2005 WERA 97 Meeting
Lethbridge, Alberta Canada

This years meeting was hosted by Dr. Denis Gaudet of Agriculture and Agri-Foods Canada. After a welcome by Dr. Zahir Mir, director of the Lethbridge station, four key note presentations related to Canadian agricultural problems were presented by AAFC staff members.

Dr. Hector Carcamo – AAFC Lethbridge

Wheatstem Sawfly – a reemergence of an old problem ---- Why?

a: Drought disrupts the reproductive cycle of the parasitoid.
b: No-till agronomic practices may increase the overwintering success.

The larvae of this insect (*Cephus Cinctus) "*mine" inside the inside of the stem removing plant tissue for nutrition. At the end of the growing season, the larvae moves to just above the crown, where it cuts the stem and forms a plug to protect itself while over-wintering. There is some question on whether the insect is native to North America or was introduced. Most likely, it is native on wild grasses. In Canada, the adults are active from mid-June to mid-July. After laying eggs, larvae develop and feed from mid-July thru August. Stem cutting occurs at ~50% kernel moisture while the stem is still green – usually around mid-August. The larvae over-winters in dry stem tissue until May, when the pupae emerge as adults. The larvae spend 97% of their life cycle in the stem.

The insect causes yield damage by reducing seed set, as well as reduced seed quality. Yield losses from cutting and boring can be 25% or more. In Canada, annual yield losses are estimated to be in the range of 10-50 million dollars.

The insect does not go to oats or non-cereal crops. Past work on developing cultivars for disease resistance has focused on development of germplasm resistant to lodging or tunneling. This has been accomplished by the development of cultivars with a solid pithy stem. Sources of this trait have come from S615 for wheat and 'Golden Ball' for durum cultivars. The degree of solid stem development is highly dependent on environment. Sunny days during stem elongation produce solid stems, where as cloudy days or periods of stress during this time result in more hollow stems developing. The solid stem characteristic in durum wheats is not as dependent on the environment as is the characteristic in spring wheat.

Hollows stem cultivars can have up to 75% cutting. Solid stem are usually in the range of 3-7% cutting. Ten percent cutting is usually considered the threshold value for reducing the potential incidence of the insect in future crops.

Resistant cultivars released in Canada 1946- present.

Cultivar	Date released	Cultivar	Date released
Rescue	1946	Leader	1981
Chinook	1952	Lancer	1985
Cyprus	1962	Eatonia	1993
Canuk	1974	Abby	1998
Chester	1976	Lillian	2006 due next year

Biocontrol measures include the use of the parasitoid *Bracon cephi* which will lay eggs inside of sawfly larvae. Parasitoids can reduce the incidence of cutting by as much as 70%. Parasitoid levels can be increased by increasing the stubble height at harvest.

Dr. Francois Eudes – AAFC Lethbridge

Fusarium head blight – New approaches for control.

The disease is moving into the irrigated wheat areas of Alberta. Fusarium head blight is associated with DON (deoxynivalenol) concentrations – T2, DON and 15-ADON are more phytotoxic than DAS (diacetoxysciprenol).

The disease causes many food and safety issues related to:

a: trichothecenes and zearalenones are two Fusaria mycotoxins groups that have severe health consequences if ingested. Inhibition of protein systhesis and general food poisoning issues are related to injestion of Fusaria infected seed.

Resistance –

Type 1. Escape/avoidance induced by physiological defense reactions.

Type 2. Disturbance of hyphal growth after infection

Type 3. Trichothecene degradation

Type 4. Tolerance – related to membrane permeability, signal transduction and peptidyl transferase.

Combining Fusarium strains usually results in more disease development than using just single strains.

Elongation of the coleoptile is negatively impacted by the concentration of various phytotoxins. Trichothecenes are not necessary for initial infection, but are needed for spread within the spike. Non trichothecene producing species have 50-80% fewer infected spikelets than do producing species. Trichothecenes are also a factor in seedling blight and crown rot of 6 small grain cereal species – oats, barley, rye, triticale, wheat, durum wheat. Resistance to Fusarium head blight is sometimes associated with resistance to seedling blight and root or crown rot..

Dr. Andre Laroche – AAFC Lethbridge

Molecular biology approaches to wheat disease control

Common bunt

- shows a gene for gene interaction
- BT 10 used frequently
- no hypersensitive reaction observed
- results are only observed in the head
- infection occurs below the growing point
- salicylic acid and jasmonic acid reduce infection in a susceptible cultivar
- infection reduced in secondary tillers and spikes, but not tertiary tillers.
- salicylic acid and actigard have a similar mode of action in secondary tillers.

