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Monitoring **STORED GRAIN** ON FARM

GRAINS FARM BIOSECURITY PROGRAM

Monitoring stored grain on farm

GRAINS FARM BIOSECURITY PROGRAM

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Plant Health AUSTRALIA

Grain storage – what to consider

BIOSECURITY IN GRAIN STORAGE

Biosecurity is the protection of livelihoods from the threats posed by pests. Comprehensive biosecurity systems help ensure Australia's food security and food safety, while good biosecurity practices protect productivity and make good business sense.

In a deregulated grain market, on farm storage is more important than ever before. If stored grain is not properly managed it can become infested with stored grain pests, which can be difficult and costly to control.

The presence of live insects delays grain sales and can impact grain markets.

Management practices applied early in the value chain have an impact on grain quality and pest numbers in the months proceeding as grain moves towards its end use.

This booklet is designed to assist you in protecting your stored grain from common stored grain pests, reducing the risk of pest issues. Further information on grain storage is available from **storedgrain.com.au.**

PROTECTING AUSTRALIA'S GRAIN MARKETS

Plan for insect control before storage

Grain markets demand that grain meets quality specifications and is free of live insects. If live insects are detected as grain is out-loaded for sale, treatments will delay the delivery by 2–4 weeks.

To maintain pest-free stored grain of good quality and value:

- Make full use of good hygiene and aeration cooling – this can overcome 70% of pest problems.
- Identify pest incursions early through regular monitoring.
- Select and apply appropriate treatments correctly.
- Keep storage records on grain quality, pests and treatments.

Pest prevention is better than cure

One tonne of infested grain can produce more than one million insects during a year, which can walk and fly to other grain storages to start new infestations.

Regular monitoring means pests will be found and identified well before dispatch, allowing them to be treated appropriately before they become a much larger problem.

With growers increasing the amount of grain stored on farm, an integrated approach to pest control is crucial.

There are four key factors in stored grain protection:

- hygiene
- aeration cooling
- regular pest monitoring and recording
- use of correct fumigation practices.

Remove spilt and left-over grain

Hygiene

Grain residues will provide shelter and food for pests and allow large numbers to build up and infest other grain storage sites under favourable conditions (i.e. the start of Spring).

Remove all grain residues to limit the areas where insects can survive and breed.

Maintain good hygiene around your storage areas, including thorough cleaning of grain handling equipment like headers, augers, field bins, silos and bulk storages, well before harvest.

The first grain harvested is often at the greatest risk of pest infestation due to contamination with grain left over from the previous season.

Separate the first few tonnes of grain that pass through headers and grain handling equipment at the start of harvest. Use it quickly for stock feed, or plan to aeration cool, then fumigate this grain within 4 weeks.

STORAGE CHOICES

A good quality storage environment not only inhibits insect activity, but also maintains grain quality. A storage facility should have at least two sealable, aerated silos on farm to provide the option for an effective fumigation and delivery program.

When buying a new silo, purchase a quality, sealable silo fitted with an aeration fan. Check with the manufacturer that it meets the Australian Standard for sealable silos (AS2628) and pressure test on delivery and at least once a year.

Many older silos were not designed to be sealed and cannot be used for fumigation, however fitting aeration cooling fans may be an option, and maintaining good hygiene standards will reduce insect numbers.

Attempting fumigation in non gas tight storages contributes to the development of phosphine resistant insects.

Silo bags should be monitored regularly

Grain bags

In years where there is high production, grain bags or silo bags can be useful for short term storage.

Wheat, feed barley and sorghum are suitable for use in bags. Silo bags are not recommended for higher value crops such as canola, pulse crops, malting barley or planting seed.

If using numerous bags, co-locating them into a central site is recommended as this helps with site preparation, monitoring and bag maintenance.

Ideally the site should be hard, smooth, elevated and have a gentle slope for drainage. Fence the site to reduce damage from livestock or wildlife.

Silo bags should be monitored regularly for both insect and vermin pests. To manage mice, establish mice baiting stations and keep the area around the site free of grass. If you purchase good quality UV stable bags (ISO 9001 compliant) you should be able to undertake a successful fumigation for insect pests if needed.

For more information on storing grain in silo bags and how to fumigate in silo bags, go to: **storedgrain.com.au/successful-storage-in-grain-bags/**

Aeration cooling

Freshly harvested grain usually has a temperature around 30°C, which is an ideal breeding temperature for grain storage pests.

Aeration fans fitted to stores can rapidly cool grain temperature, reducing pest breeding and slow development. Aim to keep grain at less than 23°C in summer and less than 15°C in winter.

Aeration is also useful in helping to manage grain moisture content. Creating uniform low moisture in bulk grain storages will also limit pest development and maintain seed viability. Prompt blending or drying is a common way to reduce the average moisture content of stored grain.

