Managing Ergot in Cereal Crops

Ergot (*Claviceps purpurea*) is a fungal disease that infects small grains and grassy weeds. The most obvious symptom of ergot infection is sclerotia bodies replacing kernels in the spikelet during grain fill (Figure 1). Ergot outbreaks resulting in yield loss are not common; however, the sclerotia bodies are toxic to humans and animals and can be difficult to separate from harvested grain. Even low levels of contamination in grain can be cause for downgrading, ultimately resulting in reduced crop income.

Identification and biology

Ergot bodies are hard, dark purple to black in color, and irregularly shaped. Infection may occur in multiple flowers on a seed head, producing multiple ergot bodies. As grain fills in the seed-head, ergot bodies also develop, and when they begin protruding from the spikelet, they are easily distinguishable from the grain.[1]

Ergot bodies vary in size and can be the same size or up to 10 times larger than the seed of the host plant.[1] Ergot infections of larger seeded plants have the potential to produce much larger ergot bodies than small-seeded grasses. The larger the ergot body, the more fruiting bodies it can produce.[2] The similar size makes it difficult to separate ergot from harvested grain (Figure 2).

Figure 1. Ergot sclerotia bodies replacing grain kernels in cereal head.

Figure 2. Ergot bodies contaminating harvested grain.

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Disease Hosts

Ergot can infect small grains including rye, wheat, winter wheat, durum, barley, and other grass crops.[3] Rye and open-pollinated grasses are the most susceptible to ergot while oats are less susceptible than other cereal crops.[1] Ergot can also infect grassy weeds such as quackgrass and bromegrass. Grasses surrounding fields of cereal crops can host the disease allowing ergot infection to spread into the crop. For this reason, ergot infection may be more severe on field edges. Broadleaf plants are not susceptible to ergot and can be used as non-host crops in crop rotation.[3]

