Ecology and Epidemiology of Ergot Infecting Barley

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Barley pathogens of importance to the Central Plains

- Bacterial leaf streak & Black chaff
  - *Xanthomonas translucens*
- Stripe rust
  - *Puccinia striiformis f. sp. hordei*
- Ergot
  - *Claviceps purpurea*
- Barley Scald
  - *Rhyncosporium secalis*
Current Concern

• Ergot of Barley
  • Certified seed fields
  • CO, WY, MT
  • Appearing in ID

• Ergot is everywhere

• More prevalent on barley over past several years

• Concern = ergot bodies
  • >0.1% net weight are rejected
  • Ergot in certified seed only perpetuates the disease

Ergot of Barley in the San Luis Valley and the Big Horn Basin
Region of focus

- Colorado, Wyoming, S. Montana
- San Luis Valley
  - 129 bu/ acres
  - ~ 9 million bushels
- Big horn basin
- Increase in ergot incidence in 2015 and 2016
History of ergot in the Central Plains

- **Origin**? – Probably an introduction event
  - Weather conditions may have been favorable to facilitate widespread infections
- **What is also contributing to its spread?**
  - Ability to infect up to 100 species of grasses
  - Location of grasses/inoculum source
- Few recorded sightings/problems in CO, WY and MT.
Genetic Diversity of *C. purpurea*

- The *C. purpurea* population in CO/WY is distinct from the European population.
- No subdivision in CO/WY based on host
- Hosts included
  - Barley
  - Rye
  - Smooth brome
  - Wild rye
  - Sleepy grass
  - Wheatgrass
  - W. wheatgrass
• No significant reduction in seed loss (*Festuca rubra*)
• Grazing avoidance
• Other studies of *C. spartina*
  • Neutral and positive effects of ergot on seed count and weight have been reported
• 1985 – 1995 (>70% infections in wild populations)
  • No reported reduction in wild populations
• All 3 host species studied are highly rhizomatous
• Maybe - Host recognizes attack and reallocates resources to vegetative growth
Claviceps beneficial evidence

• *C. purpurea* produces and cytokinins (growth promoter) for it’s host
• Abiotic stress tolerance
• Increased seed size
• Reproductive benefits (<20% infection)
• Increased root growth
• *F. rubra* & *Spartina* species
  • Highly rhizomatous
  • Mediocre to low seed set
Alternate hosts of *C. purpurea*

- Known to infect 100+ grass species
- Focus on *Bromus inermis*
  - Campbell 1957
    - **16%** of 46 grass species (1st was wheat, 21%)
  - Frequently reported by other researchers
  - *B. inermis* is ubiquitous
    - erosion, grazing, wildlife conservation
    - Invasive species – aggressive
    - Rapid rhizome growth (mediocre seed set)
- My observations
  - Highly susceptible to ergot
  - Large inoculum reservoirs
Disease Cycle – *C. purpurea*

1°
- Moisture to eject
- Wind/rain/insects

2°
- Rain-splash/insects

Favored by high RH
- May/June

10-25°C ~15 days

Still produce more
- 60 days after first

Obligate biotroph

Photo credits: Schumman 2000
Reduce 1° infection

Control Methods

Reduce sclerotia in soil

Limit 2° spread

Reduce severity
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0% 5% 10% 15% 20% 25% 30% 35% 40% 45% 50%
July August September

Inflorescences Infected Ratings

0 10 20 30 40 50 60 70

Aug Sep

Avg. Inflor / m²

0 1 2

Est. Sclerotia / m²

0 1 2

Brome Wheatgrass
Western Spring Barley Nursery

- Additional nurseries were grown in North Dakota, Montana, Idaho, Wyoming, Washington, Oregon, California and Saskatchewan.
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