

# DPI&F note

## Grain Storage — Bruchids in Mungbeans and Other Pulse Crops

### A Major Threat to the Pulse Grains Industry

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### Background

Bruchids are a major and growing problem in stored mungbeans in all regions. While crops may be infested in the field, infestations are often too low to detect at harvest. Bruchids are most often not detected until seed has been stored for a reasonable period of time (eg for longer than 3 months). Bruchids breed rapidly in storage and by the time they are detected, the infested grain is usually unmarketable. Historically, bruchid infestations have been worse in Central Queensland but in recent years the problem has spread to southern Queensland and northern NSW. The bruchid responsible for most infestations in mungbeans is the cowpea bruchid, *Callosobruchus maculatus* (Fabricius).

### Description

Cowpea bruchid adults are small (3-mm-long) brown beetles with a tear-shaped body (i.e. taper towards the head). Cowpea (and other) bruchids do not have the elongated snout of true weevils, which infest cereal grains. Cowpea bruchids are typically orange-brown with dark markings, but colour can vary and they are easily confused with other closely related bruchid species. The eggs are small and white and, despite being only 0.6 mm long, are readily visible. The larvae look like short cream-coloured maggots, and are rarely seen as they feed within mungbean grains.

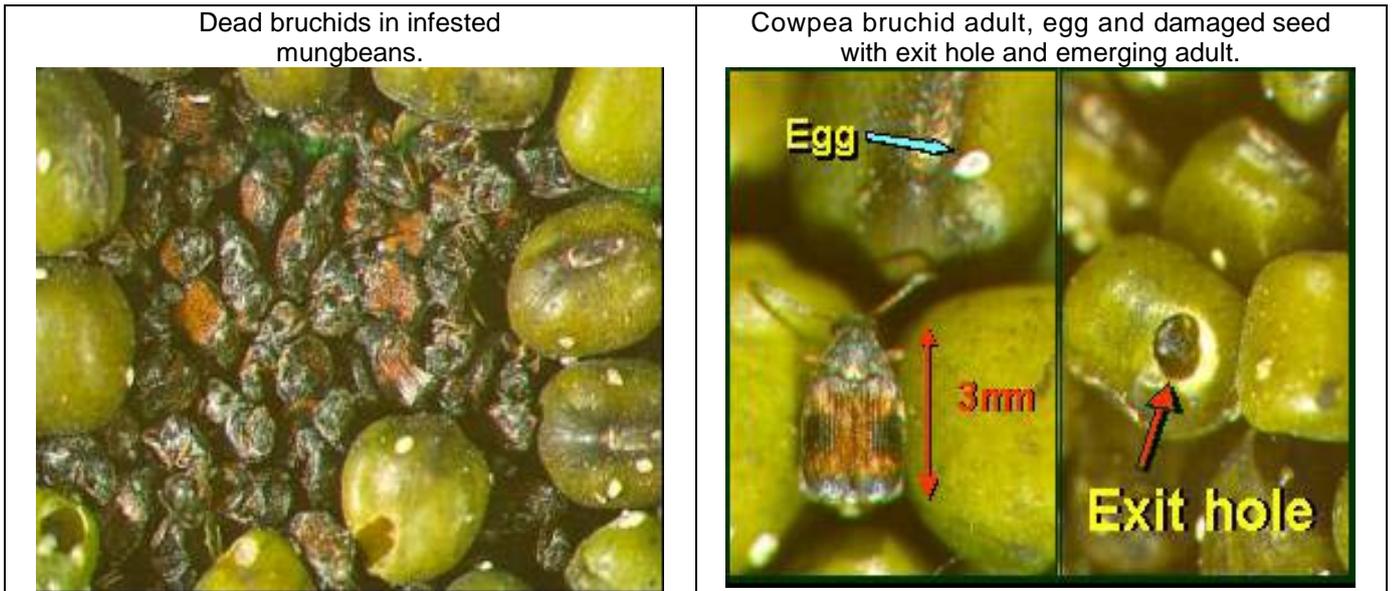
Adult Cowpea Bruchid, emergence hole, and eggs



