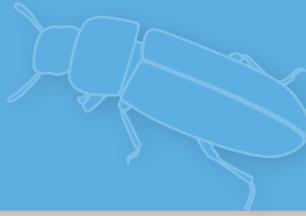


GRAIN STORAGE FACT SHEET



WESTERN REGION STORED GRAIN PESTS — IDENTIFICATION

In a deregulated grain market, on-farm storage is now more popular than ever before. But finding insects crawling up the sides of your grain hopper while loading a truck is frustrating and costly to manage. Regular monitoring is the first step to ensure delivery of insect-free grain to market.

KEY POINTS

- ▶ Avoid surprises when selling stored grain by monitoring for insect pests monthly.
- ▶ Sample from the top and bottom of grain stores for early pest detection.
- ▶ Warming an insect sieve in the sunlight will encourage insect movement, making pests easier to see.
- ▶ Correct insect identification will allow for more targeted pest control options.
- ▶ Exotic pests are a threat to the Australian grains industry — report sightings immediately.

Insect control protects grain

If stored grain is not properly managed there is a potential for it to become infested with stored grain pests.

Grain for domestic human consumption and especially grain for export must not contain live insects.

Regular inspection by sieving grain from the top and bottom of silos will provide an early warning of insect infestation.

Pitfall traps installed in the top of the grain store will show insects are active long before they are seen on the surface of the grain.

Protecting any grain stored from insect attack makes economic sense, because even feed grain can lose value through loss of protein or palatability, affecting livestock growth rates.

Seed grain is next year's investment and if boring insects are present they will destroy the germ of the grain.

Key pest species

Cereal grains include wheat, barley, oats, triticale, sorghum and maize. The most common insect pests of stored cereal grains in Australia are:

- ▶ **Weevils:** (*Sitophilus* spp.) Rice weevil is the most common weevil in wheat in Australia
- ▶ **Lesser grain borer:** (*Rhizopertha dominica*)
- ▶ **Rust-red flour beetle:** (*Tribolium* spp.)
- ▶ **Saw-toothed grain beetle:** (*Oryzaephilus* spp.)
- ▶ **Flat grain beetle:** (*Cryptolestes* spp.)
- ▶ **Indian meal moth:** (*Plodia interpunctella*)
- ▶ **Angoumois grain moth:** (*Sitotroga cerealella*)

Another dozen or so beetles, psocids (booklice) and mites are sometimes present as pests in stored cereal grain.

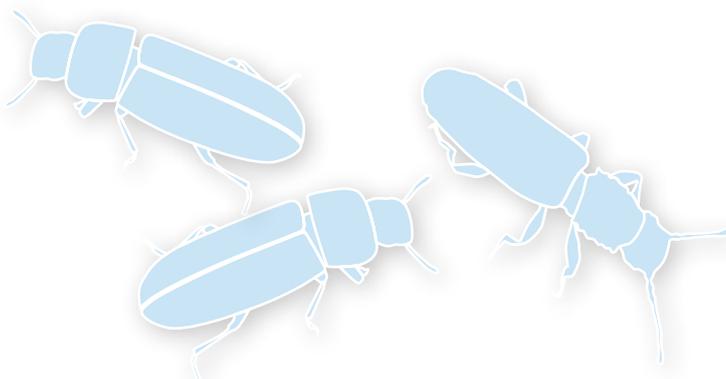
Oilseeds include canola, linseed, safflower, cottonseed and sunflower. The most common pests in stored oilseeds are:

- ▶ Flour beetles
- ▶ Saw-toothed grain beetles
- ▶ Moths

Resistance

Poor fumigation practices (such as unsealed silos) have also increased the number of phosphine-resistant stored grain pests. Such resistance can threaten grain exports as live insects remain in grain after fumigation.

