

DPI&F note

Grain Storage - identification of insect pests

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Why identify stored grain pests?

Most insect control methods for stored grain work against all species. So you don't need to identify the storage pests to make decisions about most control methods.

But if you intend spraying grain with insecticides you may need to know which species are present if:

- a previous application has failed and you want to know whether resistance was the reason - if more than one species survived, resistance is unlikely to be the cause
- you intend using a residual protectant to treat infested grain – pyrimiphos-methyl, fenitrothion and chlorpyrifos-methyl are ineffective against lesser grain borer, and pyrimiphos-methyl and fenitrothion are generally ineffective against sawtoothed grain beetle
- you intend using dichlorvos to treat infested grain - if lesser grain borer is present you need to apply the higher dose rate

Insecticide sprays are not registered for oilseeds and pulses, so identification of pests in those grains is not so important.

For details of recommended control measures, see DPI&F Note "Grain Storage – Insect Control in Stored Grains", available at -----**(CHECK THIS LINKAGE ADDRESS)**

Common species

Cereal grains

Cereal grains include wheat, barley, oats, triticale, sorghum and millets. 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: (*Rhyzopertha dominica*)
- Rust Red Flour Beetle: (*Tribolium spp.*)
- Sawtooth Grain Beetle: (*Oryzaephilus spp.*)
- Flat Grain Beetle: (*Cryptolestes spp.*). See images in this DPI&F Note.

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

Oilseeds

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

- Flour beetles
- Sawtoothed grain beetle
- Moths of various species. See images in this DPI&F Note.

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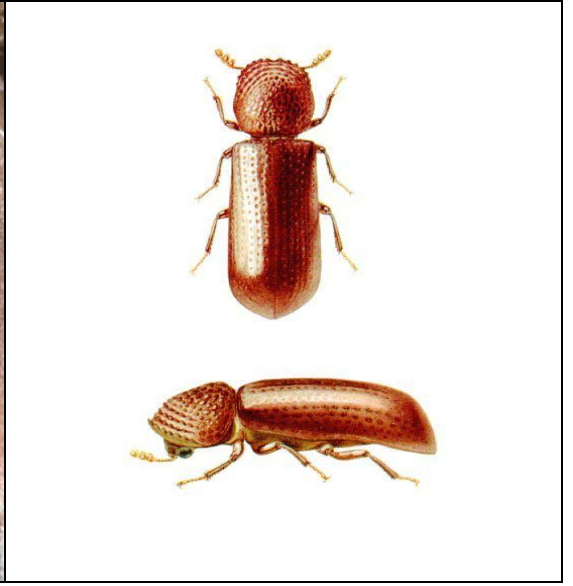
Pulses

Pulses include: faba beans, chickpea, cowpea, field pea, mung bean, navy bean, soybean, pigeon pea. The most common insect pests of stored pulses are Bruchid beetles, and moths. See images in this DPI&F Note.

Weevils - the Rice weevil (*Sitophilus oryzae*) is the most common weevil in wheat in Australia. Major pest of whole cereal grain and some solid cereal products, eg, pasta. Destroys grain directly and through heating. Approx. length adult: 3.5 – 4.0mm; Life cycle: 25 days@30°C & 70% r.h., 25 days; Population growth up to 25 x in a month; Eggs laid singly in prepared hole in grain; develops concealed within the grains; Adults fly & walk long distances; adults can walk up glass surfaces. Resistances to protectant OP insecticides is rare, phosphine resistance widespread, no known resistance to dichlorvos; can not be controlled with phosphine in unsealed silos.



Lesser grain borer (*Rhyzopertha dominica*). Major pest of whole cereal grains, most serious in hot dry conditions; Resistance to OP insecticides – common; head invisible when viewed from above; approx. adult length 2.5 – 3.0mm; resistance to phosphine fumigation, strong and widespread; resistance to methoprene protectant insecticide is increasing, susceptible to new spinosad insecticide (available in 2006-07), resistance to dichlorvos is common; adults bore through grains; max. population growth rate per month 20x; larvae lives concealed in grain or flour; adults are strong fliers.



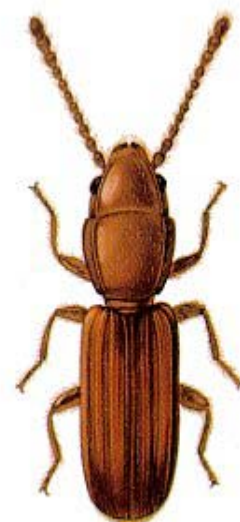
Red rust flour beetle (*Tribolium castineum*). Major pest of stored grains and milled products; approx. adult length 3.5=4.0mm; survives very dry conditions; max. population growth rate per month 70x; larvae not concealed in grains; adults strong fliers; resistance to protectant OP insecticides is rare, no known resistance to dichlorvos, strong resistance to phosphine fumigant found in C.Q.



