Crop Disease Updates

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Wheat Virus Diseases

- Viruses vectored by soil inhabitant called Polymyxia
  - Wheat soilborne mosaic
- Viruses vectored by mites
  - Wheat Streak mosaic & others
- Viruses vectored by aphids
  - Barley yellow dwarf

Barley Yellow Dwarf

- Caused by a virus
- Vectored by aphids
- Symptoms include yellowing and purpling of leaves, stunting of plants

Managing Barley Yellow Dwarf

- Control ‘green bridge’
  - Many hosts including volunteer wheat and barley, grassy weeds
  - Many hosts don’t show symptoms
- Insecticides not normally effective
- Varieties differ in susceptibility
  - But no high levels of resistance

Three Mite Transmitted Viruses

- Wheat Streak Mosaic (WSMV)
  - Most common
- High Plains Virus HPV
  - First observed in 1990’s but now widespread
  - Often co-infects with WSMV
- Triticum Mosaic (TrMV)
  - First observed in 2005
  - Also widespread in CO, NE

Vectored by the Wheat Curl Mite

- Dispersed by wind (1/4-1/2 mile or more)
- Many infections occur in fall
- Wheat, corn, millet and many grasses serve as hosts for mite and virus
WSMV Management: volunteer

- Destroy volunteer wheat
- Monitor fields hailed during heading

Virus Management

- Control grassy weeds in field during summer
- Grass weeds and volunteer should be dead at least 10 days before planting
- Don’t plant too early
- Early planting enhances chances of curl mite infestation

Virus Management

- Evaluate your cropping rotation
- Be careful about planting susceptible varieties next to late maturing corn

Wheat Virus Management

- Avoid long season corn?
- Plant a buffer strip around field in hazard areas with resistant variety?

- Wheat adjacent to late developing corn
- Mites moving in fall to wheat transmitted WSMV and HPV, also some TrMV detected
- Red is low yield and green higher yield
- Average yield 9.6 bu

- Nearby wheat field not in proximity to corn and without WSMV or HPV (or at least viruses at lower levels)
- Average Yield around 50 bushels
- Green color higher yields with red lowest

- Don’t plant too early
- Early planting enhances chances of curl mite infestation
Another symptom
- Lesion mimic or physiological leaf spot?
- Is this common?

Hatcher: Hard red winter wheat shows similar symptoms

High Plains Virus in Corn

Virus Management - Resistance
- Check susceptibility of your variety
- Use a resistant variety if you have volunteer, weeds, etc.
  - Snowmass, RonL., Mace, are examples of high resistance
- Remember that resistance to WSMV may not confer resistance to High Plains or Triticum Mosaic

Potato Cyst Nematode
- Found in Canada, Idaho 2006
- Federal survey to determine distribution in North America
- Potato Production in Colorado
  - Surveys began in 2007 and have continued to some extent through 2011

Results of PCN Sampling
- 2007-2010 CSU processed over 15,000 samples
- No reports of PCN
- Monitoring for cereal cyst nematode during sampling
  - 82% of samples had cereal cyst nematode present
  - Range is from 5 to >300 cysts per 500 cc sample
  - Average in 2007 was about 30 cysts per sample
**Plant-parasitic Nematodes in Small Grain Crops**

Slides Courtesy of R. Smiley Oregon State University

- **Root-lesion** - *Pratylenchus* species
- **Cereal cyst** - *Heterodera* species
- **Stunt** - *Geocenamus & Tylenchorhynchus* spp
- **Stern** - *Ditylenchus dipsaci*
- **Root-gall** - *Subanguina radicicola*
- **Pin** - *Paratylenchus* species
- **Dagger** - *Xiphinema* species

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**Root-lesion Nematodes**

(*Pratylenchus species*)

- *P. neglectus* & *P. thornei* in most PNW dryland crops
- *P. penetrans* often dominant in irrigated crops

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**Root-lesion nematodes (transparent)** stained with a red or blue dye to reveal their presence in roots (migratory endoparasite with 6-9 week reproductive cycle)

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**Root-lesion nematode damage to wheat**

