mycosphaerella blight (*Mycosphaerella pinodes*) was the most prevalent and was present in all 51 crops surveyed. Sclerotinia stem rot (*Sclerotinia sclerotiorum*) was detected in 4 fields. Due to the dry, warm conditions that prevailed for most of the 2006 field season, sclerotinia was not commonly observed in pea fields. By contrast in 2004, cool, wet conditions promoted the development of sclerotinia stem rot and it had a detrimental effect on pea yield in many fields (McLaren et al. 2005). In areas where sclerotinia was observed in 2006, plants were very dense or lodged, creating a more favourable microclimate for stem rot to develop. Powdery mildew (*Erysiphe pisi*) was observed in 2 fields, both at low levels (no more than 5% plant tissue infected). Low prevalence of powdery mildew can likely be attributed, in part, to the adoption of new cultivars by growers as all newly registered pea cultivars are required to have resistance to this disease. In addition, seeding was very early in 2006 and early seeding is a recommended control measure for powdery mildew when susceptible cultivars are used. Foliar diseases, such as septoria blotch (*Septoria pisi*), downy mildew (*Peronospora viciae*) and bacterial blight (*Pseudomonas syringae* pv. *pisi*) were not observed in the surveyed fields. Anthracnose (*Colletotrichum pisi*) was observed in three fields (Table 2).

REFERENCES:
McLaren, D.L., Conner, R.L., Hausermann, D.L., and Penner, W.C. 2006. Diseases of field pea in Manitoba in 2005. Can. Plant Dis. Surv. 86:112-113. (http://www.cps-scp.ca/cpds.htm)

McLaren, D.L., Conner, R.L., Hausermann, D.L., and Loutchan, K.D. 2005. Diseases of field pea in Manitoba in 2004. Can. Plant Dis. Surv. 85: 94-95. (http://www.cps-scp.ca/cpds.htm)

Table 1. Prevalence and severity of root diseases in 39 crops of field pea in Manitoba in 2006.

		Disease severity (0-9)*	
Disease	**No. crops affected**	**Mean**	**Range**
Fusarium root rot	26	1.6	0.3-3.3
Fusarium wilt	18	1.7	0.3-2.8
Rhizoctonia root rot	1	2.1	2.1

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

Table 2. Prevalence and severity of foliar diseases in 51 crops of field pea in Manitoba in 2006.

		Disease severity[1]	
Disease	No. crops affected	Mean	Range
Mycosphaerella blight	51	2.2	0.7-5.0
Sclerotinia stem rot	4	0.2	0.2
Powdery mildew	2	2.6	0.3-5.0
Septoria blotch	0	0	0
Anthracnose	3	0.6	0.3-0.7
Downy mildew	0	0	0
Bacterial blight	0	0	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

NAMES AND AGENCIES:
K.Y. Rashid[1], M.L. Desjardins[2] and D.A. Kaminski[3]
[1] Agriculture and Agri-Food Canada, Research Station
Unit 100-101, Route 100, Morden, Manitoba R6M
Telephone: (204) 822-7220; **Facsimile**: (204) 822-7207; **E-mail**: krashid@agr.gc.ca
[2] Manitoba Agriculture, Food and Rural Initiatives, Crop Diagnostic Centre.
201-545 University Crescent, Winnipeg, Manitoba R3T 5S6.
[3] Manitoba Agriculture, Food and Rural Initiatives, Soils and Crops Branch
Box 1149, Carman, Manitoba R0G 0J0

