Effects of Fusarium Diseases on Cereal Grains in Western Canada

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Fusarium disease cycle

- Infected seed known to cause seedling blight and crown rot on wheat and other cereals
Fusarium head blight (FHB)

- Head blight symptoms on cereals caused by three different *Fusarium* species
Heat treatment of seed against Fusarium and other fungal diseases

Wheat after 5 days at 50°C and 70°C

No high-throughput equipment available for large scale heat treatment of seed
How to measure presence of *Fusarium*?

- 2 main types of testing methods for *Fusarium*:
  - Identification of species by morphology
  - Identification by bio-molecular methods (DNA based)
- No officially accepted method for Fusarium testing of seed in ISTA’s international rules
- What is the recommended or preferred test method?
Identification by morphology – Agar plate method and microscopy

- **Advantages:**
  - Can determine the level of seed infection (endosperm & germ)
  - Cost effective method (inexpensive consumables)
  - Identifies only those fungi that are alive

- **Disadvantages:**
  - Slower than DNA based methods
  - Smaller sample size, less sensitivity
  - Requires familiarity with the species
  - Not all species can be identified this way

Distinctive fungal colonies from seeds on potato dextrose agar
Identification by DNA based methods (1)

- **Advantages:**
  - Faster, more reproducible
  - Species identification more objective
  - Larger sample size can be tested
  - Detection can be more sensitive

- **Disadvantages:**
  - More expensive consumables
  - Detects both living and dead fungi
  - Does not enumerate the number of infected seeds
  - Real time-PCR that can quantify fungal mass even more expensive

Gel electrophoresis of PCR Products and distinctive “bands”
Identification by DNA based methods (2)

- Quantification of *F. graminearum* in bulk and harvest samples by real-time PCR assays

Close correlation between %FDK and concentration of *Fusarium graminearum* on wheat kernels
Identification by DNA based methods (3)

- Characterization of numerous populations of *F. graminearum* using DNA sequencing
- High biodiversity of *F. graminearum* across North America
- No single point of origin at a single point in time for FHB occurrence
- Some *F. graminearum* populations unique to Alberta
Historical occurrence of Fusarium species associated with FHB

- *Fusarium* first reported from neighbouring states
- Two independent and isolated occurrences of FHB in western Canada in the mid 1980’s
- Ascospores important factor influencing spread of *F. graminearum* locally
Survey results published online on CGC’s official website (1994 – 2013)

2013 Fusarium survey (1)
2013 Fusarium survey (2)

- **Distribution and frequency of Fusarium chemotype populations**
Recent publications by the GRL/CGC on Fusarium species and FDK grading statistics
