



Mycotoxins in stored grain

What are mycotoxins?

Mycotoxins are toxic chemicals that are produced by fungi. They can be formed in a range of food crops in the field or in grain during storage.

Mycotoxins also present a risk to human or animal health and can reduce livestock productivity. Some are known or suspected to be carcinogens. Extremely small amounts may sometimes be detected in foodstuffs.

Worldwide (but not in the UK), the greatest problems are caused by aflatoxins produced on a number of tropical crops, including cereals. In the UK the mycotoxin of greatest concern is ochratoxin A (OA).

Legislation

EU legislation currently covers aflatoxin on imported foods including cereals but is certain to be extended to cover OA in cereals. The EU is considering a limit of 3-5 parts per billion (ppb).

Even without legislation, the food industry requires that amounts of mycotoxins in food are kept to the lowest levels that can be reasonably achieved.

Field fungi

Before harvest, some *Fusarium* and *Alternaria* species occasionally produce mycotoxins. In damp

seasons, it is difficult or impossible to prevent this happening. Most of these mycotoxins survive storage, milling and processing. *Claviceps purpurea* can produce ergot bodies that contain toxic alkaloids.

Storage fungi

Careful drying and good storage management should minimise post-harvest fungal growth and, therefore, mycotoxin production.

Mouldy grain presents a serious health hazard to anyone moving or handling the grain. Far more farmers become ill because of exposure to mould spores than almost any other risk in agriculture.

However, if grain is not dried quickly or remains at >16% moisture content for several weeks during storage, OA may be produced by *Penicillium verrucosum*. This can also occur if damp spots form because of leaks, condensation or insect activity. OA is quite stable, carcinogenic and is sometimes found in bread and other cereal products.

Other mycotoxins, including citrinin, also occur in UK-stored cereals. This mycotoxin is not considered carcinogenic and usually degrades during food production. Its effects may be noticed in livestock, especially pigs. As it is also

Action:

- Ensure storage facilities are clean and free from dust and grain residues.
- Dry grain to less than 16% moisture content as soon as possible after harvest.
- Take particular care if using on-floor storage facilities to dry grain. Follow the advice given in Topic Sheet No. 16.
- Do not mix contaminated grain with clean grain in order to reduce levels of mycotoxins.
- Do not feed contaminated grain to livestock.
- If in doubt about possible contamination, consider having grain tested for mycotoxins.

formed by *P. verrucosum* it often occurs with OA.

HGCA-funded R&D

HGCA funded surveys on mycotoxin-producing fungi on winter wheat in 1989 and 1990 and on OA in cereals stored from harvest 1999. The results confirm that mould and mycotoxin incidence depends mainly on climate and storage conditions.

A study of grain from 24 farm stores using on-floor drying was

carried out in 1998. Samples were collected during drying and storage and grain moisture content, temperature, fungal species and OA levels measured.

Analysis of 108 out of 240 samples showed low OA levels in 8 samples from 4 farms. Mould associated with OA was found in samples from 3 farms. The highest level detected was 5.9 ppb.

In well-managed grain total mould counts steadily declined in store as the field fungi infecting grain at harvest died out and storage fungi were unable to develop (Figure 1). If moisture content remained significantly above 16%, field species survived for much longer although ultimately were often replaced by storage fungi, eg *Penicillium* species (Figure 2). However, because grain temperature fell during on-floor drying, this extended the storage time available for drying before toxin could be produced.

Sensitive and reliable analysis for mycotoxins is expensive and requires laboratory facilities. Simple and rapid commercial mycotoxin test kits were reviewed in HGCA-funded work. None were yet considered suitable or fast enough for routine monitoring of OA in lorries at intake.

Summary

HGCA-funded survey work has indicated that mycotoxins present an occasional risk to UK cereals. Legislation currently being drafted is likely to cover ochratoxin A. While it is difficult to eradicate field fungi, farmers should dry and cool grain as quickly as possible after harvest. Take particular care if using on-floor drying systems. Simple and cheap mycotoxin test kits are not yet available for routine testing of grain by farmers or storekeepers.

Further information:

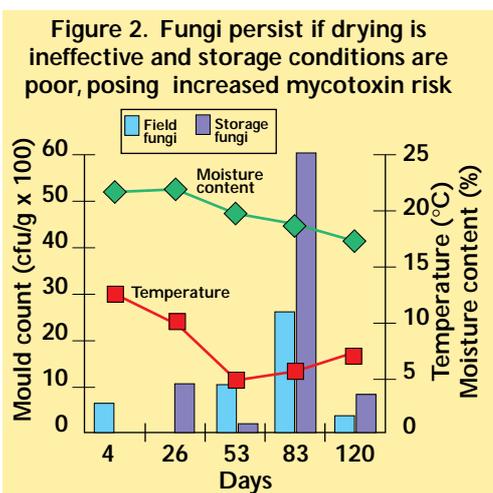
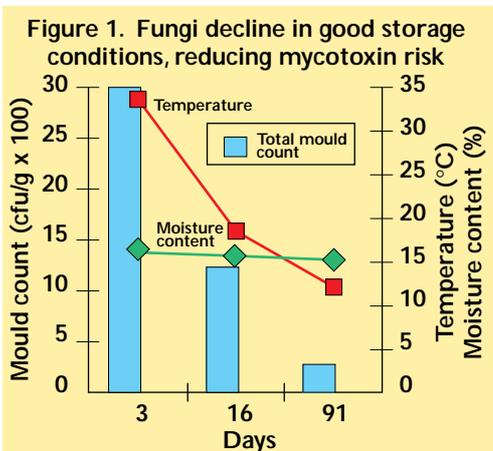
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The grain storage guide (free to levy payers from HGCA)

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