TITLE: DISEASES OF SUNFLOWER IN MANITOBA IN 2006

METHODS: A total of 53 sunflower crops were surveyed in 2005 in Manitoba. Eighty percent were confectionery hybrids and 20% were oilseed hybrids, showing a slight increase of the oilseed acreage over the past few years (1,2). Eight crops were surveyed in the second week of August, 28 crops in the third week of August, and 17 crops in the first week of September. Crops were surveyed along pre-planned routes in the major areas of sunflower production. Each crop was sampled by two persons walking 100 m in opposite directions in the field following an "M" pattern. Diseases were identified by symptoms and the percent incidences of downy mildew (*Plasmopara halstedii*), sclerotinia wilt or head and stem infections (*Sclerotinia sclerotiorum*), rhizopus head rot (*Rhizopus* spp.), and verticillium wilt (*Verticillium dahliae*) were estimated. Disease severity for rust (*Puccinia helianthi*), leaf spots (*Septoria helianthi* and *Alternaria* spp.), powdery mildew (*Erysiphe cichoracearum*) and stem diseases (*Phoma* spp. and *Phomopsis* spp.) were estimated as percent leaf or stem area infected. A disease index was calculated for each disease in every crop based on disease incidence or disease severity (Table 1). Stand establishment, vigour, and maturity were rated on a scale of 1 to 5 (I = very good/early, and 5 = very poor/very late).

In addition, 30 samples of sunflower plants were submitted for analysis to the Crop Diagnostic Centre of Manitoba Agriculture, Food and Rural Initiatives by agricultural representatives and growers.

RESULTS AND COMMENTS: Eighty percent of the sunflower crops surveyed in 2006 had excellent to good stands while the rest had fair to poor stands. Eighty seven percent of the crops were maturing early. Ninety four percent of the crops had good to excellent vigour. Only 12% of the crops were late maturing. The 2006 growing season started early with abundant moisture and good growing conditions, especially in southeastern Manitoba. However these conditions did not favour 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. Trace to 10% infestations with aphids were found in 47% of the crops, and trace to 5% infestation of sunflower beetle (*Zygogramma exclamationis*) were observed in 62% of the crops. However, damage was low in comparison to previous years (1,2,3). Low infestations of grasshoppers were observed in 25% of crops, and traces of stem weevil infestations were observed in a few crops, causing minor damage.

Sclerotinia wilt was present in 72% of crops surveyed, with incidence ranging from trace to 10% (Table 1). Sclerotinia head rot and mid-stem infection, both caused by ascospore infection, were present in 47% of crops surveyed with incidence from trace to 5%. The prevalence and incidence of head rot were the lowest observed in recent years probably due to the hot dry conditions during the growing season (1,2,3).

Rust was the present in 66% of the crops surveyed, with severity ranging from trace to 20% leaf area affected (Table 1). Rust appeared late in the season, and the incidence and severity were lower than in previous years probably due to the hot dry conditions in July-September (1,2,3). Verticillium wilt was present in 87% of the crops surveyed, with incidence ranging from trace to 20% (Table 1). Incidence was higher in 2006 than in previous years, but severity was lower than in 2005 and similar to years previous to that (1,2,3).

Downy mildew was at low prevalence in 2006; it was observed in 42% of crops with incidence from trace to 10% infected plants (Table 1). The prevalence and incidence of downy mildew in 2006 were lower than in previous years (1,2,3) due perhaps to the hot dry conditions in 2006.

Traces to 20% leaf area infected by *Septoria helianthi* and *Alternaria* spp. were observed in 57% of the crops surveyed in 2006 (Table 1). These are normal severity and prevalence values in comparison to previous years (1,2, 3). Stem lesions caused by *Phoma* and *Phomopsis* were present in 26% of the crops with trace to 5% stem area affected. Traces to 5% leaf area affected by powdery mildew were observed in 23% of the crops in south-central Manitoba.

Of the 30 samples submitted to the Crop Diagnostic Centre, three were identified as downy mildew, two as root rot caused by *Fusarium* spp., 23 as chemical injury, and two as environmental stress.

ACKNOWLEDGMENTS: The assistance of T. Walske and M. Penner is gratefully acknowledged.

REFERENCES:

1. Rashid, K. Y., Desjardins, M.L. and Kaminski, D. A. 2006. Diseases of sunflower in Manitoba and Saskatchewan in 2005. Can. Plant Dis. Surv. 86:114-115. (http://www.cps-scp.ca/cpds.htm).

2. Rashid, K. Y., Desjardins, M.L. and Kaminski, D. A. 2005. Diseases of sunflower in Manitoba in 2004. Can. Plant Dis. Surv. 85:96-97. (http://www.cps-scp.ca/cpds.htm).