Aeration fans fitted to silos can rapidly reduce grain temperatures

Begin aeration of grain as soon as it is placed into storage. For reliable results use an automatic controller that selects optimal ambient temperature and humidity.

Monitoring

Regular monitoring of stored grain is essential. Grain should be checked for insect pests, temperature, moisture content, quality and germination.

Early detection of pests gives the best chance of effectively treating the grain, preventing loss of grain quality and market access. See page 7 for details on monitoring stored grain.

Silos with ventilation units

Effective fumigation

When fumigating stored grain always read the chemical label and follow all directions.

Fumigants such as phosphine are only effective when used in gas-tight sealable grain storage facilities.

Only fumigate grain in a gas-tight silo.

Grain storage is gas-tight when it is able to pass at least a 3 minute half-life pressure test. For more information on silo pressure testing see: **storedgrain.com.au**.

If the silo isn't well sealed the gases leak out rapidly and the fumigation will not kill all stages of the pest's lifecycle. In addition to being ineffective this practice results in the proliferation of insecticide-resistant pests.

Follow all safety and application directions when mixing and applying fumigants

Resistant insects, transported in machinery or flying between stores, threaten grain exports and the industry.

Grain markets have limitations on levels of chemical residues (MRL) that must be adhered to. The demand for pesticide residue free (PRF) grain is increasing.

Check that grain buyers or potential markets will accept any insecticides you intend to use.

Ensure that phosphine tablets do not come into direct contact with grain, as grain must be free of tablet residues.

Keep records of silo fumigation. A record sheet template is shown on the following page and an electronic version can be downloaded from **planthealthaustralia.com.au/gfbp.**

Grain protectants should only be used on freshly harvested grain and not used to treat an infestation.

Aluminium phosphide record keeping sheet – for silo fumigation

Supervisor's details (if applicable): _____

Applicator's details: _____

Name and location of fumigated silo: _____

Contents and approximate tonnage: _____

Pest ID/date found	Half-life press test	Silo capacity (m^3 or tonnes of wheat when full)	Treatment product information				Fumigation			Ventilation		Withholding period (days)	Date of treatment residues removal	Date(s) of follow up inspection for insects
	Silo pressure test result		Treatment product/type (tablets, bag chains, etc.)	Application method/ location	Grain temperature (°C)	Dose/treatment quantity applied	Fumigation start date	Monitoring of fumigation levels (date/time/result (ppm))	Fumigation end date	Ventilation type (natural or forced aeration)	Start date/end date			

An electronic version can be downloaded from **planthealthaustralia.com.au/gfbp**

How to monitor stored grain

SAMPLING GRAIN FOR PESTS

Damage by grain insect pests often goes unnoticed until the grain is removed from storage.

Regular monitoring helps to ensure that grain quality is maintained.

- Sample each grain storage at least monthly. Fortnightly sampling is recommended during warmer periods of the year.
- Take samples from the top and bottom of grain stores and sieve (using 2 mm mesh) onto a white tray to separate any insects.
- Hold tray in the sunlight for 10–20 seconds to trigger movement of any insects, making them easier to see. Use a magnifying glass to identify pests. Refer to grain pest identification chart on page 10.

Use a 2 mm mesh sieve to separate insects from grain

- Grain probes can also be used to check for insects. These traps are left in the grain during storage and are often able to detect the start of an infestation if regularly monitored.
  - Push probe/trap into the grain surface and pull up for inspection fortnightly/monthly.
  - Place 1–2 traps in the top of a silo or several traps in grain stored in sheds.

- Contact a grain storage specialist (p. 31) for information on sieves or grain probes.
- Be sure to check grain 3 weeks prior to sale to allow time for fumigation if required.
- Further information on sampling grain is available from **storedgrain.com.au.**

Probe traps pushed into grain at the top of silos or bulk grain storages help detect the first signs of an insect infestation

MONITORING GRAIN TEMPERATURE AND MOISTURE CONTENT

- Pests and grain moulds thrive in warm, moist conditions. Monitor grain moisture content and temperature to prevent problems.
- Use a grain temperature probe to check storage conditions and aeration performance.
- When checking grain, smell air at the top of storages for signs of high grain moisture or mould problems.
- Check germination and vigour of planting seed in storage.
- Aeration fans can be used to cool and dry grain to reduce storage environment problems.
- Monitor the number of hours the aeration fans have run (should be between 80–120 hours per month).

If safe, monitor from the top and bottom of grain storages

Monitor moisture and temperature using a digital probe

It is vital to monitor grain temperature and moisture content to prevent pests and grain moulds from thriving.

GRAIN MONITORING TOOLS

- 2 mm mesh sieve and white tray
- push probes
- grain thermometer
- magnifying glass
- pest ID guide
- clear plastic or glass jar
- moisture meter
- recording booklet
- phosphine detector
- vials and sticky tape to catch insects.

