Managing ergot in cereal crops

Introduction
Ergot is a disease of all cereal crops and a wide range of grasses, but the most important host is perennial ryegrass. It is caused by the fungus Claviceps purpurea. Ergot has very little direct effect on yield, but ergots contain large quantities of poisonous alkaloids. Consequently, if contaminated grain is fed to stock or used to make flour there is a risk to animal and human health.

Ergot infected cereal crops can be a problem but have been reported infrequently in New Zealand. It is more of a problem in the North Island. There have been reports of ergot infected barley crops in the lower North Island in the 2012-13 season. Infection seems to be most prevalent around paddock margins.

Identification
The fungus only attacks the ear, replacing some grains with hard, purple black sclerotia known as ergots. Ergots can be up to 2 cm long and are very obvious in standing crops and infected grain.

Key points
- Grain contaminated with ergot is a risk to human and animal health.
- Grasses, particularly perennial ryegrass and cereals, can host ergot.
- Wet and cool weather during flowering favour the disease.
- There is no evidence that ergot in cereals can be controlled by fungicide sprays.
- Cultural controls include: do not sow contaminated seed, careful ploughing, at least a one year break from grasses and cereals, and controlling grass weeds in and around the cereal crop.
- Harvest heavily infested areas e.g. headlands separately to avoid contaminating large bulks of grain.
- Ergots can be cleaned from grain with gravity-type equipment but it is a slow and expensive process.

Life cycle
Ergot is not a seed-borne disease, however, it can be spread by ergots in contaminated seed. At or near harvest, ergots fall to the ground where they remain until the following summer, when they germinate to produce club-shaped spore-bearing structures (stromata). These release ascospores which are spread by the wind to nearby open flowers of grasses and cereals. The spores germinate in the flower, infecting the ovaries and this infection leads to the production of secondary spores encased in a sticky secretion commonly referred to as honeydew. This honeydew attracts insects which carry spores to other flowers where further infection can occur. Rain splash or direct contact can spread infection over short distances. See figure 2 over page.

The disease is favoured by cool, wet conditions during flowering which facilitate spore production and prolong the flowering period making infection more likely. Susceptibility decreases rapidly after pollination.

Control
Cultural control can be achieved by careful ploughing, as ergots are not viable for more than one year and cannot germinate if buried at least 5 cm. A one year break from cereals and grass gives good control of soil-borne ergot. Eradicating grass weeds in and around crops, or mowing grass weeds on headlands before they flower will prevent spread. If ergot is infecting the crop
only on paddock margins, contaminated grain could be kept separate at harvest. UK information indicates ergot in cereal crops cannot be controlled in the field by fungicide sprays. A trial in New Zealand investigating blind seed disease control in perennial ryegrass that was also infected with a low level of ergot, showed good fungicidal control of ergot. The most effective programme was 0.4 l/ha Proline at early flowering followed by 0.4 l/ha Proline and 0.5 l/ha carbendazim at seed fill. However there are no data or label recommendations to support this approach in cereals and it may fall outside the withholding period in cereals for Proline of 56 days and carbendazim 60 days. No New Zealand registered seed treatments give ergot control.

**What to do if you have ergot in your grain**

The end user will advise if there is an acceptable tolerance for ergot contaminated grain. For example, the general recommendation for grain going to pig production is that more than 0.1% (1 ergot/1000 grains) of sclerotia in the feed will cause clinical symptoms. These include poor growth rates, increased respiration and general depression.

Removal of ergot from grain is possible. Standard cleaning equipment that separates foreign material on the basis of size will work if the ergots are larger or smaller than the grain kernels. However, ergot is often the same size as the grain. Also, ergot bodies can easily break from mechanical handling, resulting in more kernel sized pieces that cannot be cleaned by size. Gravity table cleaners, which work on the basis of density, are very effective as ergot is less dense than grain, however this process tends to be expensive and slow.

**References**

HGCA, Managing ergot in cereal crops, Topic sheet no. 56, spring 2002.

HGCA, The encyclopaedia of cereal diseases.


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**The life cycle of ergot**

- Ergots over-winter on the ground or are sown with seed
- Ergots germinate in spring
- Ascospores form in stromata
- Secondary spread
- Ascospores infect the host during flowering
- Ovaries colonised by fungus from the base upwards
- Honeydew exudes from infected florets
- Ergots develop in place of grain
- Ergots germinate in spring

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