3. Rashid, K. Y., Desjardins, M.L. and Kaminski, D. A. 2004. Diseases of sunflower in Manitoba in 2003. Can. Plant Dis. Surv. 84:111-112. (http://www.cps-scp.ca/cpds.htm).

4. Rashid, K. Y., Desjardins, M.L. and Kaminski, D. A. 2003. Diseases of sunflower in Manitoba in 2002. Can. Plant Dis. Surv. 83:133-134. (http://www.cps-scp.ca/cpds.htm).

Table 1. Prevalence and intensity of diseases in 53 crops of sunflower in Manitoba in 2006.

Disease	Crops Affected		Disease Index[1]	
	No. of crops	% of crops	Mean	Range
Sclerotinia wilt	38	72%	1.0	T – 2
Sclerotinia head rot/stem rot	25	47%	1.0	T – 1
Verticillium wilt	46	87%	1.1	T – 2
Downy mildew	22	42%	1.0	T – 2
Rust	35	66%	1.1	T – 3
Leaf spots (Septoria & Alternaria)	30	57%	1.0	1 – 2
Lateness[2]	6	12%	1.5	1 – 3
Poor stand	11	20%	1.3	1 – 2
Poor vigour	3	6%	1.5	1 – 3

[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 diseases; 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

CROPS / CULTURES: Cruciferous vegetables
LOCATION / REGION: Central Alberta

NAMES AND AGENCIES / NOMS ET ETABLISSMENTS:
M.W. Harding[1], R.J. Howard[1], S. Xue[2], S.E. Strelkov[2], K.F. Chang[3] and R.C.J. Spencer[4]
[1]Alberta Agriculture, Food and Rural Development, Crop Diversification Centre South, 301 Horticultural Station Road East, Brooks, Alberta T1R 1E6
Telephone: (403) 362-1338; **Facsimile:** (403) 362-1326; **E-mail:** michael.harding@gov.ab.ca
[2]Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, Alberta T6G 2P5
[3]Alberta Agriculture, Food and Rural Development, Field Crop Development Centre, 6000 C&E Trail, Lacombe, Alberta T4L 1W1
[4]Alberta Agriculture, Food and Rural Development, Alberta Ag-Info Centre, Provincial Building, Postal Bag 600, Stettler, Alberta T0C 2L0

TITLE / TITRE: INCIDENCE OF CLUBROOT ON CRUCIFEROUS VEGETABLES IN CENTRAL ALBERTA IN 2006

METHODS: Seven commercial vegetable farms and market gardens near Edmonton, Alberta were surveyed for symptoms of clubroot caused by *Plasmodiophora brassicae* Woronin in August, 2006 (Fig. 1). The seven farms/gardens contained a total of 70 different vegetable plots at 10 different field sites. Three farms (39 plots) were sampled on August 25 and the remaining four gardens (31 plots) were sampled on August 26. Nine types of cruciferous vegetables were examined across the 70 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.]; kohlrabi [*Brassica oleracea* L. var. *gongylodes L.*]; and rutabaga *Brassica rapa* L. var. *napobrassica* (L.) Reichb.]. Conspicuous galls or tumors visible on root tissues were assumed to be positive for the disease. Five random sampling sites were chosen along a diagonal transect within each of the 70 plots. 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. The most commonly encountered crop was cabbage, which was sampled at six of the seven farms/gardens visited. Broccoli, cauliflower and kohlrabi were sampled at five of the seven operations surveyed. Brussels sprouts, kale and rutabaga were found at only one or two of the farms/gardens examined. Clubroot symptoms were observed at only one location (#3) near Leduc, AB. At this site more than 50% yield loss was observed in a plot of cauliflower with a disease incidence of 80%. Approximately 2 acres of infected plants exhibited stunting, wilting and root rot, and many of the heads were small and unmarketable (Figure 2a). Roots were severely infested with *P. brassicae*, and numerous large galls were present (Figure 2b). Over the past three years of surveys of mixed cruciferous vegetables in Alberta, clubroot has been detected six times at three locations (1, 2, S.E. Strelkov, personal communication). Pathotype 5 was found in 2004 in an experimental plot at the Crop Diversification Centre North (CDCN), Edmonton, and again at CDCN in 2005. One root gall on a single plant was detected in a commercial field of cabbage (cv. Brutus) near CDCN in 2005; however, the pathotype was not determined. Clubroot was detected at location #3 in 2004, 2005 and 2006. Pathotype 3 was identified there in 2004, but pathotype analysis was not done in 2005. Pathotyping of clubroot-infested samples from location #3 collected in 2006 is in progress. The absence of disease outbreaks at new vegetable farms over the past three years may indicate that clubroot has not been moving rapidly between fields where cruciferous vegetables are grown. By contrast, clubroot infection has been detected in over 110 canola fields in the Edmonton area since 2003 (3, 4, 6, 7, S.E. Strelkov, personal communication). Pathotype 3 of *P. brassicae* was confirmed in all of these fields, except at CDCN, where pathotype 5 was found in volunteer canola in 2003 (6). The results of clubroot surveys of canola fields in 2006 are presented in a separate report (5).