Stored grain pest identification

The tolerance for live storage pests in grain either for domestic animal feed, human consumption or export markets is nil.

Furthermore, an increasing number of grain markets are requesting nil chemical residues on grain.

It is important to accurately identify any pests to ensure use of the most appropriate control options.

Correct identification and treatment choice helps prevent pest treatment failures due to chemical resistance. Follow the pest identification chart to work out which pest you have.

Regular monitoring of grain avoids surprises when out-loading

WHAT TO DO IF LIVE INSECTS ARE FOUND

Identify pests and select the appropriate treatment for the grain type and insect. Always use correct fumigation techniques in pressure tested, sealed silos. Ensure potential grain buyers and end users will accept the treatments you select.

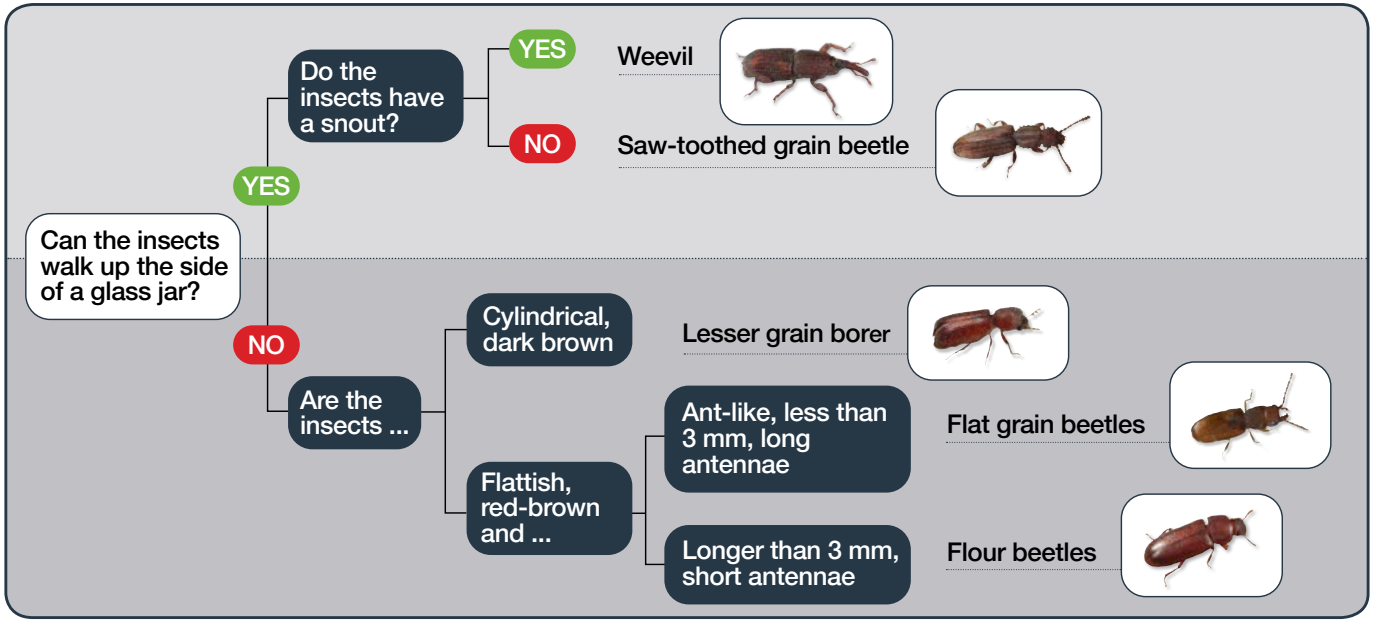
HOW TO IDENTIFY COMMON GRAIN PESTS

Keep a good magnifying glass handy to see the key features of insects. A piece of sticky tape may be helpful to hold insects still. Vials should be used to collect and send insects for identification.

To assist identification, place live insects into a glass container and check if they can climb up the glass. If it is cold, warm the jar in the sun briefly to encourage the insects to move. Use the identification chart on the following page.

Bruchids on mungbeans

STORED GRAIN PEST IDENTIFICATION CHART



Source: QDAF

GENERIC LIFECYCLE OF STORED GRAIN BEETLES

Most stored grain beetles measure between 2 and 3 mm in length and are brownish in colour. Some of the more common grain beetle species are clearly identifiable. Typically, the insects look slightly flattened in appearance and can be distinguished by head shape, body size, and markings.

Adults live on average six to ten months, but can live as long as three years. The females can lay between 40 and 300 eggs during their lifetime. Eggs are laid loosely among grain kernels or tucked into a crevice in a kernel. Eggs hatch in three to five days when environmental conditions are optimal (26° to 30°C).

