

Ergot disease in Cereals

SUMMARY

- **Ergot in cereals is very poisonous to both people and animals**
- **Open flowering cereals and varieties are at greater risk of infection**
- **Ergot only survives for a short period in the soil and poses little threat if buried at a greater depth than 4cm**
- **Grass weeds and field margins are a potential source of disease**
- **Colour sorters are available to separate ergot from healthy grain**

Introduction

Ergots are black fungal resting bodies which develop in the grain sites of all cereals and grasses. They are an important disease since they contain toxic alkaloids which are very poisonous to both humans and livestock.

The tolerance level for ergots for human consumption is 0.001 % by weight. In practice, grain samples with any ergot will be rejected. It may be possible to screen out some ergot, but ergot levels may become concentrated to toxic levels in the screenings, even when dressing grain carrying very low levels of ergot. These heavily contaminated screenings must be buried or burnt.

Some companies run a service to remove ergot from grain using a colour sorter (e.g. Satake AlphaScan). These sorters are suitable for ergot, foreign grain and stone removal from wheat and barley with a capacity on ergot removal from wheat of 12 - 16 tonnes per hour.

Biology

Ergot occurs in barley, wheat, triticale oats and rye, as well as many grasses. Grasses tend to be the main source of the disease, and the fungal bodies remain viable in the soil for about 1 year. In dry storage they can survive longer.

Ergots in the soil or ergots sown with the seed germinate in the spring and summer to produce spores which are distributed by the air and rain splash. These spores can then infect grasses as well as cereals at flowering and infect the cereal ovary within 24 hours. Within five days spores form on the ovary surface (the honey-dew stage), and serve as a secondary infection. These honey-dew spores attract insects which spread them further. Alternatively the spores are spread through rain splash. The ergot bodies then develop in the grain sites, and are harvested with the grain or fall to the ground to become a source of infection for the following year.

Ergot is favoured by cool, wet weather or coastal haars at flowering. Flowering is prolonged during these conditions, and they also favour spread of the honeydew which attracts insects.

Open flowered varieties tend to be more susceptible to ergot, and sterile florets are also more likely to become infected as they remain open for longer periods. Crops with many secondary tillers pose a risk due to a wider window where the crop is at flowering growth stages.

Prevention

How do you prevent ergot next season? Ergot is best avoided by planting clean seed. Seed treatments can help reduce ergot germinating in seed, but this will only have limited effect, since ergot in grasses will be the main source for the next crop. Pay particular attention to grass weed control, but this still leaves grass margins as a key source. If you find ergot in a crop, harvesting the endrugs separately may help, but ergot can spread first by wind blown spores and then by insects further into the crop.

Varietal

The spring barley varieties Decanter and Maresi are affected most by ergot in the field. HGCA- funded research is looking at flowering habits of spring barley varieties to determine the potential risk of ergot infection and preliminary results suggest that open flowering varieties and varieties which flower for a longer period (6 days) are more susceptible to disease e.g. Decanter, Maresi and Optic.

Closed flowering spring barley varieties which flower for a short period (2 days) will pose a lower risk e.g. Waggon, Riviera, Power, Cocktail, Appaloosa and Westminster, Cellar, Chalice.

Cultivation

Burying the ergots to a depth greater than 4 cm will stop them germinating the following year. Ploughing affected fields is an effective way to bury ergots. Minimal cultivation techniques can encourage problems, since grass weeds are a greater problem and ergots will remain close to the surface.

Whatever cultivations you carry out be aware that mature grass in field margins, beetle banks, set-aside and road verges will act as a source of spores for crops when they are in flower. Grasses known to spread ergot include ryegrass, black-grass, cocksfoot, couch and annual meadow-grass.

Grass Margins for Conservation

Although grass margins may be a source of ergot spores, they provide habitat for grey partridge, beneficial insects and spiders and hunting ground for barn owls. These margins can be either tussocky or species rich and additionally are used to buffer watercourses and sensitive habitats.

Tussocky grass margins include cocksfoot, timothy, creeping red fescue and perennial ryegrass. Species rich grass margins have the aforementioned grasses and the addition of wildflowers such as knapweed, oxeye daisy, common vetch, birds foot trefoil and yarrow. Clover can also be used as a grass margin species.

If a crop susceptible to ergot is to be sown, it is best to remove grasses that harbour ergot from the mix (cocksfoot and perennial ryegrass). Alternatively the tussocky grass margin could be sown around a less sensitive crop and a clover grass margin could be sown instead which will provide nectar for bees and butterflies.