Sawtooth grain beetle (*Oryzaephilus surinamensis*). Major pest of stored grains and other stored products; approx. adult length 3.0mm; max. population growth rate per month 50x; Strong resistance to phosphine found in D. Downs, strong resistance to protectant OP insecticides is common, no known resistance yet to dichlorvos; adult feeds, flies, and walks long distances; adults can walk up glass surfaces.



Flat grain beetle (*Cryptolestes spp.*). Important pest of stored grains and other stored products; adults very flat, antennae very long and hair-like; approx. adult length 3.0mm; resistance to protectant OP insecticides is untested, strong resistance to phosphine fumigant on Darling Downs and in Biloela district; max. population growth rate per month 55x; adults long lived, feeds, flies and walks rapidly.



Psocids – or booklice (*Liposcelis spp.*). Pronounced ‘so-kids’; important pest in grain storages in Australia; very tiny – about 1.0mm long; infest a wide range of stored grains and other commodities; appear as a ‘moving carpet of dust’ on grain; thrive under warm moist conditions, max. population growth rate per month 25x. Life cycle 21 days under ideal conditions; ‘secondary’ feeders, living on damaged grain etc., can cause heating of grain; huge infestations spread to structures and cause worker discomfort; if protectant insecticides fail to control psocids, expert identification of species involved is advisable; For further detail refer to special DPI&F

Note ‘Grain storage - psocid pests (or booklice)’, available at **(CHECK THIS LINKAGE ADDRESS)**



Mites (*various species*). Common pests in stored grains; occur mostly in damp or moist grain; Mould mite or Lemon-scented mite (*Tyrophagus putrescentiae*) – very tiny, about 0.5mm long.

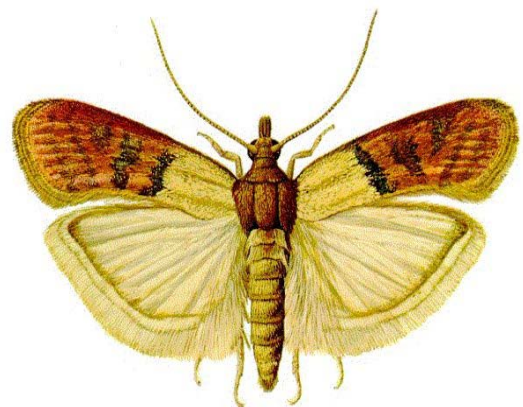
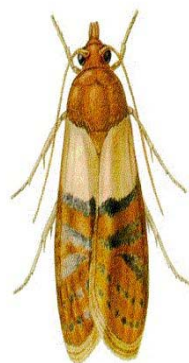
Appear as a moving carpet of brown dust on grains, bags, structures and floors; large populations may emit a pungent smell; life cycle is 8-12 days under ideal conditions, max. population growth rate per month 500x; more conspicuous at high moisture mouldy conditions. Feeding damages grains, promotes mould growth, imparts an 'off' odour, and may cause severe discomfort and dermatitis in workers. Protectant OP and methoprene insecticides not effective; resistance to dichlorvos untested; no known resistance to new spinosad protectant insecticide (on market 2006-07). Phosphine fumigation will only be successful if done in sealed, gas-tight storages. For further details on controls, etc., see DPI&F Note 'Grain storage – mite pests', available at **(CHECK THIS LINKAGE ADDRESS)**.



Acknowledgement:

This image was obtained from Systematic Entomology Laboratory, Agricultural Research Service, United States Department of Agriculture, via www.sel.barc.usda.gov/acari/frames/mites.html, accessed 07/07/2005.

Indian Meal Moth (*Plodia interpunctella*). adults' wings are bicoloured cream & brown, length approx. 8.0-9.0mm, larvae creamy white, approx. 12mm long; major pest in flour mills, processing plants etc., webbing produced by larvae can block machinery; max. population growth rate per month 60x; adult does not feed; active at dusk and dawn.