The larvae emerge and can crawl freely about the grain to feed. Larvae can mature in about two weeks under optimal conditions, and construct cocoon-like coverings in which they pupate. The pupal stage lasts about a week. Total development from egg to adult requires about three to four weeks under optimal conditions.
Go to page 17 onwards for more information.

Protect the Australian grains industry, report suspect pests

Early detection and reporting may prevent or minimise the long-term impact of an exotic pest on your farm and the grains industry as a whole.

Report any unusual or suspect plant pest immediately via the Exotic Plant Pest Hotline on 1800 084 881.

Calls to the Exotic Plant Pest Hotline will be forwarded to an experienced person in your state or territory government, who will ask some questions about what you have seen and will either arrange to collect a sample or give information on how and where samples should be sent.

Do not send samples without first speaking to someone from the state department.

If you think you have found a suspect exotic pest, the following precautions should be taken immediately to contain the pest and protect other parts of your farm:

- Do not touch, move or transport affected grain or plant material.
- Wash hands, clothes and footwear that have been in contact with affected plant, grain or soil.
- Mark the location of the pest detection and limit access to the area.
- Restrict the movement of people and operations in the area.

Inspecting grain for pests

IF YOU SEE ANYTHING UNUSUAL, CALL THE EXOTIC PLANT PEST HOTLINE

1800 084 881

Exotic grain storage pests – not present in Australia

A number of pests present in other countries have been identified as potential threats to the grains industry. Any of these exotic pests would have serious consequences should they enter and become established in Australia.

Grain storage pests damage grain and can also have significant market access impacts which can potentially affect the ability to export grain.

Early reporting enhances the chance of effective control, eradication or management.

Grain storage facility for export markets

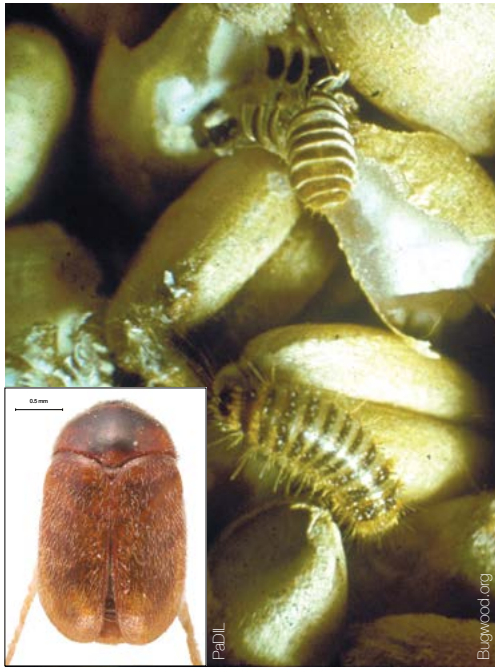
Loading grain for export

The two exotic stored grain pests of greatest concern to the Australian grains industry are Karnal bunt (*Tilletia indica*) and khapra beetle (*Trogoderma granarium*). Either pest would have a serious impact on grain export markets and the value of grain should they be detected in Australia.

IF YOU SEE ANYTHING UNUSUAL, CALL THE EXOTIC PLANT PEST HOTLINE

1800 084 881

Khapra beetle (*Trogoderma granarium*)



A serious exotic pest of all stored products that can cause losses of up to 75% from direct feeding, as well as reduced grain value and impact on market access. A trained specialist is required to differentiate between *Trogoderma* species.

KEY FEATURES

- Adults reddish-brown in colour, 1.5–3 mm long and covered in dense yellowish-brown hairs.
- Looks identical to the warehouse beetle, and other native dermestids, to the naked eye.
- Larvae covered in short and long hairs and are yellowish-brown when young, becoming reddish-brown as they mature.
- Damage mostly caused by larval feeding and up to 30% of grain can be damaged before it is noticed.
- Larvae can survive without food for very long periods.
- Cast skins and hair of larvae contaminate grain.
- Phosphine fumigation not reliably effective.
- When examining grain samples, look for characteristic hairy larvae and cast skins.

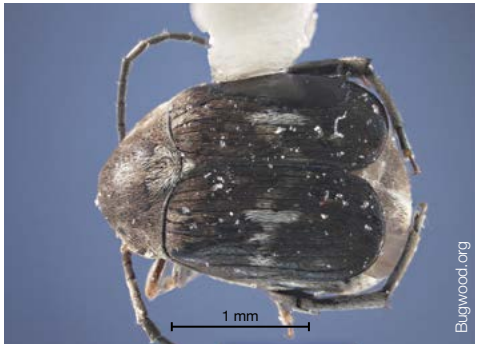
Karnal bunt (*Tilletia indica*)

The most serious exotic pest of grain (infecting wheat, durum and triticale) and greatly reduces grain quality. If established in Australia, grain price and market access could be seriously impacted.