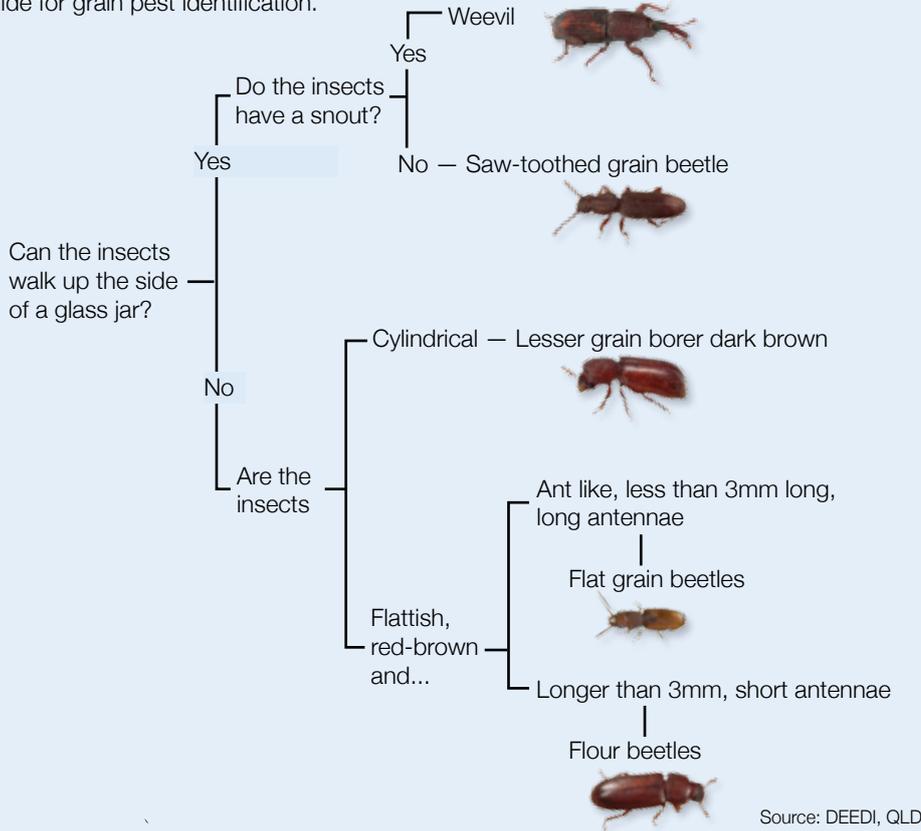
If insects survive fumigation, contact your regional grain storage specialist. See contact details on page 4.



IDENTIFICATION OF COMMON BEETLE PESTS OF STORED GRAIN

FIGURE 1 IDENTIFICATION OF COMMON PESTS OF STORED GRAIN

The following flow chart provides a useful guide for grain pest identification.



LESSER GRAIN BORER
(*RHYZOPERTHA DOMINICA*)

- A serious pest of most stored grains.
- Dark brown cylindrical beetle (3mm long). Borers have their head tucked under their body with their eyes and mouth only visible from the side.
- Adult beetles are strong flyers and live for 2–3 months.
- Females lay 200–400 eggs on grain surface. Breeding ceases below 18°C.
- Young larvae (white with brown heads) initially feed outside then bore into grain.
- Life cycle completed in four weeks at 35°C and seven weeks at 22°C.
- Aeration cooling effectively reduces activity and breeding.
- Their habit is to remain hidden in grain. Sieving required for detection.



RUST-RED FLOUR BEETLE
(*TRIBOLIUM CASTANEUM*)

- Common pest of stored cereal grain, processed grain products, oilseeds, nuts and dried fruit.
- Adult beetles are reddish-brown (3–4.5mm long) with club-shaped segments on antennae ends.
- Adults live from 200 days to two years and fly in warm conditions.
- Beetles will infest grain, but breed more successfully on processed products (such as flour).