REFERENCES:

1. Harding, M.W., Howard, R.J., Neeser, C., Strelkov, S.E., Tewari, J.P., Lisowski, S.L.I., Slomp, D.L., Xue, S., and Spencer, R.C.J. 2005. Incidence of clubroot on cruciferous vegetables in Alberta in 2004. Can. Plant Dis. Surv. 85:98-99. (http://www.cps-scp.ca/cpds.htm)
2. Harding, M.W., Howard, R.J., Xue, S., Strelkov, S.E., Chang, K.F., Lisowski, S.L. I., Pugh, S.L., and Spencer, R.C.J. 2006. Incidence of clubroot on cruciferous vegetables in Alberta in 2005. Can. Plant Dis. Surv. 86:116-117. (http://www.cps-scp.ca/cpds.htm)
3. Tewari, J.P., Strelkov, S.E., Orchard, D., Hartman, M., Lange, R.M., and Turkington, T.K. 2005. Identification of clubroot of crucifers on canola (*Brassica napus*) in Alberta. Can. J. Plant Pathol. 27:143-144. (http://pubs.nrc-cnrc.gc.ca/tcjpp/cjplant27-01.html)
4. Strelkov, S.E., Cao, T., Manolii, V.P., Lange, R.M., Smith-Degenhardt, E., Orchard, D., and Tewari, J.P. 2006. Incidence of clubroot on canola in Alberta in 2005. Can. Plant Dis. Surv. 86:91-93. (http://www.cps-scp.ca/cpds.htm)
5. Strelkov, S.E., Manolii, V.P., Cao, T., Hwang, S.F., and Orchard, D. 2007. Incidence of clubroot on canola in Alberta in 2006. Can. Plant Dis. Surv. 87: 109-111. (http://www.cps-scp.ca/cpds.htm)
6. Strelkov, S.E., Tewari, J.P., Hartman, M., and Orchard, D. 2005. Clubroot on canola in Alberta in 2003 and 2004. Can. Plant Dis. Surv. 85:72-73. (http://www.cps-scp.ca/cpds.htm)
7. Strelkov, S.E., Tewari, J.P., and Smith-Degenhardt, E. 2006. Characterization of *Plasmodiophora brassicae* populations from Alberta, Canada. Can. J. Plant Pathol. 28: 467-474. (http://pubs.nrc-cnrc.gc.ca/tcjpp/plant.html)