KEY FEATURES

- Not detectable in the field since only a few grains in an ear become infected and are hidden within the glumes.
- Usually only part of each grain is affected.
- Harvesting breaks infected grains, releasing spores that can survive in soil or stored grain for at least 5 years.
- Infected stored grain has a sooty appearance and crushes easily, leaving a greasy black powder.
- Infected grain often has a rotten fish smell and flour quality is reduced.
- Symptoms are similar to common bunt.
- Import restrictions exist in many countries.

Exotic bruchids



Bruchids are pests of most pulse crops including mungbeans, cowpeas, field peas, chickpeas, soybeans and lentils.

There are many species of bruchids. Exotic species include:

- *Acanthoscelides zeteki* – pigeon pea
- *Callosobruchus analis* – soybean, mung bean, cowpea
- *Callosobruchus rhodesianus* – garden pea, mung bean, cowpea
- *Callosobruchus theobromae* – peanut, pigeon pea, soybean
- *Zabrotes subfasciatus* – beans, some strains capable of attacking mung bean, cowpea.

If bruchids are found in stored pulse commodities, a trained specialist is required to differentiate.

KEY FEATURES

- Adults (up to 4 mm long) have long antennae, climb vertical surfaces (eg. glass jar) and are strong flyers.
- Globular, tear-shaped bodies are reddish-brown to black with lighter markings.
- Not a true weevil as does not have a long weevil ‘snout’ (rostrum).
- Adults can have a short lifespan (10–12 days).
- Adults do not feed, but lay about 100 white eggs on the outside of seed.
- Larvae feed and develop within individual seeds and emerge as adults leaving a characteristic neat round hole.

Common grain storage pests in Australia

BEETLES *(Coleoptera)*

Rice weevil (*Sitophilus oryzae*)

Note four spots and snout (arrows)

Major pest of whole cereal grains commonly found throughout Australia.

KEY FEATURES

- Bores holes in grain.
- Adults are 2–4 mm long, dark brownish black with a long weevil ‘snout’ and four light spots on back.
- Adults live 2–3 months, do not readily fly but can climb vertical surfaces (eg. glass jar).
- Life cycle completed in 4 weeks at 30°C, 15 weeks at 18°C, breeding stops below 15°C.
- White larvae generally not seen as they feed and develop inside grains.
- Often observed climbing up vertical surfaces under warm conditions or when grain is moved.
- Use sieves and probe traps to detect low numbers of insects.
- The Maize weevil, *Sitophilus zeamais* is a strong flier and very similar in appearance to the Rice weevil.

Lesser grain borer (*Rhyzopertha dominica*)

Note the head tucked under the body

Serious pest of stored grain that is widespread across Australian grain producing regions.

KEY FEATURES

- Bores holes in grain.
- Adults are 3 mm long, reddish-brown to very dark brown in colour.
- Head tucked under body with eyes and mouth only visible from the side.
- Adults are strong fliers and live for 2–3 months.
- Life cycle completed in 4 weeks at 35°C, 7 weeks at 22°C, breeding stops below 18°C.
- Young larvae (white with brown heads) initially feed externally, then bore into grain.
- Usually remains hidden in grain so sieving is required to detect them.
- Resistant to a number of grain insecticides.

Rust-red flour beetle (*Tribolium castaneum*)

Note club-shaped segments on antennae ends (arrow)

Common in stored cereal grain, processed grain products, oilseeds, nuts and dried fruit.

KEY FEATURES

- Adults are 3–4.5 mm long, bright reddish-brown in colour when young and a darker brown when older.
- Club-shaped segments on antennae ends.
- Adults live from 200 days to 2 years and fly in warm conditions.
- Life cycle completed in 4 weeks at 30°C, 11 weeks at 22°C, breeding stops below 20°C.
- Cream-coloured larvae feed externally on damaged grain and cereal dust.
- Will infest whole grain, but breeds more successfully on processed products.
- Use sieving and probe traps to detect.
- Similar in appearance to *Tribolium* species (e.g. Confused flour beetle (*Tribolium confusum*) which is more common in cool, temperate regions).

Flat grain beetle (*Cryptolestes* spp.)

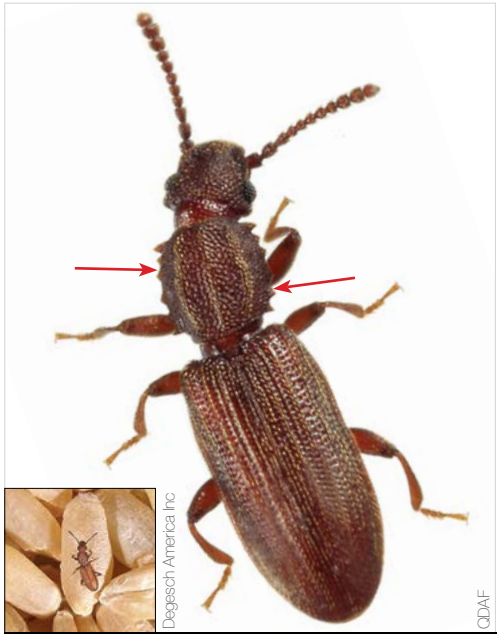
Note the long, thin antenna (arrow)

Small, fast moving pest of stored grain that usually feeds on damaged grain.