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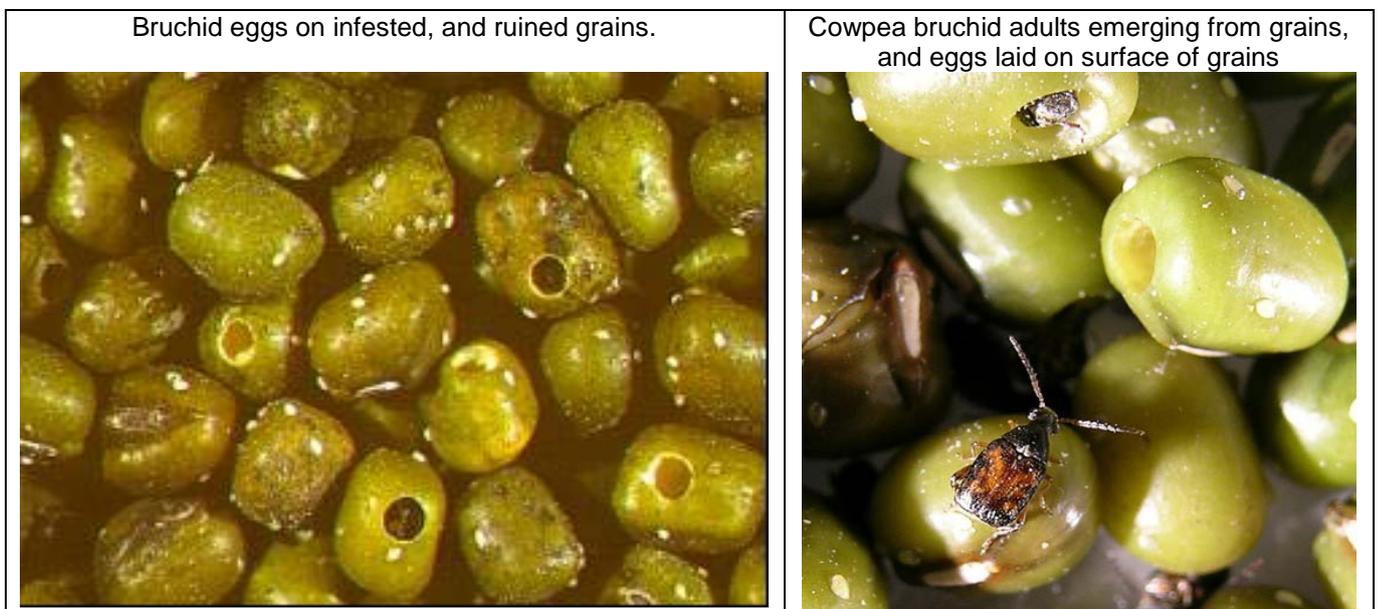
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## Biology

Adults can infest mungbeans in the field or in storage. Eggs are laid on maturing pods in the field, but in storage are laid directly on grains. Hatching larvae burrow into the grain and complete their development (including pupation) within a grain before emerging as adults. Cowpea bruchids breed rapidly in stored seed and can complete a lifecycle in as little as 28 days (at 30°C). Adults live only 10-12 days and females lay about 100 eggs. Adults are strong fliers and can travel 2-3 km.



Acknowledgement: all images of *C. maculatus* (above) and *A. obtectus* (below), produced by Mr Joe Wessels, DPI&F, Kingaroy, Q..

## Bruchids in Stored Mungbeans

***How many bruchids pose a threat at intake?*** Even an extremely low bruchid population at intake (eg undetectable levels of 2 bruchids/tonne or 0.00001% of grains infested) could result in major damage (100% of grains damaged) within 4 - 6 months of intake. Because infestations are often difficult to detect at harvest, carefully check for live insects and the characteristic grain damage at intake and at regular intervals during storage. Just because live bruchids are not seen at intake does not mean that they aren't present. Regular checking of both bulk and bagged pulses stored in your premises is a critical bruchid management strategy.

### *Do bruchids develop over winter?*

Cowpea bruchids are a tropical species and breeding ceases at temperatures below 20°C. However, stored grain is a good insulator and beans remain basically at the temperature they were at harvest. Consequently where grain temperatures are above 20°C, bruchid breeding continues unabated but unseen during the winter. Often it is not until beans have been in storage for 3-4 months that bruchid populations reach detectable levels, often during the spring. This gives rise to the misconception that bruchids are dormant during winter and only 'spring to life' with the onset of warmer weather. Because potential predators and parasites are unable to penetrate stored grain, the survival of immature bruchids in storage is very high (usually ≥ 90%).