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

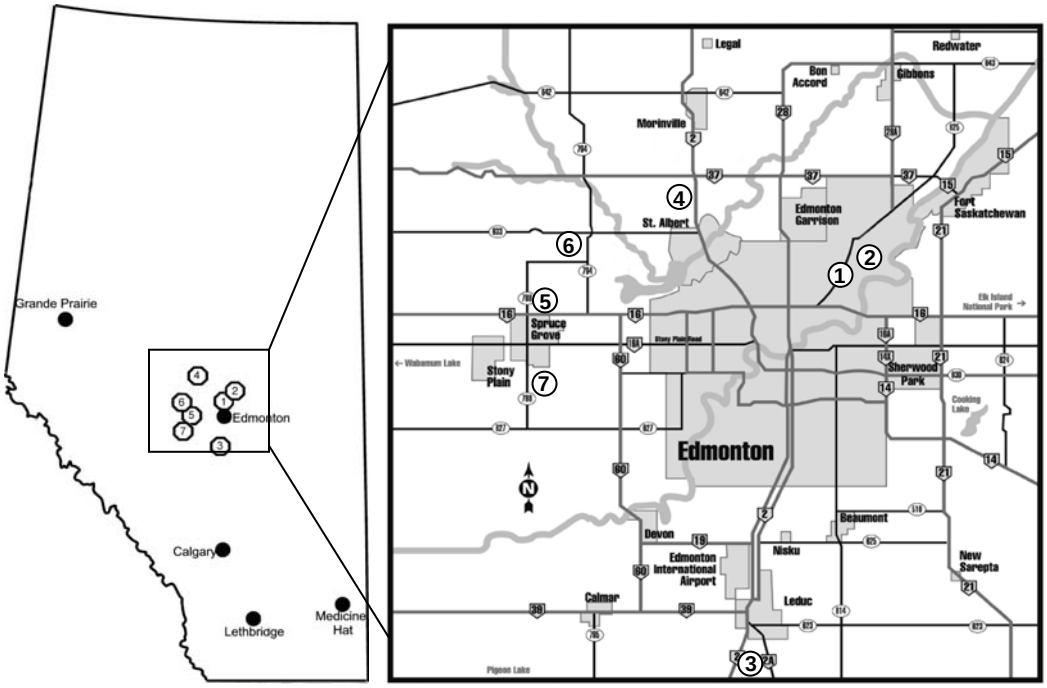

Figure 1. Locations of cruciferous vegetable plantings surveyed for clubroot in central Alberta in 2006.

Figure 2. Symptoms of clubroot on cauliflower. Wilting, yellowing and stunted growth observed above ground (A), and tumors and galls seen on below ground tissues (B).

CROPS / CULTURES: Onion
LOCATION / RÉGION: Manitoba

NAMES AND AGENCIES / NOMS ET ÉTABLISSEMENTS:
P.R. Northover[1], B.G. Elliott[1], and M.L. Desjardins[2]
[1]Manitoba Agriculture, Food and Rural Initiatives, Crops Branch Knowledge Centre
Box 1149, 65-3rd Avenue NE, Carman, Manitoba R0G 0J0
Telephone: (204) 745-5694; **Facsimile:** (204) 745-5690; **E-mail:** pnorthover@gov.mb.ca
[2]Manitoba Agriculture, Food and Rural Initiatives, Crop Diagnostic Centre.
201-545 University Crescent, Winnipeg, Manitoba R3T 5S6.

TITLE /TITRE: INCIDENCE LEVELS OF BOTRYTIS NECK ROT OF ONIONS FROM THE 2005 GROWING SEASON IN MANITOBA

METHODS: Two commercial vegetable farms near Portage la Prairie and Winkler, MB were surveyed for neck rot of onion (*Botrytis allii* Munn) at harvest, subsequent to topping, from September 15th to October 1st 2005, and again after approximately four months of storage (January 15th to January 18th 2006). At harvest, 1100 onion bulbs from each of five fields, each with a different cultivar, were collected at random. The yellow cultivars 'Eagle','W-10', 'Tamara', and 'Varsity' were collected from the farm at Winkler, the cultivar 'Cooker' from the farm near Portage la Prairie. Prior to placement into storage, the sample of 1100 onions of each cultivar was divided in two; 550 were put in mesh onion bags and placed into storage, the remaining 550 were tested for the presence of *B. allii*. Using sterilized apple corers, cylindrical cores approximately 3 cm in length X 1.5 cm in diameter were taken from the top (neck) to the centre of the onion bulb. Individual cores were placed into a sealed shallow plastic container (16 cores per container) with a moistened paper towel and incubated at room temperature (22°±1°C) for seven days. After incubation, the cores were examined for the presence of mycelium and conidiophores using a dissecting microscope. Portions of cores with conidiophores resembling typical *Botrytis* morphology were placed onto three types of solid media, potato dextrose agar, onion leaf agar, and pectin agar. Based on colony appearance on these media, *B.allii* could be differentiated from other species of *Botrytis* (1). The percent incidence of onions with *B.allii* present was recorded. In mid-January of 2006, the second set of onions held in storage for approximately four months were removed from storage. Each bulb was cut longitudinally, and examined for visual symptoms of neck rot (discoloured, water soaked tissue and the presence of sclerotia at the neck). The incidence of neck rot symptoms was then recorded.