KEY FEATURES

- Adults are 2 mm long, flat and fast moving reddish-brown beetles with long thin antennae.
- Adults live for several months and can fly readily.
- Life cycle completed in 4 weeks at 30–35°C with moist conditions, 13 weeks at 20°C, breeding stops below 17°C.
- Larvae with characteristic tail and horns feed and develop externally on damaged grain.
- Sieving and probe traps usually required to detect as they avoid the grain surface.
- Some populations have developed high levels of phosphine resistance.
- There are a number of flat grain beetle species with a similar appearance. (eg. *Cryptolestes ferrugineus* the Rusty grain beetle).

Saw-toothed grain beetle (*Oryzaephilus surinamensis*)



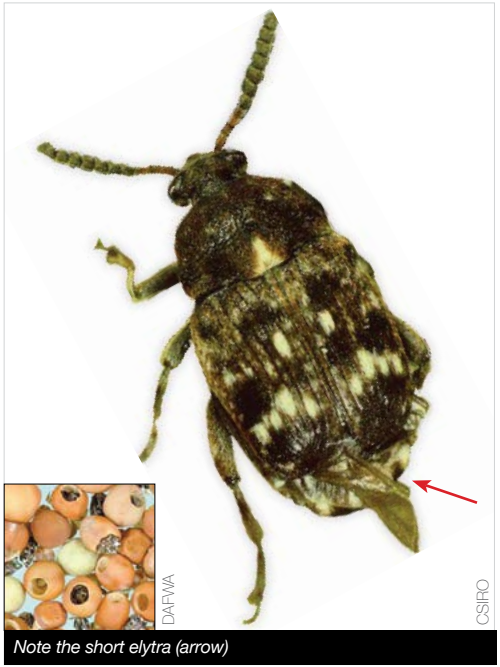
Note saw toothed pattern on each side of the thorax (arrows)

Found throughout Australia and infests cereal grains, oilseeds, processed products, peanuts and dried fruits.

KEY FEATURES

- Adults are up to 3 mm long, fast moving and dark brown-black in colour.
- Characteristic saw-toothed pattern on each side of thorax and three distinct ridge lines on top.
- Adults climb vertical surfaces (eg. glass jar) and fly in warm conditions.
- Prefers damaged or processed grain.
- Life cycle completed in 3 weeks at 30–33°C, 17 weeks at 20°C, breeding stops below 17°C.
- White, flattened larvae feed and develop externally but are hard to see.
- Sieving and probe traps are recommended to detect these insects.
- Resistant to a number of insecticides.

Pea weevil (*Bruchus pisorum*)



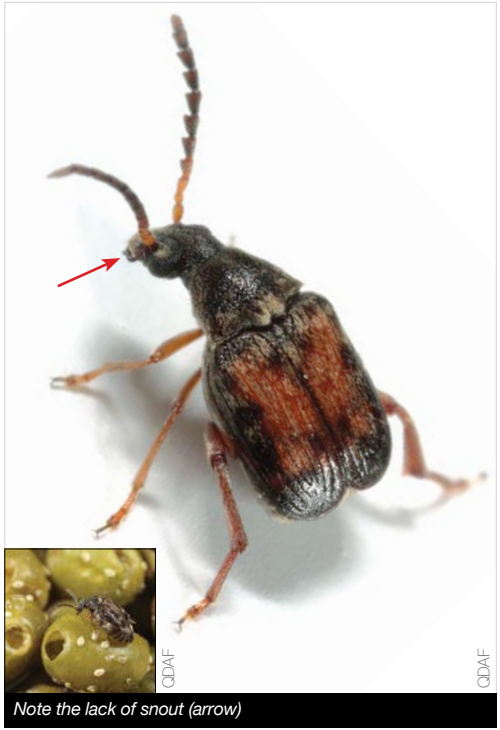
Note the short elytra (arrow)

Field and storage pest of field pea. Currently found in Australia's field pea-growing states (excluding Tasmania).