Genes

- BT10 not sure which chromosome this gene is on
- BT 11 effective against all know common bunt races – good against TCK
- BT 12 effective against all know common bunt races – good against most TCK races

Rust Resistance

Leaf rust

- Genes LR 24, 37 and 34 are widely used

Stripe rust

- YR 10 – found on short arm of chromosome 1B is widely used

Snow mold

Five percent of all cultivated wheat (11 M ha) in Canada is winter wheat. This crop needs both freeze tolerance and snow mold resistance.

- snow mold is induced by low temperatures
- there are 3 loci for snow mold resistance
- freeze tolerance is multi-genetic

Development of a new stem rust race in Africa. – Information presented by Ruth Dill-Macky of University of Minnesota.

In North America:

- The pathogen has been very stable
- Resistance to current races is present in all wheat classes

In India and South America

- Resistance is based on Cimmyt developed cultivars

East Africa

- New isolates are virulent on SR31 and SR38. The new isolate was first found in Uganda.
- 2003 and 2004 – Cimmyt based lines were susceptible.
- Isolates from Kenya and Ethiopia are virulent on most resistant cultivars.

The following hard red spring wheat cultivars grown in North America are susceptible

Granger, Briggs, Knudson, Alsen, Reeder, AC Barrie

The SR31 gene is deployed worldwide on 69 million hectares. Cultivars grown on these hectares may have other resistance genes. It is hard to determine this in the presence of SR31. SR24 and SR36 show resistance to this new race.

The cereal disease lab in Minnesota is building a new containment lab so that they can work with this new race. A risk assessment involving Cimmyt and the USDA is currently underway. A cereal nursery is available in Kenya under a combined Cimmyt- USDA agreement.

Part of the problem is related to the fact that Barberries are making a comeback world wide.

Winter Wheat Breeding in Alberta – Rob Graf. – AAFC Lethbridge

Winter wheat represents 5% of the total value (35.7 billon dollars) of Canadian ag receipts.

Why go winter wheat

- of value in conservation tillage practices – usually seeded into standing stubble. it must be seeded before Sept 12. The crop can not be insured if seeder after Sept 20th.
- Yields 65% better than spring wheat.
- It has a better water use pattern. It uses most of its water early in the growing season.
- Lower fuel costs due to fewer field operations.
- Less weeds and wild oats. Tends to be more competitive than spring wheat.
- Less Fusarium head blight.
- Avoids the wheat midge
- Avoids the problems of planting into cool wet spring soils
- Early harvest
- Allows for more efficient use of equipment
- Less disturbance of wildlife – especially waterfowl.

Current breeding programs in Canada

- Ag Canada – Lethbridge, Ottawa, Charlottetown
- Univ of Saskatchewan
- Ag and rural development group
- Univ of Manitoba
- Univ of Guelph
- Hyland seeds

Hard red wheats can only be grown in Canada

Before 1990	1990-2000	After 2000
Westmont	AC Readymade	CDC Buteo
Winalta	CDC Kestrel	McClintock
Gaines	Clair	Radiant
Nugaines	Ospray	
Sundance	Harrier	
Norstar	AC Tempest	
Norwin	Bellatrix	
	CDC Falcon	
	Raptor	
	Ptarmigan	

Goals of winter wheat breeding project:

- increased yield
- decreased plant height
- increased straw strength
- earlier maturity
- increase winter survival
- stem and leaf rust resistance
- bunt resistance
- wheat curl mite resistance to help control wheat streak mosaic virus.

Agricultural areas of Canada are divided into either a brown or black zone.

Brown zone – covers the drier areas of Canada and represents 40% of the acreage.
Needs of cultivars grown in this area and genes deployed

- common bunt resistance BT 5,10,11&12
- WSMV cmc1, cmc2, wsm1
- Russian wheat aphid dw1,dw2, dw4, dw5
- tan spot resistance
- wheat stem sawfly – use resistance from Golden Ball
- stripe rust Yr5,10,17 &18

Black zone – high organic low pH soils – 60% of the acreage.
Needs of cultivars grown in this area and genes deployed

- leaf and stem rust sr24 & 38 lr 24,37,21,34,41,43
- common bunt bt5,10,11,12
- WSMV cmc1, cmc4 and msm1
- Fusarium head blight resistance
- tan spot – depend on fungicides to reduce disease levels
- powdery mildew pm25
- snow mold

The winter wheat breeding project uses both a pedigree and double haploid system for germplasm development.