Toxicity of contaminated grain to livestock

Since it is likely that all barley containing even a hint of ergot will be rejected for malting, the rejected grain will become available as animal feed which will pose the question of how safe it is for feeding to livestock.

Toxic components

Ergot contains a number of alkaloids which have different toxic effects on animals. The two main effects are (1) on the nervous system - resulting in an initial stimulation followed by depression and weakness, and (2) on small blood vessels which constrict leading to thrombosis and dry gangrene. (This property is used in human medicine and extracts of ergot are used for controlling haemorrhaging). The toxins also cause disturbances in levels of reproductive and other hormones

Toxicity symptoms

These vary between animal species but in cattle the first symptom may be diarrhoea, a high temperature, rapid breathing, poor appetite and performance, or even a rapid loss of weight. Lameness, stiffness of the lower joints and insensitivity of extremities, as the blood supply is cut, off may follow. Continued feeding results in dry gangrene affecting feet, ears, tail and sometimes the tongue in sheep, and these bits may fall off even after only a month. However it should be stated that these extreme symptoms only occur when animals have eaten fairly large quantities of ergot usually on grass which had not been grazed for several weeks.

Ruminants seem to be more susceptible to toxicity than pigs or poultry.

Safe feeding levels for contaminated grain

Ergot toxins are particularly nasty and it is essential that the feeding of contaminated grain is controlled to prevent toxicity.

It is an offence under current feed regulations to sell grain which contains more than 0.1% by weight of ergot.

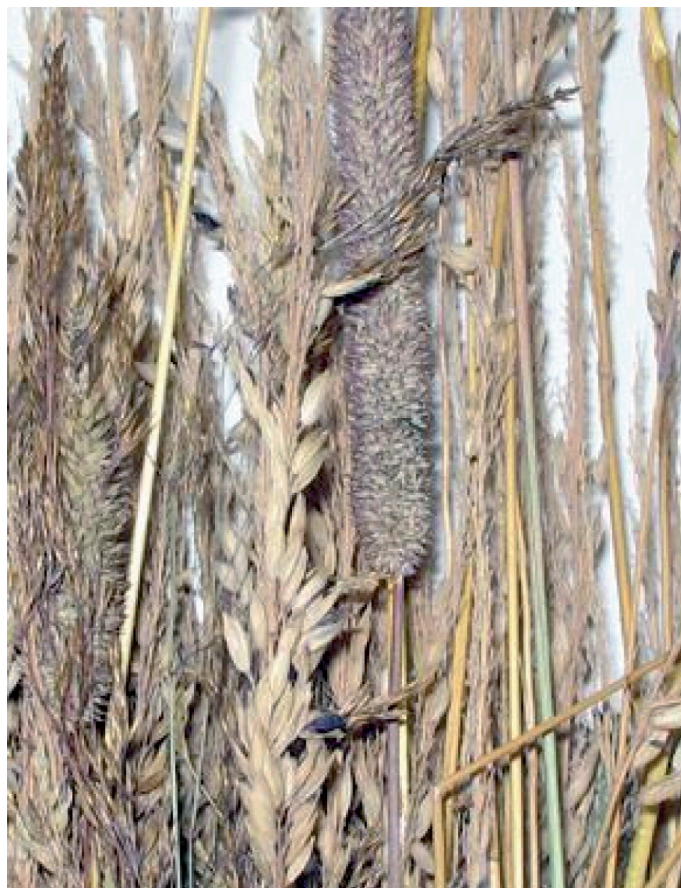
From the information available it is difficult to specify safe feeding levels but this level of 0.1% is considered to be the upper safe limit for cattle and sheep fed moderate amounts of grain i.e. as a supplement to forage.

For cattle fed large amounts of grain, as in the barley beef system, the safe limit will be much lower and there is a report in the literature of toxicity occurring in 85% of 1700 cattle in a large feedlot in Western Australia in 1990 These were fed barley containing only 0.06% ergot. Only 11 of the cattle died but most of the others developed clinical signs of high temperature, clear nasal discharge, increased breathing rate, poor appetite and weight loss

Care is therefore needed to ensure that the level of ergot in contaminated barley is tested to ensure that it is within safe feeding levels and, if over the limit, it should not be fed or diluted with other foods.



Ergot in barley. Ergots are similar in size to the harvested grain



Ergots produced in grass weeds are smaller but pose a similar threat to animal health

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