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How to avoid insect contamination of cereal grain harvest

By Svetlana Micic, Entomologist and Lucy Anderton, Economist, Albany

Contamination of cereal grain with insects is a problem for exporters of Western Australian grain. To ensure only high quality grain is exported, grain exporters have set insect limits, which vary for the different cereals. If this limit is exceeded, growers must pay the additional costs for their grain to be cleaned. Insects, which contaminate grain, commonly known as vagrant insects, do not directly damage the grain.

Most common vagrant insects

The major contaminant of cereal grain is the bronzed field beetle (*Adelium brevicorne*).

Other common vagrant insects include: predatory beetles, vegetable beetles, weevils, grasshoppers.

Bronzed field beetle

Grain contaminated with insects

Grain from direct harvested crops contain fewer vagrant insects than grain from swathed crops

Swaths provide a better insect refuge than standing crops. Vagrant insects are present in most paddocks and congregate under swaths, therefore higher numbers of vagrant insects are found in grain from crops which are swathed prior to harvest.

It is cheaper to direct harvest a crop than to swath prior to pick-up harvest of a cereal crop

In high rainfall areas (>450 mm), direct harvesting may produce grain with a higher moisture content than is acceptable for delivery. In this case, growers have the added cost of drying grain to bring the moisture content of the grain down to acceptable levels.

If cereals are swathed and pick-up harvested, then the grain may contain unacceptable numbers of vagrant insects. In this case the grower will incur the additional cost of grain- cleaning.

The table below shows the cost comparisons between different harvest techniques and grain drying and cleaning.

In the high rainfall areas of the State, direct harvesting cereals is not always feasible, however, the incidence of vagrant insects in the grain can be reduced if:

- Cereals are swathed at a height of 125 mm which is the same height as a beer can[1]. This allows the swath to form above the ground, supported by the stubble. If the swath is close to or on the ground, it is more likely that vagrant insects will be harvested with the grain.

	Direct cost (per ha)	**Cost of grain drying*** (per tonne)	**Cost of grain cleaning** (per tonne)	**Total Cost** (per ha) with yield at 2 tonnes per ha
Direct harvest	$38 to $45	$17+$3.50**	N/A	$81
Swathing and pick-up harvest	$62 ($22+$40)	N/A	$15	$92

* Cost varies according to moisture content. Malt barley will be more than feed barley and minimum tonnages often apply. E.g. 25 tonne of barley and 36 tonne of wheat.

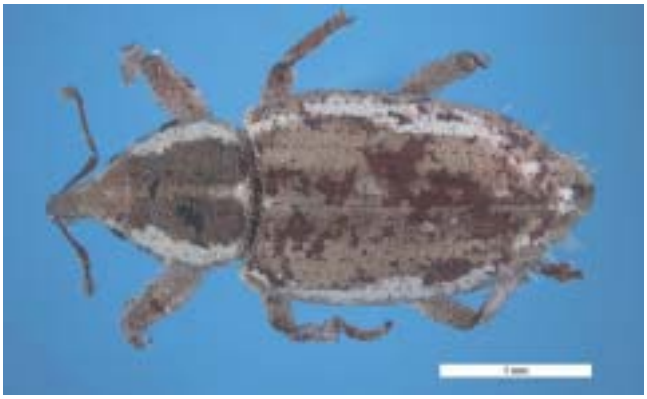
** Delivery charge from grain dryer to CBH per tonne.

- Swaths are pick-up harvested as soon as they are dry enough. The longer that swaths are left unharvested, the more vagrant insects use them as a refuge, consequently increasing the number of insects that are harvested with the grain.

Other factors that affect the number of vagrant insects in grain harvested from swaths

- Pick-up harvest during the heat of the day minimises the number of vagrant insects found in the grain.
  - During the hottest part of the day, all insects are found under the swath. However at night, insects move out from under the swath and up onto the top of the swath. Consequently, grain harvested at night contains more insect contaminants than grain harvested during the day.
- Maintaining the recommended height at swathing minimises the number of vagrant insects contaminating grain.
  - If swaths are cut at the recommended height, the type of harvester fronts does not affect the number of vagrant insects contaminating grain. However, harvester fronts that use crop-lifters are better able to pick up low swaths than harvesters with belt pick-up fronts. If swaths are low or close to the ground, grain harvested using crop-lifters will contain more vagrant insects than grain harvested using a belt pick-up front.
- Using insecticidal sprays under swaths is not effective.
  - Some growers have used insecticidal sprays under swaths to deter insects from using swaths as a refuge. As the insects are not feeding on plant material under the swath, most insecticides are not effective. Trials have shown that spraying under swaths does not reduce the number of insects using the swath as a refuge. Additionally, no insecticides are registered for this use as it may lead to chemical contamination of the grain and rejection by national and international grain markets.

A new vagrant insect in direct harvested grain?



Hypsomus weevil

Few insects contaminate direct harvested grain. However, some growers in the south coast region have had their grain contaminated by Hypsomus weevil in numbers above the delivery standard. Surveys have found very few Hypsomus weevils in grain harvested from swaths.

Little is known of the Hypsomus weevil's lifecycle in Australia. Hypsomus weevil, which is 4 mm long, originated in South Africa where it is known to lay its eggs on grasses. The larvae burrow into the grass stems and feed within them. It is not known to use cereals as hosts. In Australia, it is expected that adult Hypsomus would emerge prior to harvest, most likely when the grasses begin to dry.

During the hottest part of the day, Hypsomus weevils have been observed on the tops of cereals in standing crops. As the ground temperatures increase, the weevils climb to the tops of plants where they may be harvested with the grain. However, due to the weevil's small size most are likely to be expelled with the chaff. If there are very high numbers of Hypsomus weevils present in the crop, the numbers harvested with the grain may be higher than the acceptable delivery standard.

There is little that can be done to control Hypsomus weevil at harvest. Grain-cleaning is the most cost-effective method to remove the weevil.

Pre-harvest control of weed grasses may control Hypsomus. As Hypsomus breed in grasses, controlling weed grasses in the paddock during the growing season may decrease the number of Hypsomus present at harvest. As these weevils are flightless, it is highly unlikely that large numbers will migrate into cereal crops from surrounding areas.

Further reading

1 Co-operative Bulk Handling (2003) *Swathing: A harvest management tool for Western Australia.*

Acknowledgments

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