- The double haploid part produces 5-6 thousand new lines per year
- The pedigree part produces 8-10 thousand new lines per year
- Some marker assisted selection is also used

In Canada each wheat class has its own seed characteristics.

- size
- shape
- color

All cultivars must undergo a three year evaluation before being recommended for release and must meet minimum standards for quality, disease resistance and agronomic traits.

80 % of Canadian wheat is exported.

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The meeting ended the first day with a tour of the Lethbridge facilities which included a presentation by Dr. H. Haung and Scott Erickson on bacterial wilt of common bean caused by *Curtobacterium flaccumfaciens pv flaccumfaciens*

Discoloration of seed due to bacterial infection by *Curtobacterium flaccumfaciens* The causal agent of bacterial wilt of beans

Discoloration of seed due to bacterial infection by *Erwinia rhapontici* the causal agent of pink seed. The beans (left) are cultivar US1140, and the peas (right) are cultivar Delta. The pathogen has also been found on lentil, chickpea, spring wheat and durum wheat in North America – may be confused with fungicide treated seed.

Symptoms of bacterial wilt on common beans
Curtobacterium flaccumfaciens

Temporary storage of field samples

A tour through the glasshouse facilities
Denis Gaudet – the host of the meetings is in the background.

State reports

California Report, by Lee Jackson, Extension Agronomist/Pathologist, UC Davis

General. Most small grains in California are sown in the fall and consist primarily of hard red and hard white spring wheat, durum wheat, 6-row spring feed barley, triticale and oat. Small acreages of fall-sown winter wheat, triticale (for grazing and forage) and winter barley and spring-sown spring wheat and spring barley also are grown in the intermountain valleys of northern California. Planted acreage in 2005 includes 558,000 acres of wheat (including 90,000 acres of durum), 100,000 acres of barley, and 250,000 acres of oat (nearly all for hay). Wet weather prevented planting of about 25-30% of the durum acreage in the Imperial Valley. Triticale acreage for green-chop for dairies in the San Joaquin Valley continues to expand; total triticale acreage, including winter triticale in the intermountain area, amounts to about 60,000 acres. Wheat for green-chop also continues to expand at the expense of grain acres and now accounts for 60-70% of the San Joaquin Valley wheat crop. The fall-sown spring wheat acreage in 2005 is dominated by cultivars that began the season as resistant to stripe rust: Summit (hard red spring) and Blanca Grande (hard white spring), both developed by Resource Seeds, Inc. The statewide acreage of Summit is 169,000 (35% of the total wheat acreage) while that of Blanca Grande is 86,500 (18% of the total). Durum acreage remains dominated by Kronos, developed by Arizona Plant Breeders. Kronos is moderately susceptible to stripe rust, with acreage of 28,700 (37% of total durum acreage) in 2005. The 2005 season was wet and cool, just about the opposite from 2004 when warm weather and a relatively dry season led to an early maturing crop. The 2005 season in California has resulted in a later maturing crop and high disease pressure – not only from stripe rust but also from other diseases including Septoria tritici blotch of wheat, leaf rusts of wheat and barley, BYDV of all cereals, and scald and net blotch of barley. The 2005 season serves as a reminder to plant breeders that they don't have the luxury of focusing their programs on a single problem.

Wheat stripe rust. Reports of stripe rust infections began coming in from scattered locations in the Sacramento Valley early in April and included reports of hot spots of infection in fields of the resistant cultivar Summit. In most cases these didn't expand to high disease severity on a field-wide basis. Some fields of Summit and other cultivars, however, were significantly damaged. Fairly frequent rain events and cool temperatures occurred throughout the season and it was easy to detect at least trace to low severity infections on all cultivars throughout the Central Valley. I detected 15 races of the wheat stripe rust pathogen in California in 2004, including 4 new races, and additional races may have become established in 2005. Among the casualties of presumptive new races was a new forage cultivar, Super Dirkwin, developed in partnership between the University of Idaho (Ed Souza's program) and Resource Seeds, Inc., to replace the highly susceptible cultivar Dirkwin. Seed fields were disease-free until mid-May, but then began showing severe disease; Super Dirkwin will not enter commercial production. Near the end of the 2005 season, severe infection occurred in a nursery in the Sacramento/San Joaquin Delta on two advanced breeding lines from the University of California's wheat breeding program (Jorge Dubcovsky's program) that had not shown significant infection previously at any location in the state. The two lines had been slated for release next season. Yield loss from stripe rust this season will probably be about the same as for 2004, or about 5%. I conducted a stripe rust screening nursery on the UC Davis Agronomy Farm. Included in the nursery were cultivars and breeding lines from many breeding programs in the Western region, from both the Pacific Northwest and the Southwest, including large blocks of material from Washington State University, University of Idaho, Arizona Plant Breeders, Westbred L.L.C, and World Wide Wheat. HTAP resistance populations from USDA-ARS at Washington State University also were evaluated. Extremely high natural disease pressure developed early in the season (the first infection was present in late February) and susceptible checks had 100% severity by late April.