KEY FEATURES

- Adults have globular shaped body (4–5 mm long) with long legs and antennae.
- Does not have a long snout like true weevils.
- Wings are patterned with white/cream spots.
- One generation per year and only breed in standing pea crops before harvest. Eggs laid and glued onto pods.
- Adult is long-lived and overwinters, but does not feed on field peas.
- Cream coloured and C-shaped larvae bore into the seed.
- Adults are strong fliers and reappear in spring to visit flowers to feed on the nectar, then seek out new field pea crops to lay eggs.
- As eggs are laid in the field, field pea crops should be regularly checked when first pods are forming using a sweep net when temperatures are above 18°C.
- Sieve and check pea seed for neat round holes (evidence adults have emerged).

Cowpea weevils or Bruchids (*Callosobruchus* spp.)



Note the lack of snout (arrow)

Bruchids are pests of most pulse crops including mungbeans, cowpeas, field peas, chickpeas, soybeans and lentils.

KEY FEATURES

- Adults are up to 4 mm long, have long antennae, climb vertical surfaces (eg. glass jar) and are strong flyers.
- Globular, tear-shaped body is reddish-brown to black with markings.
- Does not have a long snout like true weevils.
- Adults have a short lifespan (10–12 days).
- Adults do not feed, but lay about 100 white eggs on the outside of seed.
- Larvae feed and develop within individual seeds and emerge as adults leaving a neat round hole.
- Common problem in warmer months for mungbeans especially.
- Fortnightly sampling and sieving is important to prevent serious losses.

Dried fruit beetles (*Carpophilus* spp.) and minute mould beetles (*Cryptophagidae* and *Latridiidae* spp.)

Minute mould beetle

Dried fruit beetle (Carpophilus spp.)

Beetles associated with damp, and other stored product insects, can be present and infest damp grain due to their feeding strategies as fungal feeders.

Dried fruit beetles (*Carpophilus* spp.) and minute mould beetles (*Cryptophagidae* and *Lathridiidae* spp.) can be highly mobile and tend to be attracted by moulds and yeasts on potential food. Some species feed only on the mould, not attacking the grain directly (minute mould beetles).

KEY FEATURES

- Adults are 2–4 mm long with oval-shaped flattened body. Light brown to blackish in colour often with one or two markings.
- Shortened wing covers that don't fully cover the body (abdomen).
- Globular-shaped segments on antennae ends.
- Adults are long-lived, can fly, feed and lay eggs on and in the commodity.
- Larvae feed externally, though some species (*Carpophilus* spp.) burrow into soft and mouldy parts of grain.
- Dried fruit beetles can be trapped using pheromones or a food bait
- Minute mould beetles are easily caught in pitfall traps.

Dermestids

Black carpet beetle adult and larvae (Attagenus unicolor)

Larder beetle (Dermestes lardarius)

There are a number of genera within the Dermestidae family that feed on stored products. It is important to become familiar with the general appearance and key features of this large family.

Adults are a different shape to other common stored product pests and larvae are distinctively hairy.

Further identification by a specialist should be sourced when dermestids are found in grain commodities. Genera include:

- *Trogoderma* notably the most important genera
- *Anthrenus* eg. variegated carpet beetle *(Anthrenus verbasci)* and museum beetles
- *Anthrenocerus* eg. Australian carpet beetle *(Anthrenocerus australis)*
- *Attagenus* spp. eg. black carpet beetles and fur beetles
- *Dermestes* spp. eg. hide and larder beetles.

KEY FEATURES

Adults:

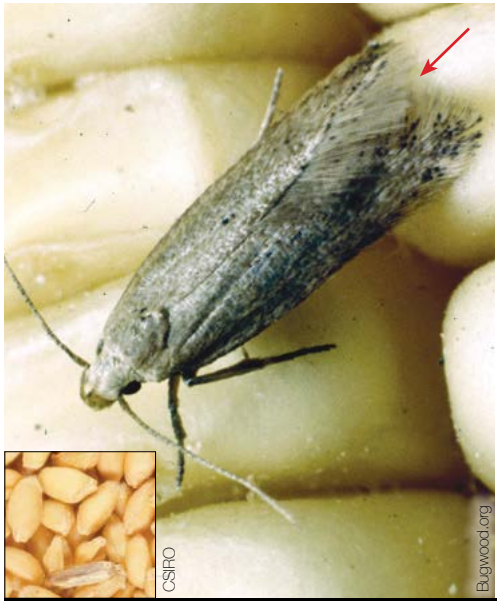
- Body smoothed compact and rounded, oval to oblong shaped. Species associated with stored products can be 2–12 mm in length.
- Body colour variable and many covered in with hairs or scales on the surface that can form colourful and characteristic patterns and markings for some species (eg. *Anthrenus* spp.).
- Compact head with clubbed antennae which can fit into a cavity.

Larvae:

- Cylindrical (oval or elongate) in shape, cream to light brown/brown in colour.
- Characteristically very hairy. Body covered with a range of short and long hairs or setae that can be tufted in some species.
- Larvae leave cast skins in grain and stored product.