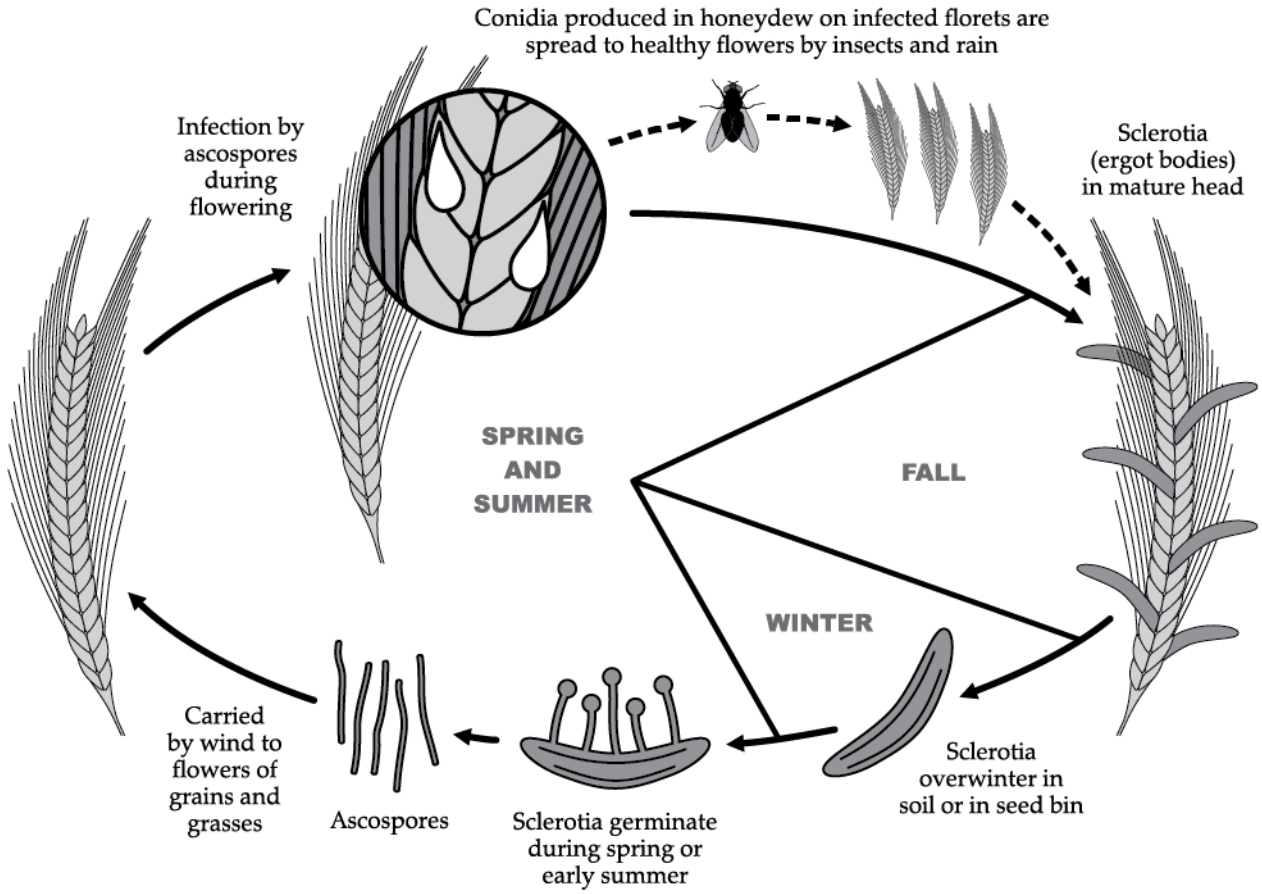

Figure 3. Disease cycle of ergot on cereals and other grasses from Diseases of Field Crops in Canada by The Canadian Phytopathological Society.

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Environmental Conditions

Plants are susceptible to infection during flowering. Disease development is favored by moist conditions and temperatures of 60 to 80 °F though infections can occur even in dry conditions.[2,3] A longer flowering period means there is more time for infection. Some plants have longer flowering periods than others. Cool, wet conditions during flowering may also result in a longer flowering period.

1. Overwintering: Ergot overwinters as ergot (sclerotia) bodies on or near the soil surface. Dormancy breaks following a cold period.
2. Germinating: Ergot sclerotia germinate with moist soil conditions in spring. Periods of dry conditions slow this phase but when moisture returns, germination continues. Ergot can germinate underground and elongate 1 to 2 inches to reach light.[2]
3. Spore release: After germination, ascospores are released and become air borne. This stage is also favored by wet or moist soil conditions and slows when the soil dries; however, spore release can begin again when wet conditions return.
4. Primary Infection: The organ susceptible to infection is the ovary. Therefore, infection of the grass or crop can only occur when the plant is flowering. Primary infection occurs when stigmas of flowering grasses or grassy crops trap ergot ascospores. The ergot colonizes the ovary producing conidia spores. The "honeydew" symptom of ergot (Figure 4) is the mixing of these conidia spores with plant sap leaking out from the site of infection.

Figure 4. Honeydew leaking from site of infection.

Grain Grading

Ergot is toxic to animals and humans and can cause downgrading of grain at the point of sale. Many ergot bodies are similar to the grain in size and shape, making separation from grain difficult. A gravity table (which sorts by density) or a color sorter can work.[3]

Table 1. Thresholds for ergot for top grade of common cereal crops.

Crop	Ergot Threshold (weight per grain weight)
Wheat	0.05%
Barley	0.1%
Oats	0.1%
Rye	0.3%

Source: Adapted from NDSU PP1904.

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Key Aspects of Disease Management

Planning

- Using ergot-free seed can help manage the risk of introducing the disease to a previously un-infected field.[1]
- Cultivar selection. Some crops and some cultivars may be less susceptible to ergot infection than others.[1] Rye is more susceptible than other cereal crops. There are cultivars of rye that are advertised to be less susceptible to ergot than other cultivars.

In-season

- Manage length of flowering period with uniform stands using best management practices for good germination, ensuring consistent seed depth, and using a balanced fertilizer program. In copper deficient soils, the addition of copper can also help manage ergot.[1]
- Mow or control grasses in ditches around the field prior to grasses flowering to reduce the risk of wild grasses producing ergot conidia spores or sclerotia bodies.[1]

Harvest

- Harvesting headlands separately may help maintain higher grain quality of the bulk of the grain as infection can begin in headlands where wild grasses surround the field.[1]
- Cleaning the grain using a gravity table or color sorter can help maintain the grade of the grain.[1,3]

Post-harvest

- Rotation to a broadleaf crop can help reduce disease pressure in the field for future cereal crops.[3]
- Tillage following a crop with ergot infection incorporating ergot bodies at least one inch deep can reduce spore release and break the disease cycle.[3]

Sources

[1] Saskatchewan. Ergot of cereals and grasses. https://www.saskatchewan.ca/business/agriculture-natural-resources-and-industry/agribusiness-farmers-and-ranchers/crops-and-irrigation/disease/ergot-of-cereals-and-grasses

[2] Alderman, S. 2006. Ergot: Biology and Control. USDA-ARS National Forage Seed Production Research Center.

[3] Friskop, A., Endres, G., Hoppe, K., Mostrom, M., Ransom, J., Stokka, G. Ergot in small grains PP1904. 2018. North Dakota State University Extension. https://www.ag.ndsu.edu/publications/crops/ergot-in-small-grains.

[4] Canadian Grain Commission. 2019. Official Grain Grading Guide. ISSN 1704-5118.