Barley stripe rust. Stripe rust was very severe on many entries in the Western Regional Spring Barley Nursery (sown in Fall, 2004) at UC Davis, but only on a few entries in the statewide nurseries. Most germplasm from the University of California barley breeding program, including the main cultivars UC 933 and UC 937, showed excellent resistance. Yield impact of barley stripe rust in California in 2005 will be low except on germplasm not developed in California. I detected 11 races of the barley stripe rust pathogen in California in 2004, including 3 new races. One of the new races contains virulence factors against all of the differential cultivars used in race identification. I conducted a barley stripe rust screening nursery on the UC Davis Agronomy Farm. Included in the nursery were cultivars and breeding lines from many breeding programs in the Western region and 1000 lines from the National Small Grains Collection housed in Aberdeen ID. The stripe rust pressure in the nursery was high, indicated by 80-100% severity on rows of the susceptible check cultivar Max sown throughout the nursery.

Wheat and barley leaf rusts. Leaf rusts of wheat and barley reached very high severity late in the season in the Central Valley due to the extended cool, wet spring. Yield impact probably will be low because grain-fill was nearly complete before disease became severe. Leaf rust was not detected on durum wheat in California in 2005.

Observations of other diseases. California's very wet and cool growing season in 2005 favored other foliar diseases. Septoria tritici blotch of wheat was very severe on many genotypes in nurseries in the Sacramento Valley. Very severe levels of barley scald and/or barley net blotch developed on many spring barley advanced breeding lines in the barley stripe rust screening nursery at UC Davis, obscuring the development of stripe rust since in many cases there was no green tissue left for the stripe rust pathogen to infect; UC-developed germplasm generally had low scald and net blotch severity at Davis. Net/spot blotch has been building up on UC 937 (one of the main cultivars) in Glenn County in the Sacramento Valley over the past few years. This season flag leaves of many plants in several fields of UC 937 died prematurely even though leaves showed no more than 20% disease severity (and leaf sheaths show no infection), possibly suggesting the effect of a toxin. BYDV was widespread throughout the Central Valley on wheat, barley and oat. Finally, stripe rust seemed unusually severe on grassy weeds (ryegrass and canarygrass) around wheat fields in the Sacramento Valley.

Kansas Report, by William Bockus

Personnel news. We have recently completed interviews for a faculty position dealing with Extension/Research on turf, vegetable, ornamental, and tree pathology. An offer to one of those candidates should be made shortly. Additionally, we are initiating the process of hiring a department head and a description for that position should be coming out soon.

Wheat crop condition. As of the writing of this report (June 9, 2005), 37% of the wheat acreage was rated good to excellent, 40% fair, 17% poor and 6% very poor. About 10 million acres were planted and harvest is just beginning with about 9 million acres projected to be harvested.

Disease loss estimates for 2004. Data are from Jon Appel, Bob Bowden, Jim Stack, and Bill Bockus.

Table 1. Wheat disease losses in Kansas

Disease	Loss in 2003	Loss in 2004	20-year avg.
Leaf rust	1.3%	1.4%	3.89%
Wheat streak mosaic	0.4	0.4	1.74
Barley yellow dwarf	0.001	0.23	1.34
Tan spot	0.8	0.28	1.20
Septoria complex	0.1	0.05	1.14
Stripe rust	10.6	0.01	0.95
Soilborne, spindle streak	0.01	0.001	0.60
Take-all	0.001	0.22	0.41
Stem rust	0.0001	0.001	0.29
Powdery mildew	0.1	0.8	0.24
Fusarium head blight	0.05	0.01	0.22
Common root rot	0.01	0.01	0.16
Strawbreaker	0	0	0.07
Cephalosporium stripe	0	0	0.03
Bunt & loose smut	0.01	0.02	0.01
Total	13.4	3.4	12.25

Potential wheat disease losses for 2005. Although final estimates of wheat disease losses during 2005 have not yet been produced, the following diseases were observed during the season. The number one disease problem statewide will probably be stripe rust. It was observed over much of the state but especially in West-central, Central, South-central, and North-central areas. Additionally, there was a late flush of leaf rust that will cause significant losses. Similar to last year, powdery mildew and tan spot caused problems in some areas. Septoria tritici blotch will also have some significant losses this year. The number one virus disease will probably be wheat streak which was especially evident in the Western portion of the state. Barley yellow dwarf occurred but was widely scattered. Similarly, spindle streak mosaic was noted but will likely not cause a lot of loss.