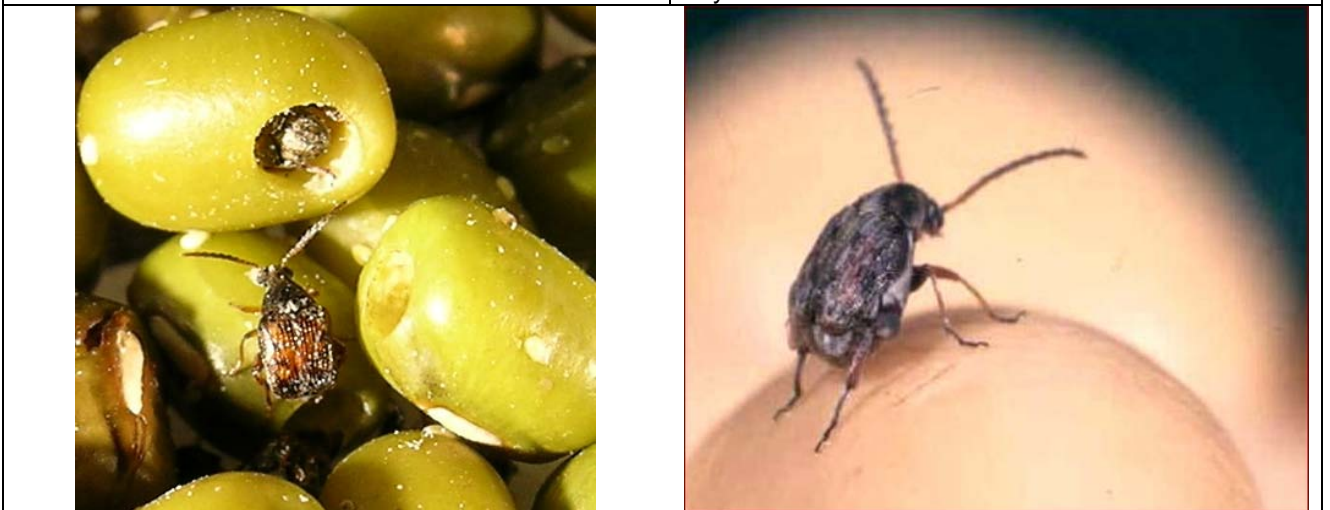


Angoumois grain moth (*Citotroga cerealella*), and grain damage. Smaller than other storage moth pests, adults 5.0-6.0mm long; pest of whole cereal grains, will attack grains before harvest, esp. maize. Infests only surface layer of bulk-stored grains, adult unable to penetrate deeply. Max. population growth rate per month 50x. Larvae develop concealed in a single grain; adult moth does not feed. No known resistance to protectant OP's, or new spinosad insecticide. Not susceptible to methoprene.



Cowpea Bruchid (*Callosobruchus spp*) in mungbean

Soybean Bruchid (*Bruchidius mackenzii*) in soybean



Bruchids are a major and increasing pest of pulse crops in Australia. In Northern region, Cowpea bruchid is a major problem to the mungbean industry. Adults are small, about 3.0mm long, with a tear-shaped body. Eggs are easily visible, white and laid on surface of individual beans. Larvae develop within the seeds, from where they emerge as adults, leaving a perfectly round hole in seeds. Adults are strong fliers and lay about 100 eggs in their 10-12 day lifespan. The soybean bruchid is now becoming more widespread in the soybean industry.

NOTE: For more detail on bruchid pests, see 'Bruchids in Mungbeans and Other Pulse Crops – A Major Threat to the Pulse Grains Industry', by Brier, Collins and others, available at [PLEASE](#)

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Acknowledgements:

- Insect drawings used above sourced from **Degesch America Inc..**

- Some text regarding species above was sourced from, '**Insects of Stored Grain – A Pocket Reference**', David Rees, (1994), Stored Grains Research Laboratory, CSIRO Division of Entomology, GPO Box 1700, Canberra, ACT, 2601, Australia.

Distinguishing between the common grain beetles

You can use a clean glass container as a simple test for identifying grain beetles. Put the live grain insects into a warm glass container (above 20°C so they are active, but not over 40°C or they will die).

