Stored grain

Quality

Keep a tight lid on storage to reduce risk

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With the harvest season complete, producers storing grain on-farm will benefit from a vigilant approach with clean, dry storage.

Grain buyers are demanding increasingly high standards for grain appearance, quality factors, chemical residues and freedom from pests. Storage conditions are critical to meet expected standards.

Grain is perishable and its quality will rapidly deteriorate during storage in warm, moist conditions.

Optimum storage maintains grain in an environment where changes only occur slowly or not at all. This usually means keeping it cool and dry.

Cereal grains maintain their quality if kept at a moisture content of 12 per cent or less and free from pests. Oilseeds stored on-farm require even lower moisture contents, depending on oil content, to maintain optimum quality.

Grain quality and germination potential are maintained if grain is kept at temperatures less than 20ºC, when most insect pests breed slowly or not at all.

Growers can use well-controlled aeration systems or heat-reflective white-painted silos to help achieve and maintain lower grain temperatures.

The risk of rapid deterioration in grain quality increases as temperature and moisture levels increase. Grain stored at high temperatures and moisture contents will deteriorate in quality after a few days without cooling, aeration or drying.

A clear understanding of the capabilities of on-farm grain handling and storage will help growers avoid expensive mistakes.

Beth Field

Effective storage can enhance grain quality. Inset: For on-farm grain storage, CSIRO recommends raised, sealed silos, painted white and sited on a concrete base to enable a residue-free environment.

Pest-free grain

Maintaining cool, dry conditions during storage will help control pests, but it is unlikely to prevent completely attack from insects, rodents and birds.

A three-pronged approach is needed to reduce the risk of attack. This involves detecting pests, killing them and keeping pests out of the storages.

The earlier pests are detected, the sooner they can be removed. This is especially important with insects, which can multiply at rates of up to 100-fold per month if left unchecked. Regular inspection of all grain storage facilities and the use of traps can help detect a potential infestation.

Check storages fortnightly, or at least monthly, to ensure quality is maintained and pest problems do not get out of control.

Pests such as rodents and insects are often more active in the evening and therefore easier to see. Insects will often congregate at or near the grain peak. But for safety reasons, do not enter filled bin type storages to carry out an inspection. Examine the grain surface from the hatch using a torch or gather surface samples using a scoop (for example a tin attached to a broom handle). Samples also can be run out of the bottom chute.

Trap early

Start inspecting and trapping before harvest to help locate existing infestations. A monthly inspection of traps which have been left in place for a week would be sufficient.

If traps are empty, this may only reveal that no insects were caught, not that there are no insects present. While many grain storage pests are relatively easy to trap some, such as grain weevils (*Sitophilus spp.*) and lesser grain borer (*Rhyzopertha dominica*), are notoriously difficult species to detect by any method.

The presence of detectable numbers of grain storage insects is a warning that a substantial problem is on its way.

If the stored grain remains cool (less than 20ºC) then any insect problem will develop slowly or not at all.

But if grain is allowed to heat or stay warm with summer temperatures, the few insects detected can develop into an overwhelming number within a couple of months.

Unless the grain is to be used immediately, treat the presence of a few insects as a signal to act. Leaving an infestation until it becomes rampant or until the grain is about to be sold creates a difficult if not impossible pest-control situation.

Keeping pests out

The basis of pest-free grain is common sense and clean, well maintained grain handling and storage facilities.

Photos: CSIRO Entomology

Grain weevils (Sitophilus spp.) are important pests of stored grain which have the potential to cause substantial grain damage and contamination.

in brief

- The quality of stored grain on-farm will be maximised by keeping it cool, dry and pest-free during storage.
- Vigilance with pre-harvest pest control will reduce the risk of pest infestations during the storage period.
- Regular monitoring of grain handling and storage facilities will ensure pest problems are nipped in the bud.
- Ensure withholding periods for insecticides are maintained to keep market options open.

Birds can be kept out by using suitable netting and by keeping doors to grain stores closed. Prevent rodents from entering storage facilities by removing clutter and other potential nesting sites. Insects that infest freshly stored grain are most likely to have come from grain residues left from previous seasons. These residues are often found in harvesting, handling and storage equipment, in rubbish and other clutter.

Thoroughly clean all grain-handling equipment and storage facilities as it is the small quantity of residue 'up behind and round the back' that is the most likely source of insect pest problems.

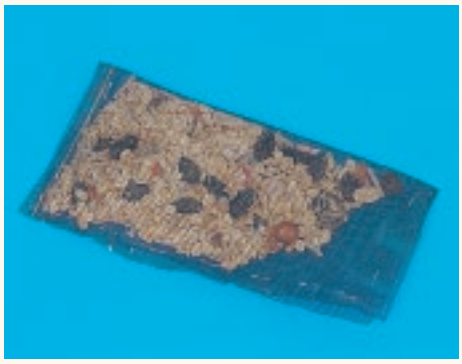
Make a note of places where grain residues are found, dispose of or redesign facilities to eliminate the problem, or at least inspect and clean such sites before storing new grain.

Provided the grain storage facilities and incoming grain are free of pests at the time of filling with pest-free grain, sealed silos maintained to manufacturer's specifications offer a significant barrier to the entry of all pests, even insects.

Killing pests

Fumigants and grain protectants are the most common methods of killing stored grain insect pests.

Several gases are available to fumigate infested stored grain. The most frequently used chemical for this purpose is phosphine.



Bait traps can be used to detect insect infestations in structures and machinery.

While phosphine is highly toxic to humans, it takes time for it to kill insects.

For effective use the gas must be maintained in a storage facility for 5–10 days depending on the insect species. This requires a sealed structure; on-farm this typically means a silo bin that is sealed or a bunker with an intact plastic cover.

Phosphine will not work effectively in an unsealed structure. A small number of adult insects may be killed but many other insect life stages will remain unharmed. These surviving stages will emerge a few days later to carry on where the previous insects left off.

Several pesticides are available for use on cereal grains only or to kill insects in storage facilities. Generally speaking these can only be applied effectively to moving grain as it is being loaded into the storage facility.

Grain protectants merely help prevent grain becoming infested initially. They are not designed or marketed as materials to control insect infestations of stored grain.

Only use grain protectants and fumigants in strict accordance with the product label and in such a way as to meet 'health and safety' and 'duty of care' legislation.

Remember that many chemicals have withholding periods; a time after treatment where chemically treated grain cannot be used.

Before applying any chemical, find out what the market will accept. Only use chemicals which are in-date and say on the label that they are suited to the application. If in doubt contact the chemical supplier. This also applies to stock that are fed treated grain.

Inappropriate use of chemicals is a quick way to render a product unmarketable.

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More Information

For information on trapping stored grain pests see *Farming Ahead* No.91, page 43