RESULTS AND COMMENTS: Levels of neck rot were very high in three of the five cultivars examined after storage (Table 1) and were higher than the levels detected at harvest. The three cultivars with a disease incidence of 38% or higher represent a significant loss in terms of crop yield, cost of storage, and disposal costs. It is still unclear when conidia are first present in Manitoba onion fields and are able to infect the developing bulb. The 2005 crop year was unseasonably wet and cool through April and July, which greatly impacted crop development, and may have increased the likelihood of bulb infection. Moist periods near harvest time in September lengthened the normal drying time of the onions in the field, which may have at least partly attributed to the high levels observed in 2005.

ACKNOWLEDGEMENTS: The authors would like to express their appreciation to the three growers who provided us with the opportunity to survey their onion storages. The Vegetable Growers Association of Manitoba and the Covering New Ground Sustainable Agriculture Funding Initiative of Manitoba Agriculture, Food, & Rural Initiatives are also recognized for their generous financial support of this project.

REFERENCE:
1. Chilvers, M.I. 2003. Epidemiology of *Botrytis* spp. associated with neck rot of onion (*Allium cepa* L.) in northern Tasmania, Australia. Ph.D Thesis. University of Tasmania, Burnie, Australia. 374pp.

Table 1. Incidence of *Botrytis allii* infection of onion bulbs at time of harvest, and incidence of symptoms expressed after almost four months of storage*.

Onion cultivar	% Incidence of *B.allii* at harvest	% Incidence of neck rot after 4 months in storage
Cooker	0	0.9
Eagle	0.5	85.0
W-10	2.2	76.0
Tamara	0	3.6
Varsity	10.4	38.0

* n=550 onions for all onions collected at harvest and at storage with the exception of 'Eagle' after harvest when n=470

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

CROP / CULTURE: Grape
LOCATION /RÉGION: British Columbia

NAMES AND AGENCY / NOMS ET ORGANISME:
P. Sholberg and P. Haag
Agriculture and Agri-Food Canada, Pacific Agri-Food Research Centre, Summerland, B.C., V0H 1Z0
Telephone: (250) 494-6383; **Facsimile:** (250) 494-0755; **E-mail:** SholbergP@agr.gc.ca

TITLE / TITRE: GRAPE ROOT ROT DISEASE FOUND IN TWO OKANAGAN VINEYARDS

INTRODUCTION: The causal agent of grape root rot, *Roesleria subterranea* (Weinmann) Redhead was first reported by H. Toms on roots of commercial grapes from the Okanagan Valley of British Columbia in 1971 (Redhead, 1984). *Roesleria subterranea* is a fungus that grows best at 10-12°C and is distinguished from other fungi in the family Caliciaceae by its nonlichenized habit and production of septate spores. It is considered an opportunistic saprophyte that colonizes injured or dead roots and may grow from these into healthy, living root tissue (Gärtel, 1988). Symptoms of grape root rot are most conspicuous in the summer time. Distinguishing characteristics of the fungus and disease are distinctive fruiting bodies that look like miniature mushrooms, a brilliant green colour on potato dextrose agar, and the presence of reduced vigour and chlorotic leaves on declining vines (Liberato and Sholberg, 2006).

METHODS: Vines displaying symptoms of decline were sampled in 1999 at a vineyard in the North Okanagan Valley near Kelowna, BC and again in 2005 from a vineyard in the Central Okanagan Valley near Okanagan Falls, BC. The plants were *Vitis vinifera* cultivars possibly 'Chardonnay'. Roots were dug up and brought to the Pacific Agri-Food Research Centre (PARC) for examination and isolation. Necrotic tissues from root samples were surface-sterilized in 0.05% NaOCl for 2 min, rinsed with sterile water and allowed to dry. Pieces of tissue approximately 2 x 2 x 2 mm were plated on potato dextrose agar (PDA) and incubated at 20°C for 14-21 days. Single spore cultures were used for identification of the fungus.