Minnesota Report – Ruth Dill-Macky

Small Grains Crops in Minnesota
2005 season

2005 was a disappointing year for Minnesota's small grains producers. Following nearly ideal planting conditions for small grains in early spring wet conditions immediately following planting drowned out many fields and led to sparse stands in many small grains crops in the northern part of the Red River Valley. An extended early summer with saturated soils throughout Minnesota also prevented the planting of much of the corn and soybean acreage. Heavy storm rains in early- to mid-June resulted in flooding of fields and ponded water caused further plant damage especially in low areas.

Tan spot was problematic in 2005 being well established in crops by early June. Tan spot was not surprisingly most evident on wheat planted into wheat residues. Tan spot was present on flag leaves in most wheat fields throughout the state and substantial levels were evident in cultivars generally considered to have good genetic resistance. Septoria was present, but at lower levels than tan spot. A bacterial stripe epidemic occurred after plants headed and was more severe on some cultivars than others. Leaf rust of wheat was evident at low-moderate levels in the Red River Valley, while stripe rust failed to become established. Bacterial blight, spot blotch and net blotch were the most common foliar diseases seen in barley crops. There was also low-moderate BYDV/CYDV disease pressure in SW Minnesota.

Not surprisingly the wet conditions in May and June favored the development of Fusarium head blight across much of the Minnesota small grains production area. After small grains commodity leaders; Rick Ward, USWBSI Chair; and extension pathologists from ND, MN, and MI issued formal rebuttals concerning EPA's memo of not issuing a Section 18 during 2005, EPA granted MN wheat and barley producers a Section 18 specific exemption for the use of Folicur and Orius to control FHB.

The impact of the flooding and diseases in small grains production areas was reflected in reduced harvested acreages. Below normal yields and quality are the result. Wheat is being discounted that tests greater than 2 ppm for deoxynivalenol (DON). The 2005 spring wheat crop at 1.83 million acres was much the same size as the 2003 and 2004 crops, yield data for wheat in 2005 is not yet available. The winter wheat crop, at 25,000 A was also similar in size to the 2003 and 2004 crops. Durum wheat seems to have all but disappeared from the state and Minnesota's barley acreage was 120,000 acres, a record low. The losses in acreage of barley and durum wheat likely reflect the long term impact of FHB on these commodities. The oat acreage, at 320,000 A, was larger than the 2004 crop of 310,000 A, although the averaging yield of 62 bu/A was the lowest since 2001.

The Spread of a New Virulent Race of Wheat Stem Rust

Dr Yue Jin sent a presentation to the 2005 meeting alerting participants of a significant threat posed be a new race of wheat stem rust, first detected in Uganda in 1998, present in eastern Africa, specifically Kenya and Ethoipia, that has virulence on the wheat stem rust resistance gene Sr31. Participants were alerted to the vulnerability of North American wheat cultivars to this stem rust race from work Dr Jin has conducted at the USDA Cereal Disease Laboratory, St Paul, MN.

Overview of Present Research Programs

Fusarium head blight (FHB) research in Minnesota continues as a large collaborative effort. Faculty from the four departments of the College of Agriculture, Food and Environmental Sciences, three University of Minnesota Research and Outreach Centers and two USDA-ARS units (Cereal Disease Laboratory & Plant Science Research Unit) are involved in FHB research on wheat and barley. While many researchers in Minnesota have projects funded by the U.S. Wheat and Barley Scab Initaitive, researchers have also been supported by state funding and other competitive sources. The research being conducted in Minnesota includes breeding for resistance to FHB in wheat and barley utilizing classical and molecular techniques, studies aimed at improving the efficiency of breeding methodologies and selection of resistance, investigations on the pathogenic variation in *Fusarium graminearum*, examinations into the pathways of entry by Fusarium head blight, and the chemical and cultural control practices of FHB.

Drs Yue Jin and James Kolmer at the USDA-ARS Cereal Disease Laboratory focus their research on the genetics of stem rust (Yue Jin) and leaf rust (James Kolmer) resistance in wheat.