- Up to 1000 eggs per female, loosely scattered through the commodity.
- Cream-coloured larvae feed externally on damaged grain and cereal dust.
- Life cycle completed in four weeks at 30°C, 11 weeks at 22°C and reproduction stops below 20°C.
- Similar species: *Tribolium confusum* – confused flour beetle, more common in cool, temperate regions.



RICE WEEVIL
(*SITOPHILUS ORYZAE*)

- Major pest of whole cereal grains.
- Small (3–4mm long) dark brown-black weevil with a long 'snout' and four light spots on back.
- Adults live 2–3 months, do not readily fly but climb vertical surfaces (for example, glass jar).
- White larvae generally not seen as they feed and develop inside single grains.

- Life cycle completed in four weeks at 30°C, 15 weeks at 18°C, breeding stops below 15°C.
- **Similar species:** *Sitophilus zeamais* – maize weevil, and *Sitophilus granarius* – granary weevil.



SAW-TOOTHED GRAIN BEETLE
(*ORYZAEPHILUS SURINAMENSIS*)

- Infests cereal grains, oilseeds, processed products, peanuts and dried fruits.
- Fast moving, dark brown-black beetle (3mm long) with characteristic saw-toothed pattern on each side of thorax.
- Adults move rapidly through stored grain and fly in warm conditions. They may live for several months.
- Females lay 300–400 eggs loosely throughout the grain stack.
- White, flattened larvae feed and develop externally but are hard to see.
- Preference for damaged or processed grain to establish in significant numbers.
- Life cycle completed in three weeks at 30–33°C, 17 weeks at 20°C, reproduction stops below 17.5°C.



FLAT GRAIN BEETLE
(*CRYPTOLESTES* SPP.)

- Infests most stored grain feeding on damaged grain.
- Small, flat and fast moving reddish-brown beetles (2mm long) with long antennae.
- Adults fly readily and can live for several months.
- Females lay up to 300 eggs loosely in the grain stack.
- Larvae, with characteristic tail and horns, feed and develop externally on damaged grains.
- Life cycle completed in four weeks at 30–35°C with moist conditions, 13 weeks at 20°C, breeding stops at 17.5°C.
- There are several closely related *Cryptolestes* species with similar appearance and habits.
- A strain of flat grain beetle has developed high phosphine resistance. Contact your regional grain storage specialist (see contact details page 4).



PSOCIDS
(*LIPOSCELIS* SPP), BOOKLICE

- Infests a wide range of grains and commodities.
- Considered a secondary pest, feeding on damaged grain and moulds.
- Very small (1mm long) usually, appears as a 'moving carpet of dust' on grain or storage structures.
- Eggs laid on grain surface, hatching to nymphs that moult through to adult stage.
- Thrives under warm, moist conditions – optimum 25°C and 75% relative humidity. Life cycle 21 days.
- Three main species of psocids in Australia, often in mixed populations. Some can fly.

PHOTOS: DEEDI, QLD

EXOTIC PESTS – BE ON THE LOOKOUT

The following pests have a high potential impact on the value of stored grain if they were to establish in Australia. Report any unusual sightings immediately to the local State department of agriculture or ring the Exotic Plant Pest Hotline on 1800 084 881.



KARNAL BUNT
(*TILLETIA INDICA*)

PHOTO: PADIL

- Not present in Australia.
- Can infect wheat, durum and triticale.
- Usually only part of each grain is affected.
- Infected stored grain will have a sooty appearance and will crush easily, leaving a black powder.
- Infected grain often has a rotten fish smell, flour quality is seriously reduced.
- Symptoms are similar to common bunt.



KHAPRA BEETLE
(*TROGODERMA GRANARIUM*)

PHOTO: MINISTRY OF AG. AND REGIONAL DEVELOPMENT

- Not present in Australia.
- Attacks most stored grains.
- Adults have wings but do not fly.
- Larvae are covered in fine hairs.
- Looks identical to the warehouse beetle to the naked eye.
- Causes grain loss in storage.
- Larvae skins contaminate grain and cause allergies on consumption.
- Phosphine fumigation is not reliably effective.