RESULTS: Distinctive fruiting bodies similar to those described by Redhead (1984) were observed and photographed from the *Vitis vinifera* roots collected in 1999. A photograph of the fruiting bodies has been published by the British Columbia Ministry of Agriculture and Land and is available online at http://www.agf.gov.bc.ca/cropprot/grapeipm/rootrot.htm. The fungus that was isolated from infected tissue in 1999 and 2005 produced brilliant green cultures on PDA. In both years single spore isolates from these cultures were identified by Dr. J. H. Ginns, Biosystematics Research Centre, Ottawa, Ontario as *R. subterranea* (Weinmann) Redhead. The culture that was collected in 1999 was deposited in the Canadian Culture Collection in Ottawa and has the accession number DAOM 226683.

DISCUSSION: Grape root rot is rarely found in BC based on our observations over the past 10 years. When it was first observed in 1999 we conducted limited surveys of vineyards in the Okanagan Valley for vines with decline symptoms but did not come across it again until 2005. The disease could be confused with some other root diseases that are known to occur in Okanagan vineyards. Utkhede and Vielvoye (1984) identified a decline of grape vines in BC caused by *Pythium ultimum* that was pathogenic on 'Okanagan Riesling' grape. This pathogen caused a general decline like *R. subterreanea* but appears to be restricted to the 'Okanagan Riesling' cultivar. Since *V. vinifera* has been planted in BC and 'Okanagan Riesling' removed, pythium grape decline has not been reported. It is also possible that grape root rot could be confused with damage caused by nematodes. The original sample collected in 1999 was by Dr. Tom Forge, PARC, Agassiz, BC who found it during a survey for nematodes in recently planted grape vineyards. Studies on pathogenicity of *R. subterreanea* on common vinifera cultivars have not been pursued because of the limited distribution and commercial importance of the disease. Grape plants could be predisposed to root rot by nematode damage and/or weak older vines, so the disease may become a bigger problem in the future. Wet soil, the condition that predisposes plants to the disease in Europe, is not common in the Okanagan Valley.

REFERENCES

Gärtel, W. 1988. Grape root rot. *In*: Compendium of Grape Diseases. *Edited by* R. C. Pearson and A. C. Goheen. APS Press, St. Paul, Minn. pp. 40-41.

Liverato, J.R. and Sholberg, P. 2006. Grape root rot (*Roesleria subterranean*) Pest and Diseases Image Library. Available online: http://www.padil.gov.au.

Redhead, S.A. 1984. *Roeslerina* gen. nov. (Caliciales, Caliciaceae), an ally of *Roesleria* and *Coniocybe*. Can. J. Bot. 62: 2514-2519.

Utkhede, R.S., and Vielvoye, J. 1984. Cause and control of decline of grapevines in British Columbia. Plant Dis. 68: 820-822.

Forest Trees / Arbres Forestiers

CROP: Elm
LOCATION: Alberta

NAMES AND AGENCIES:
S.E. Strelkov[1], S. Brezden[1], V.P. Manolii[1], C. Saunders[2] and J. Feddes Calpas[3]
Telephone: (780) 492-1969; **Facsimile:** (780) 492-4265; **E-mail:** stephen.strelkov@ualberta.ca
[1]Department of Agricultural, Food and Nutritional Science, University of Alberta, 410 Agriculture/Forestry Centre, Edmonton, AB T6G 2P5
[2]City of Edmonton Parks Branch, 3rd Floor Century Place, 9803-102A Ave, Edmonton, AB T5J 3A3
[3]DED Provincial Program Coordinator, Box 18, Site 12, R.R. #4, Ponoka, AB T4J 1R4