Research on the foliar diseases of cereals is being conducted by Ruth Dill-Macky (tan spot of wheat; net blotch of barley; loose smut of oat), Char Hollingsworth (Septoria speckled leaf blotch of barley; Septoria tritici blotch and aster yellows of wheat), and Brian Steffenson (Septoria speckled leaf blotch, spot blotch and stem rust of barley)

Personnel changes in Minnesota

New Personnel:

Carol Ishimaru, Department Head – started November 2004.

Dean Malvick, Assistant Professor (soybean diseases) - started July 2005.

Publications

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Montana Report, by Bob Johnston

Disease information supplied by Jack Riesselman and Nina Zidack

Powdery Mildew – This disease showed up frequently in the plant disease clinic. The disease is not uncommon in Montana, however it usually only impacts the lower leaves and tends to disappear as soon as the weather warms up and moisture levels fall off.

Cephalosporium stripe – Some scattered reports from west of the divide. Mainly on Stephens winter wheat.

Wheat Streak – Very minor problem so far.

Stripe rust has not been an issue yet this summer. We had a small amount of inoculum around last fall and the disease may show up after we dry out and warm up in the next week or so. Currently, the stripe rust differentials at Bozeman are clean.

Frost damage – Lots of samples coming into the clinic. Mainly due to a drop in temperatures to the low 20's in mid May. An associated problem caused by Beyond herbicide applied to Clearfield lines at the time we had these low temperatures.

Some **Tan Spot** is showing up on winter wheat in fields that have high residues and thin stands. May be related to splash dispersal of conidia.

With the amount of cool wet weather we have had over the last few weeks, the malt growers are concerned about the potential of **scald and net blotch** developing. We will need to keep an eye on this incase it becomes necessary to apply a foliar fungicide application.

Growers are glad to see a significant amount of moisture falling over the last few weeks. However, many fields are showing signs of Nitrogen deficiency due to either leaching from the root zone or insufficient quantities of N applied at seeding. With the lack of moisture and the current high price of N, growers are hesitant to apply more N than is absolutely necessary. The cool soil conditions also help to reduce the availability of N. This may turn around somewhat once conditions begin to warm up.

One last item of interest – One of the entomologist on campus was seeing a high number of **brown wheat mites** in late April – early May. This was very strange since this mite is usually associated with hot – dry weather. This mite vectors the virus causing **barley yellow streak mosaic virus**. It will be interesting to see if the mites can survive the cool wet weather we have been experiencing over the last few weeks and re-emerge to cause a disease problem.

Lab work

Development of a real time PCR technique to ID *Fusarium culmorum, graminearum* and *pseudograminearum* species in plant tissue is underway. We have found that the copy number is closely associated with the severity of disease symptoms. Compared with a visual 1-4 scoring system the copy number more accurately predicts yield loss of infected plants.

We plan on using this technique to track the presence of Fusarium spp in infested straw residue either on or in the soil. We would like to know if the widespread use of solid stem cultivars released for sawfly control will have implications for development of Fusarium crown rot in future crops. Montana produced solid stem cultivars are susceptible to this disease and we would like to know if these solid stem cultivars decompose at rates significantly different than hollow stem cultivars.

Spring Wheat

Year	Total						
	Acres		Production		Value		
	Planted (000)	Harvested (000)	Yield Per Acre Bu.	Total Bushels (000)	Price Per Bu. Dols.	Value of Production (000) Dols	Value Per Acre Dols.
2005	2,600						
2004	3,000	2,850	31	88,350	3.60	318,060	112
2003	2,900	2,750	22	60,500	3.78	228,690	83
2002	3,750	3,450	22	75,900	4.08	309,672	90
2001	3,550	2,850	23	65,550	3.06	200,583	70

Durum Wheat

Year	Total						
	Acres		Production		Value		
	Planted (000)	Harvested (000)	Yield Per Acre Bu.	Total Bushels (000)	Price Per Bu. Dols.	Value of Production (000) Dols	Value Per Acre Dols.
2005	560						
2004	570	545	33	17,985	3.90	70,142	129
2003	640	630	23	14,490	4.07	58,974	94
2002	590	565	23	12,995	4.49	58,348	103
2001	510	495	24	11,880	3.80	45,144	91

Barley

Year	TOTAL						
	Acres		Production		Value		
	Planted (000)	Harvested (000)	Yield Per Acre Bu.	Total Bushels (000)	Price Per Bu. Dols.	Value of Production (000) Dols.	Value Per Acre Dols.
2005	950						
2004	1,000	830	59	48,970	2.85	139,565	168
2003	1,150	850	40	34,000	2.93	99,620	117
2002	1,180	930	42	39,060	2.86	111,712	120
2001	1,100	720	41	29,520	2.65	78,228	109