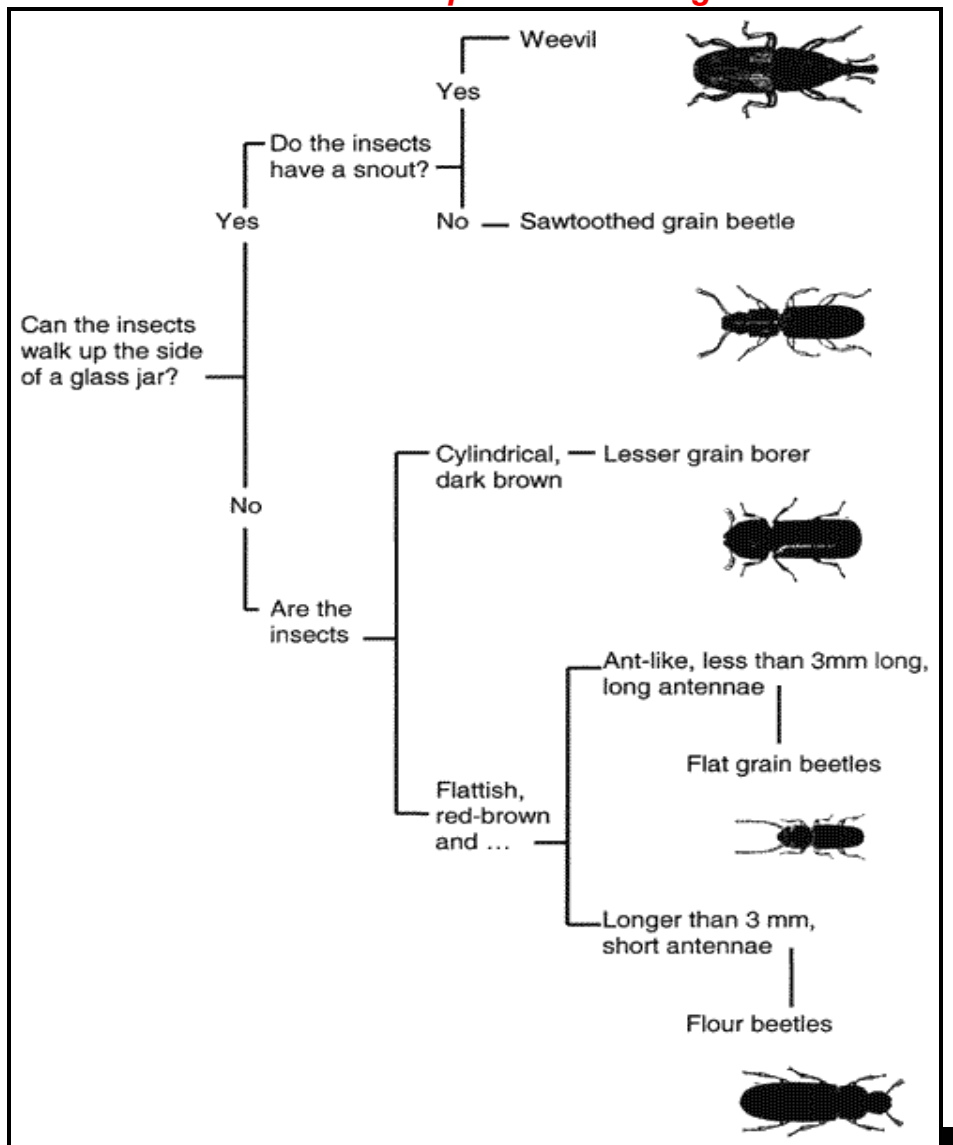
Weevils and sawtoothed grain beetles can walk up the walls of the glass easily, but flour beetles and lesser grain borer cannot.

If you look closely at the insects walking up the glass, weevils have a curved snout at the front but sawtoothed grain beetles do not.

Distinguishing between the species that can't walk up the glass is more difficult. Lesser grain borers are cylindrical, dark brown and usually have their head tucked under their body. Flour beetles and flat grain beetles are flatter, copper-brown, and their head usually protrudes in front of their body. Flat grain beetles are usually small, ant-like with long antennae. Flour beetles are larger with short antennae.

Drawings of the common beetle pests and the steps in identifying them are shown on the next page. Most of the beetles other than the common species look something like the flour beetles, and should not be confused with the lesser grain borer if you know what the borer looks like.

**Identification of common beetle pests of stored grain.
Follow the steps from left to right**



Further information

You can find colour pictures and some information on insect pests of stored grain in:

- 'Insects of stored grain: a pocket reference' by David Rees. CSIRO Division of Entomology (1994). The book is available from The Librarian, Stored Grain Research Laboratory, GPO Box 1700, Canberra ACT 2601, Tel 02 6246 4201, Fax 02 6246 4202.
- 'Insect pests of field crops in colour' Queensland Department of Primary Industries Q18 3006 (1983). The book is available from DPI&F Client Service Centres
- The entomology section of the AgWest web site <http://www.agric.wa.gov.au>.
- See the DPI&F Note 'Grain Storage - Insect control in stored grain', - www.dpi.qld.gov.au/fieldcrops/3947 **(CHECK THIS LINKAGE ADDRESS)** for information on control methods.
- 'Bruchids in Mungbeans and other Pulse Crops - a Major Threat to the Pulse Grains Industry', by Hugh Brier, Pat Collins, Phil Burrill and Mike Lucy, Ken Bullen, DPI&F. Available at **(CHECK THIS LINKAGE ADDRESS)**

- DPI&F website www.dpi.qld.gov.au/fieldcrops/3947?? (CHECK THIS LINKAGE ADDRESS) - for a comprehensive range of useful Notes on Grain Storage management on-farm
- DPI&F Call Centre open from 8.00am to 6.00pm Monday to Friday (telephone 13 25 23 for the cost of a local call within Queensland; interstate callers 07 3404 6999) or email callweb@dpi.qld.gov.au
- Or, phone one of the National Grain Storage Extension Team

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