### *Do other bruchid species attack mungbeans?*

Cowpea bruchid (*Callosobruchus maculatus*) is the predominant species infesting Australian mungbeans but *Callosobruchus chinensis* (adzuki bruchid) and *C. phaseoli* can potentially infest stored mungbeans, although there are no records of this occurring in Australia.

### *Other pulses attacked by Callosobruchus spp.*

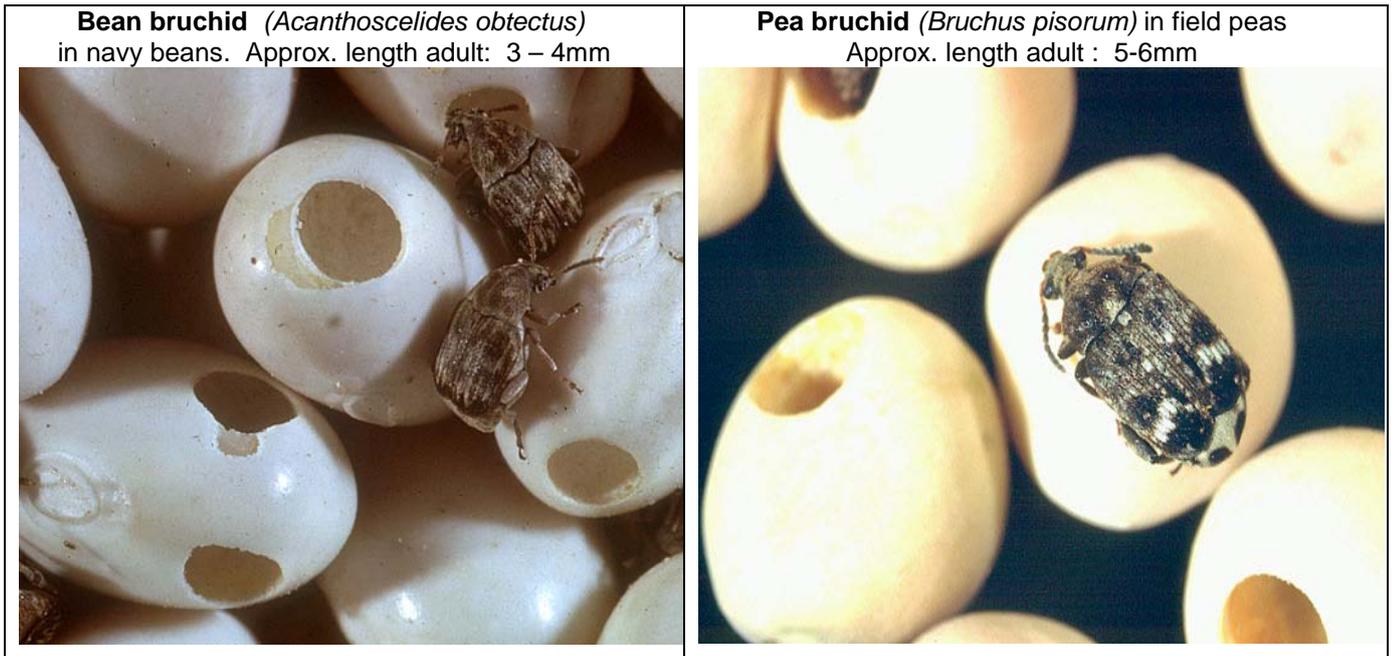
Cowpea bruchids have also been reported in chickpea, cowpea, field pea and soybean, and infrequently in navy bean. While chickpea acid usually protects chickpea pods in the field from attack, bruchids can attack the seed after harvest. Obviously there is potential for cross contamination of mungbeans from other infested pulses in storage. *Callosobruchus chinensis* has also been reported in siratro and *C. phaseoli* in Dolichos lab lab. Adzuki beans are also at risk from *Callosobruchus* attack.

**Cowpea bruchid (*C. maculatus*) in chickpeas**



### *What about other bruchids?*

Other pulse-attacking bruchids present in Australia include the Bean bruchid (*Acanthoscelides obtectus*), the Soybean bruchid, (*Bruchidus mackenziei*), and Pea weevil (*Bruchus pisorum*). These species are usually not a problem in mungbeans. Bean bruchids prefer navy beans and field peas and also attack leuceana (a fodder legume). Soybean bruchids prefer soybeans while pea weevils prefer field peas and faba beans. Both species are supposedly unable to develop in storage, but *B. mackenziei* has been recorded in soybean grain samples.