Winter Wheat

Year	Total						
	Acres		Production		Value		
	Planted (000)	Harvested (000)	Yield Per Acre Bu.	Total Bushels (000)	Price Per Bu. Dols.	Value of Production (000) Dols	Value Per Acre Dols.
2005	2,150						
2004	1,900	1,630	41	66,830	3.35	223,881	137
2003	1,900	1,820	37	67,340	3.56	239,730	132
2002	1,450	780	28	21,840	3.73	81,463	104
2001	1,300	870	22	19,140	3.07	58,760	68

Crop Condition Table

Winter Wheat – Condition As of June 6 2005

	This Week	Last Week	Last Year	5-yr Avg.
Very Poor	6	6	2	16
Poor	15	18	5	20
Fair	46	47	20	26
Good	28	26	50	29
Excellent	5	3	23	9
Spring Wheat - Condition				
Very Poor	1	1	0	3
Poor	5	5	2	9
Fair	33	41	24	33
Good	56	51	67	48
Excellent	5	2	7	7
Durum Wheat - Condition				
Very Poor	1	N/A	0	N/A
Poor	3	N/A	4	N/A
Fair	23	N/A	13	N/A
Good	62	N/A	71	N/A
Excellent	11	N/A	12	N/A
Barley - Condition				
Very Poor	1	1	0	3
Poor	6	6	1	11
Fair	39	50	14	32
Good	41	37	67	44
Excellent	13	6	18	10

Nebraska report by John Watkins

In late April and again in early May temperatures fell to from 19F to 28F throughout much of the state. This caused varying degrees of damage that ranged from tillers being killed to partial sterilization of the head to bleaching of the awns. The degree of damage was most pronounced in western Nebraska where temperatures dropped to 19F for several hours. Areas in the field where the wheat was stressed due to drought and stands were thinner showed the greatest damage.

The Panhandle and West Central Nebraska

In September and October of 2004, a significant out break of leaf rust occurred throughout western Nebraska. The outbreak was severe enough that some growers applied a fungicide to the seedling wheat. Impact of this fall outbreak is difficult to assess but some growers felt it did affect the vigor of the crop going into winter and during spring green up in April.

Field surveys in June of fields in the Nebraska Panhandle and in west central Nebraska identified wheat streak mosaic and stripe rust as the major diseases in western Nebraska. Of the two, wheat streak was the most wide spread and damaging disease in the Panhandle. Stripe rust made its presence strongly felt in west central Nebraska and in a few fields in the Panhandle. Both disease will undoubtedly impact wheat yields and test weights in many fields.

The incidence of wheat streak mosaic is high in the southern Panhandle, particularly in Cheyenne County. A series of hail storms at this time last year resulted in an abundance of volunteer wheat on which wheat streak mosaic virus and its curl mite vector built up to very high numbers between then and emergence of the fall planted crop. Although some growers attempted to control their volunteer, others did not which significantly contributed to the problem. The extensive warm fall weather and good growth enhanced the spread of the mites in the fall-planted crop after it emerged. Wheat in the northern Panhandle was impacted less by wheat streak mosaic with just isolated fields or areas showing mosaic. Some wheat streak mosaic was present in areas of southwestern Nebraska similar to that found in the northern Panhandle. This was probably one of the most extensive outbreaks of wheat streak mosaic to occur in the past 20 years.

Stripe rust was present everywhere in Nebraska, but was most evident in the west central. A cool May combined with irrigation or frequent rain created excellent conditions for stripe rust. Many irrigated fields were treated with a fungicide which in most, but not all, cases protected the flag leaves from severe rusting. On susceptible varieties stripe rust severities of 50-70% were not uncommon.

Eastern and South Central Nebraska

The most evident disease in eastern and south central Nebraska during May and early June was powdery mildew. Extensive periods of cool, cloudy weather promoted its development. By early June the mildew had reached the flag leaf, however, severity on the flag leaf was only light to moderate.

Leaf rust, although present in Nebraska, developed late due to cool temperatures in May and reached only a moderate level of severity on the flag leaf. The same was noted for tan spot in fields where it occurred.

We have not had any reports of any widespread outbreaks of scab although some fields did show a low incidence of this disease.

Personnel Changes

John Watkins will retire in December, 2005 and will be replace by Dr. Stephen Wegulo. Dr. Wegulo started on June 1, 2005 and will have extension and research responsibility for diseases of small grains, forages and ornamentals.