- Cortical degradation and pruning of lateral roots, similar to *Rhizoctonia* and *Pythium* root rots
- Stunting and unthrifty growth in large patches, often with fewer tillers and yellowing of lower leaves

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**Relationship of lesion nematode to yield loss**

(*Armstrong et al. 1993*)

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**Nematode Survey 2007**

- 550 locations sampled in eastern Colorado
  - 70% of samples had lesion nematodes (*Pratylenchus neglectus*)
  - Of those samples with lesion nematode about 20% had populations greater than 70 nematodes/100 cc soil
  - Populations above 70/100 cc soil are capable, given the right conditions, of causing >3% yield loss
  - 30 fields had populations >200/100 cc soil
  - Control? Necessary? Resistance? Seed treatment?
- Lesion nematode may not be as much of a problem in irrigated fields in Colorado’s Western Slope.
  - However, it is prudent to check populations
Loose smut

- Loose smut common in Colorado
- Often at very low levels in fields (<0.1%)
  - These levels probably don't need seed treatment
- If field has 1-2 smutted heads per 10-20 feet of row, then seed treatment is a good idea

Summary

- Treating seed with fungicide is not necessary in all circumstances
  - Treat seed if past problem with loose smut or common smut
- Fields with more than 1-2 heads per 10-20 feet of row should be treated
  - Treat seed if scab was severe (maybe 5-10%)

Take-All of Wheat and Barley

Take All Gaeumannomyces graminis var. graminis

- Areas of the crop is bleached
  - Often in patches
- Whiteheads develop

Take All Gaeumannomyces graminis var. graminis

- Diseased plants have blackened roots
  - Very few roots may be present

Survival

- Fungus survives on debris left in field
- Survival dependent on temperature
  - Killed by excessive heat
- Poor saprophyte
  - Not good soil competitor
**Important Facts**

- Fall sown grains usually more seriously damaged
  - i.e. winter wheat often has more disease than spring wheat or barley (but there are exceptions)
- More severe in monoculture
- More severe with reduced tillage practices
- More severe in poorly drained soils
- More severe where volunteer not controlled

**Management**

- Rotation with non-host crops
- Reduced tillage practices can increase disease
- Control grassy weeds and volunteer
- Improve soil drainage
- Seed treatment?
  - Probably not viable
  - Not needed if following a rotation

**Questions**

**Goss’s Wilt… A Corn disease here?**

**Goss’s leaf blight & bacterial wilt**

- Normally shortened to Goss’s wilt
- First described in Central Nebraska in 1969
  - Subsequently found in adjacent states
- Bacterial disease
  - *Clavibacter michiganensis* subsp. *Nebraskensis*
- Disease of dent, sweet, food grade corn & popcorn

**Goss’s wilt potential impact**

- Can reduce yields as much as 50% or more in susceptible varieties
Old corn residues serve as the most common bacterial source.

Crop Injury – Wind & Sand

Systemically infected plants in the field also provide a source of the bacteria... Ala Typhoid Mary
Research has found up to 32% of ears infected by Goss’s wilt bacteria after harvest (21% in Nebraska fields).

Seed transmission of Goss’s wilt has been demonstrated at low rates (2 percent) from naturally infected seeds (volunteer & seeded).

The following grasses serve to host Goss’s wilt bacteria:
- Green foxtail
- Barnyard grass
- Shattercane

Goss’ Wilt Disease Management

Corn Varietal Resistance
- Tolerant/Resistant
- Susceptible

Crop Rotation
Tillage

Controlling grassy weeds

Bactericides?
- Research trials using standard bactericidal chemicals (Kocide) have proven marginally to not effective
- Other concerns – Cost, Timing, Cost, frequency
- Oxidizing chemicals (hydrogen peroxide)?
- Natural acids (Procidic)
  - No University trial.
  - One private industry trial – gave no benefit
  - Cost of chemical & application(s)

How do you know if the seed is clean?
- Visual inspection no good
- Culturing takes time
- Development of DNA markers to detect pathogen on seed.
  - Markers have been developed – currently testing seed lots

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