Acknowledgement: The Pea bruchid image above was sourced from Institut National de la Recherche Agronomique website:- <http://www.inra.fr/Internet/Produits/HYPPZ/IMAGES/7030971.jpg> , accessed 13/07/05.

## Bruchid Management

Because they are a threat at all stages of the mungbean supply chain (from field to export and beyond), bruchids should be regarded as a 'whole of industry problem'. Basically there are three strategies to counter bruchid damage:

1. Hygiene and Inspection.
2. Treating bruchids in infested seed.
3. Slowing bruchid development in storage.

### *Hygiene and Inspection*

Hygiene is vital at all stages of the mungbean supply chain, from on-farm to export. Cleaning out old seed residues in storage sheds, silos, trucks, elevators, etc., before harvest or intake will remove potential infestation sources. Old planting seed in your shed or from elsewhere poses a major infestation threat. Beans should be inspected for insects once a fortnight in summer and once a month in winter. Controlling bruchids in the field is not an effective option and would not guarantee immunity from storage damage. Anything less than 100% in-field control of bruchids could still result in significant bruchid damage in storage. Also, potential pesticide options are not registered or compatible with mungbean IPM strategies.

### *Treating infested seed*

Targeting high-risk bagged and bulk pulses is a more effective strategy to minimise bruchid damage in storage. Carryover bag stocks and bulk pulses stored under warm conditions in unaerated silos would be considered 'high risk'. A regular sampling and monitoring programme is essential.

Phosphine fumigation is the only 'chemical' approved for cowpea bruchid control in pulses and should be considered for all 'at risk' loads at intake, whether bruchids are detected or not. Correct fumigation is vital for successful bruchid control, with best results achieved in sealed (pressure-tested gas-tight) silos (<200 tonnes) or in sealed bag stacks. Seed should be fumigated for at least 10 days and phosphine tablets applied at recommended doses (2 tablets per tonne capacity of wheat or 3 tablets per 2 cubic metre). That is, if your silo has the capacity to hold 100 tonnes of wheat, then you will always use 200 tablets for phosphine fumigation, regardless of how much grain is in the silo...

**Do not mix tablets with grain**, as the residual tablet dust is toxic. **Mungbeans contaminated with phosphine tablet residues may be rejected by exporters and domestic market clients.** Spread tablets in trays hung in silo headspace, or place trays in bag stacks. Phosphine 'blankets' or 'belts' are an alternative to tablets. For detail on safe, effective

use of phosphine, see DPI&F Note, 'Grain Storage – Insect Control in Stored Grain', at [www.dpi.qld.gov.au/3947.html](http://www.dpi.qld.gov.au/3947.html) ?? **(Check Linkage address here)**

### *Slowing bruchid development*

This can be achieved by cooling aeration. Seed temperature and moisture should be monitored regularly during aeration. Bruchid development will cease at grain temperatures lower than 20<sup>0</sup>C. (See DPI&F Notes 'Grain Storage – Aeration for Cooling and Drying', 'Grain Storage – Why install Aeration?', at [www.dpi.qld.gov.au/fieldcrops/3947.html](http://www.dpi.qld.gov.au/fieldcrops/3947.html), See also GRDC publications, 'Aeration in On-Farm Storage-What's Possible?', and 'How Aeration Works', at <http://www.grdc.com.au/growers/as/advice.html> .

To assist researchers to develop more effective bruchid control measures in pulse crops, we would be grateful for your reports on infestations, **Please contact a DPI&F agronomist or entomologist nearest to you, eg,**

Hugh Brier, Kingaroy: 07 41 600 740

Pat Collins, Brisbane: 07 38 969 433

Philip Burrill, Warwick: 07 46 603 620

Ken Bullen, or Peter Hughes Toowoomba: 07 46 881 200

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Australian Mungbean Association.

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### **Further information**

If you require further information on a wide range of Grain Storage issues, please see:

DPI&F website [www.dpi.qld.gov.au/fieldcrops/3947](http://www.dpi.qld.gov.au/fieldcrops/3947) **(CHECK THIS LINKAGE ADDRESS)**

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- 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](mailto:callweb@dpi.qld.gov.au)

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