Washington Report by Tim Murray & Xianming Chen

Acreage & Production estimates

Winter wheat - 1.85 million acres were planted in 2005; 100,000 ac over 2004. Yield is estimated at 68 bu/ac; up from 67 in 2004. Total production is estimated at 126 million bushels; up from 117 in 2004.

Spring wheat - 440,000 acres were planted in 2005; 90,000 ac below 2004. In 2004, average 50 bu/ac with total production of 26.25 million bushels. Production estimates for 2005 have not been published yet.

Barley – 200,000 acres were planted in 2005; 50,000 below 2004. In 2004, yield was 70 bu/ac with total production of 17.2 million bushels. Production estimates for 2005 have not been published yet.

Growing Conditions

Overall the winter wheat crop is in good condition and yields are expected to be higher than last year, due to abundant and timely rainfall during spring. Dry early spring weather with warm temperatures provided good conditions for seeding and establishment of spring crops.

Fall-winter 2004-05. Timely rains in September provided good conditions for early seeding of winter wheat in most areas of the state. Winter wheat generally emerged quickly and uniformly throughout the wheat-producing areas in Washington. Winter temperatures were warmer than normal. For example, the average temperature at Pullman in December 2004 was 34.8^{o}F; 4.9^{o}F higher than the normal monthly mean temperature. In January 2005, the average maximum daily temperature at Pullman was 39.6^{o}F; 4.6^{o}F higher than normal, and the average minimum temperature was 27.7^{o}F; 3.7^{o}F higher than normal. Precipitation (snows and rains) was much lower than normal across the state. For example, Pullman had only 0.55 inches of participation in December 2004; 2.23 inches lower than normal (2.78 inches), and had only 0.38 inches in January 2005; 2.08 inches lower than the normal (2.46 inches).

Spring 2005. February and March were warmer and dryer than normal and April and May temperatures were close to normal. Precipitation from February to May was below normal, but the precipitation from late March to early June was above normal and provided good moisture conditions for crop growth. Crop maturity is delayed about 7 days due to the cool weather. Overall rainfall for the growing season is 15 cm below normal.

Disease problems

Soilborne pathogens

Cephalosporium stripe is prevalent in inoculated nurseries, but no reports have been received from commercial fields. Fall and winter conditions were favorable for Eyespot, but early scouting did not uncover fields with severe disease and no reports of significant outbreaks have been received.

Pink snow mold and Speckled snow mold were insignificant this year due to the lack of a persistent snow cover in the wheat-producing areas of the state.

Foliar Pathogens

Stripe rust was the major disease in 2005. Early emergence of winter wheat provided early host plants for stripe rust infection in the fall. Stripe rust was observed on volunteer wheat plants in late October near Pullman. The warmer winter weather allowed the pathogen to overwinter as mycelium in wheat leaves. The rust even sporulated in the south-central region of the state. Stripe rust started developing much earlier in most wheat producing areas. In the first week of April, stripe rust was found on winter wheat in central Washington, and in the third week of April, the disease was found near Pullman in eastern Washington. Application of fungicide for stripe rust control was started in late April in south central Washington. The early development and spread of stripe rust provided large amounts of inoculum for the spring wheat crop. The first leaves of spring wheat in eastern Washington were frequently infected by stripe rust, which is uncommon. Fungicides were used widely to control stripe rust on spring wheat. The majority of winter wheat fields were not affected by the rust epidemic because of high-temperature adult-plant (HTAP) resistance. Some winter and spring wheat cultivars with low to moderate levels of HTAP resistance were sprayed because of the early development of the disease, heavy inoculum load, rust-favorable weather conditions, and high yield potential. Barley stripe rust also occurred, but was generally light because most of the barley acreage wase planted with spring barley, which leaves a big gap between crops, and were planted with barley varieties with HTAP resistance. Only a few malting barley fields were sprayed with fungicides.

Leaf rust and stem rust: Trace leaf rust was reported in Central Washington in mid-May, but have not widespread yet. It is still too early for stem rust to occur. Typically, crop maturity is too advanced for extensive damage by the time conditions become favorable for development of these diseases.

Physiological leaf spot is a appearing again and very severe in some areas. Many growers now apply chloride to limit symptom development, but yield may be limited even when symptoms are not present.

Personnel.
Searches for a bacteriologist & Cook endowed chair in cropping systems pathology are underway. Pete Bristow, small fruit pathologist in western Washington, retired May 31 and will not be replaced.

List of participants at this years WERA 97 meeting

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