MOTHS (*Lepidoptera*)

Angoumois grain moth (*Sitotroga cerealella*)



Note the long fringe of fine hairs (arrow)

Infests surface layers of whole cereal stored grains. Can infest standing maize crops prior to harvest and occasionally other cereal crops.

KEY FEATURES

- Adults (5–7 mm long) have brownish-grey body and silvery grey to grey-brown wings.
- Wings have a long fringe of fine hairs along the bottom edge and taper to a point.
- Adults cannot penetrate grain, therefore only infest surface layers of bulk grain.
- Life cycle around 5–7 weeks in warm conditions.
- Adult moths do not feed but lay 150–300 eggs on or near the grain surface, with no webbing.
- Larvae burrow into a single grain. The adult moth emerges in 10–14 days through a visible hole.
- Pupal cases are often found protruding from grain.
- Sample monthly for moths near grain surface.

Indian meal moth (*Plodia interpunctella*)

Note the distinctive colouring on the wings (arrows)

An established pest common in flour mills, processing plants, dried fruit and on the surface of stored grains.

KEY FEATURES

- Adults (5–7 mm long) have distinctive coloured wings that are dark reddish-brown on rear and grey at front.
- Adults fly readily and in summer. Their life cycle takes about 4 weeks.
- Larvae are pinkish with brown head and create webbing that contaminates grain and is characteristic of their presence.
- Larvae pupate in grains webbed together in a clump.
- Look for webbing and moths near grain surface.
- Check for leftover grain in harvesting and handling equipment before use to avoid contamination of next season's grain.

Warehouse moth (*Cadra cautella*)

Note the rounded tips and fringe of hairs on wings (arrows)

A widespread pest, commonly infesting flour mills, food processing plants, cereal grains and oilseeds.

KEY FEATURES

- Adults are 8–10 mm long and fly readily.
- Moth wings are brownish to blackish-grey with many fine, dark wavy markings, including lighter stripes extending horizontally across each forewing.
- Wings rounded at tip with a fringe of hairs.
- Adults do not feed and are short-lived. They're typically active at dusk and dawn.
- Larvae are coloured cream to light pink and create a webbing that accumulates and contaminates the grain.
- Life cycle takes 30 days under ideal conditions (30°C and 75% relative humidity).
- Sample monthly. Look for webbing and moths near grain surface.

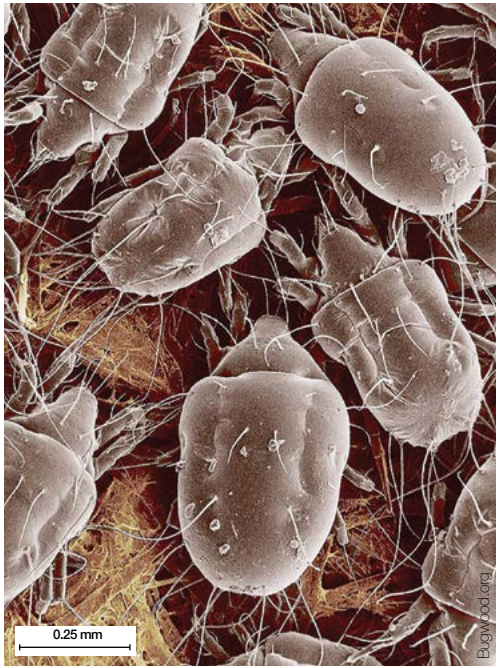
Booklice or Psocids (*Liposcelis* spp.)

Psocids are considered a secondary pest, feeding on damaged grain and moulds. They infest a wide range of grains, commodities and storage facilities.

KEY FEATURES

- Very small (less than 1 mm long), soft-bodied and opaque.
- Thrives in warm, moist conditions (optimum 25°C and 75% relative humidity).
- Life cycle 21 of days in optimal conditions.
- Eggs are laid on grain surface.
- There are three main species of psocids in Australia, often in mixed populations. Some can fly.
- Heavily infested grain becomes tainted and may trigger allergic reactions.
- Large infestations appear as a ‘moving carpet of dust’ on grain storage structures.
- Sample and sieve to detect when in low numbers.

Lemon-scented mite (*Tyrophagus putrescentiae*)



Common pest of high protein, moist foods such as stock feeds, processed grains and stored grain. Infestations reduce grain or product quality.

KEY FEATURES

- Very tiny (0.5 mm long) and not visible without using a magnifying glass or lens.
- Body translucent to pearly white with sparse, long hairs.
- Life cycle of 8–12 days.
- Usually seen in late spring to early summer in damp or moist grain.
- Mites appear as moving carpet of brown dust on grains or storage bags.
- Feeding damages grain, increases mould growth and creates an ‘off’ odour.
- Mites can cause allergies to humans.

Notes

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