TITLE: INCIDENCE OF ELM WILT PATHOGENS IN ALBERTA IN 2006

METHODS: Annual surveys to detect symptoms of Dutch elm disease (DED) are conducted throughout Edmonton by members of the City of Edmonton Pest Management Lab, as well as by communities throughout Alberta. In 2006, samples of elm shoots with wilted or discolored leaves (which may be caused by a number of fungi) were sent to the University of Alberta Plant Pathology Lab for identification. The three most diseased twigs (based on degree of vascular staining) received from an individual tree were selected for further processing. Three 1 cm^3 pieces were cut from each twig (generating 9 test pieces per tree), surface sterilized, and plated onto potato dextrose agar (PDA) containing streptomycin sulfate (0.2 g/L), at a density of three pieces per petri dish. The samples were incubated at room temperature in darkness for 3 weeks, and then examined microscopically to confirm identification.

RESULTS AND COMMENTS: A total of 64 samples, each representing one elm tree, were received by the Plant Pathology Lab. Fifty-one samples came from Edmonton, 6 from Red Deer, 4 from Stettler, and 1 each from Calgary, High River and Medicine Hat. One or more fungal species were isolated from 62 of the samples received, while no growth was obtained from the remaining two. *Ophiostoma* was not present in any of the samples tested. The large majority of trees from Edmonton (92%) were infected with *Dothiorella ulmi*. In the provincial samples, *Nectria* and *Cladosporium* were most commonly found, while *D. ulmi* was absent. The fungi isolated from the Edmonton and provincial samples are summarized in Tables 1 and 2, respectively.

Based on the samples tested by the Plant Pathology Lab, Alberta appeared to be DED-free in 2006. *Dothiorella ulmi*, cause of dothiorella wilt, was the predominant elm pathogen in Edmonton. The disease is less destructive than DED, causing a die-back of shoots and branches instead of killing the trees outright. Nevertheless, as of 2004, 119 mature elms had been removed by the City of Edmonton because of progressive die-back from infection (1). It is not clear why *D. ulmi* was so prevalent in Edmonton, yet was not found in any samples from outside the city. This was also observed in previous years (J.P. Tewari, personal communication), and is perhaps related to the fact that boulevard elms in the city may be predisposed to infection by stress. Isolates of the second most common fungal genus in the Edmonton samples, *Cytospora*, were always found in association with *D. ulmi*, which seems to support previous suggestions that this fungus is a colonizer of recently killed stem tissue rather than the primary cause of death (2). Similarly, *Nectria*, which was one of the most frequent fungi in the provincial samples, has been described as a secondary pathogen of dead or dying tissue (2). Most other fungi identified were also secondary invaders or incidentals. The inclusion of an antibiotic in the PDA precluded the detection of bacterial pathogens.

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

REFERENCES:

1. Saunders, C., Wartenbe, M.D., and Barr, W.B. 2004. Drought stress problems in Edmonton's forest. Proceedings of the 6th Canadian Urban Forest Conference, Oct. 19-23, Kelowna, B.C. Available from http://www.treecanada.ca/cufc6/ [accessed 20 November 2006].

2. Hiratsuka, Y. 1987. Forest tree diseases of the prairie provinces. Can. For. Serv., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-286.

Table 1. Fungi isolated from elm samples from Edmonton, Alberta.

FUNGUS	NUMBER OF TREES INFECTED*
Dothiorella ulmi	47
Cytospora spp.	6
Cladosporium spp.	5
Coniothyrium spp.	2
Chaetophoma spp	2
Fusarium spp.	2
Trichoderma spp.	2

*51 samples, each representing one elm tree, were received. Some trees had multiple infections.

Table 2. Fungi isolated from elm samples received from Red Deer, Stettler, Calgary, High River and Medicine Hat, Alberta.

FUNGUS	NUMBER OF TREES INFECTED*
Nectria spp.	3
Cladosporium spp.	3
Moniales spp	2
Alternaria alternata, Chaetophoma, Chaetomium, Cytospora, Botrydiplodia, Botrytis, Asteromella & an unidentified pycnidial fungus	1 of each

*13 samples, each representing one elm tree, were received. Some trees had multiple infections.

LIST OF CPDS AUTHORS IN ALPHABETICAL ORDER

LIST OF FIGURES