Monitoring information

To maintain grain quality and to select the correct treatments, identify pests early by sampling monthly.

Sieving is the most effective method of detecting grain pests.

Sieve samples from the top and bottom of stores to detect low levels of insects early.

Sieving samples onto a white tray will make it easier to see small insects. Holding the tray in the sunlight warms the insects and encourages movement making it easier to identify them and monitor population numbers.



PHOTO: CHRIS WARRICK, KONDININ GROUP

Sieve a sample: Shaking a grain sample on a mesh sieve (2mm) will separate any insects making them easier to identify. Sieves need to hold at least half a litre of grain.



PHOTO: CHRIS WARRICK, KONDININ GROUP

Probing pests: Taking a representative grain sample, providing it's safe to do so, requires a grain probe. Some pest species avoid light so are more easily detected by using a probe and sieve.

Grain pest identification

A clean glass container helps to identify grain pests. Place the live insects into a warm glass container (above 20°C so they are active, but not hot or they will die).

Weevils and saw-toothed grain beetles can walk up the walls of the glass easily, but flour beetles and lesser grain borer cannot.

Look closely at the insects walking up the glass — weevils have a curved snout at the front but saw-toothed grain beetles do not.



PHOTO: CHRIS NEWMAN, DAFFWA

Caught at work: Push the probe or pitfall cone trap below the surface of the grain. Insects moving through the surface grain layers enter trap holes and are captured. Inspect traps once every month.

Useful resources

GRDC Grain storage extension project
www.storedgrain.com.au

Exotic Plant Pest Hotline
1800 084 881

Grain Trade Australia
02 9235 2155
www.graintrade.org.au

Graintec Scientific Pty Ltd
07 4638 7666
www.graintec.com.au

FURTHER READING

Crop Insects: the Ute Guide – southern and western grain belt edition Ground Cover

Crop Insects: the Ute Guide – northern grain belt edition Ground Cover

Stored grain pests identification (The back pocket guide)

Stored grain pest control guide (Fact sheet)

1800 11 00 44

Email

ground-cover-direct@canprint.com.au

GRAIN STORAGE SPECIALISTS

QLD and northern NSW, Philip Burrill

0427 696 500

Email philip.burrill@daff.qld.gov.au

Southern NSW, VIC, SA and TAS, Peter Botta

0417 501 890

Email pbotta@bigpond.com

WA, Ben White

08 6189 2457

Email ben@storedgrain.com.au

GRAIN BIOSECURITY CONTACTS

Plant Health Australia

02 6215 7700

Email biosecurity@phau.com.au

www.planthealthaustralia.com.au

GRDC PROJECT CODE

PAD00001

Acknowledgements: Philip Burrill, DAFF QLD. Peter Botta, PCB Consulting. Chris Newman, Stored Grain Services. Ben White, GIWA. Chris Warrick, ProAdvice.

DISCLAIMER

Any recommendations, suggestions or opinions contained in this publication do not necessarily represent the policy or views of the Grains Research and Development Corporation. No person should act on the basis of the contents of this publication without first obtaining specific, independent professional advice. The Corporation and contributors to this Fact Sheet may identify products by proprietary or trade names to help readers identify particular types of products. We do not endorse or recommend the products of any manufacturer referred to. Other products may perform as well as or better than those specifically referred to. The GRDC will not be liable for any loss, damage, cost or expense incurred or arising by reason of any person using or relying on the information in this publication.

CAUTION: RESEARCH ON UNREGISTERED PESTICIDE USE

Any research with unregistered pesticides or of unregistered products reported in this document does not constitute a recommendation for that particular use by the authors or the authors' organisations. All pesticide applications must accord with the currently registered label for that particular pesticide, crop, pest and region.

Copyright © All material published in this Fact Sheet is copyright protected and may not be reproduced in any form without written permission from the GRDC.

PRODUCED BY: WWW.PROADVICE.COM.AU