

Pacific Pests, Pathogens and Weeds - Online edition

Rice grain moth (337)

Common Name

Grain moth, Angoumois grain moth, rice grain moth

Scientific Name

Sitotroga cerealella. It is a member of the Gelechiidae.

Distribution

Asia, Africa, North and South America, the Caribbean, Europe. It is recorded from Australia and Fiji¹.

Hosts

Rice, maize, sorghum, pearl millet and related grasses, and small grains: barley, oats, rye, wheat.

Symptoms & Life Cycle

The larvae bore into the seed and feed on it causing decrease in grain weight and quality. And infestations cause a bad smell. The damage is mostly to stored grain, but undamaged grain is also attacked in the field.

Eggs are laid into cracks in the grains, singly or in clumps. Each female lays about 40 eggs. The larvae bore into the grain to feed and to complete their development (Photo 1). When mature, just before pupation, they make a thin 'window' in the grain by eating to the seed coat.

Pupation occurs in a silken cocoon and, after about 10 days, the adult emerges through the window. Adults are 6 mm long, grey, pale or yellowish-brown, with fringed wings and a span of 10-15 mm (Photo 2).

At 25°C and 70% RH the life cycle is about 35-40 days.

Infestations in the field begin at the 'milk stage'. In storage bins, the moth only affects the surface grains as it has no way to move into lower layers. That is not the case if maize kernels are left on the cob. The adults are strong fliers; the moth easily spreads to new locations, either on the wing or as larvae within the grain.

Impact

The impact of the moth is greater in the tropics and sub-tropics; in these areas, it attacks grain in the field as well as in storage. This means that the attack continues during temporary storage after harvest, transportation, processing and final storage. Estimates of yield losses are up to 30%, but often the grain moth occurs with other storage pests (e.g., the weevils, *Sitophilus zeamais* and *Sitophilus oryzae*) and the combined impact is much greater. In maize, low germination and abnormal germination occurs.

Detection & inspection

Look for the translucent windows that appear on the grain. Look for the emergence holes; and look for dust spilled from the grains after the adult has emerged. Check grain in storage every 7-14 days.

Management

QUARANTINE

The moth has a very restricted distribution among Pacific island countries, and biosecurity authorities should take all precautions necessary to prevent further spread.

NATURAL ENEMIES

Several predators and parasitoids (especially, *Trichogramma* species) exist, but their effectiveness is uncertain.

CULTURAL CONTROL

Once the problem is found, it can be difficult to control the grain moth infestation. Therefore, it is most important to dry the grain properly, to keep the storage area clean, and to monitor the grain often and regularly.

Before storage:



Photo 1. The larvae of the grain moth, *Sitotroga cerealella*, bores into the kernel of grains and eats the endosperm and germ.



Photo 2. Adult grain moth, *Sitotroga cerealella*.

Dry the grain as soon as possible after harvest, and repeat during storage if necessary. Moisture levels should be about 12% (most stored product pests required moisture levels of 13-18% to reproduce).

Keep grain storage rooms, sheds, houses, or "cribs" clean. Remove old kernels and ears, and sweep floors, walls, doors, and vents to collect grain powder and dust before storing the new harvest.

Collect and dispose of spilled grain in or around the storage area.

Remove weeds that can harbour insects from around the store.

If using bins, remove any grains that remain (and, if possible, spray with insecticide). If using sacks, do not reuse those that stored previous harvests.

During storage:

Check the grain storage bins or sacks every 7-14 days. Look for small holes on individual kernels of maize or grains of rice. If the grain is in bins, only the top layers will be infested; if the maize kernels are still on the cobs sample throughout the piles or bags.

After harvest:

Ideally, store grain in drums, metal, or concrete bins, through which air can pass. This will dry the grain and prevent contamination from mould or infestations of the grain moth.

Preferably, store maize as kernels removed from the cobs. The kernels are best placed in bins, as only the grain in the top layers will be infested.

RESISTANT VARIETIES

There are resistant varieties of rice, maize, millet and wheat.

CHEMICAL CONTROL

Unless the grain is going to be stored for more than a year, it is unlikely that an insecticide is necessary. However, a number of chemicals are used for the control of this and other storage pests, usually on commercial seed lots. For monitoring purposes, a pheromone is available and this can be used together with sticky traps.

Routine hygiene treatments

- *Malathion*: apply to walls, floors, and inside of bins used to store the grain

Treatment of seed for sowing

- *Synthetic pyrethroids*: deltamethrin or cypermethrin. Note care must be taken to ensure that the treated seed does not contaminate that used for human consumption. It must not be used for animal consumption, poultry feed or mixed with animal feed.
- *Neonicotinoids*: e.g., imidacloprid. Similar cautions apply as for pyrethroids (above).

Treatment of grains for human consumption or for animal feed [make sure the product is labelled for use on rice, maize and small grains (barley, oats, wheat)]

- *Malathion*: (i) As a spray; treat grain and do not use for food within 90 days of treatment; (ii) as a dust; treat grain and do not use for food within 14 days of treatment. Note that many storage pests are resistant to malathion.
- *Pyrethrins*: Used as a grain protectant (sometimes with piperonyl butoxide). Pyrethrins are manufactured from chrysanthemum flowers. There is a withholding period of 1 day before treated grain can be used for human or stock consumption.
- *Bt*: Some success has been reported using Bt, *Bacillus thuringiensis*.
- *Phosphine*: Used as a fumigant; grain is covered by a tarpaulin or in other ways sealed for the duration of the fumigation. The procedure is carried out by certified operators.

ALWAYS CHECK WHETHER THE PRODUCT IS FOR TREATING EQUIPMENT, BINS AND BUILDINGS OR FOR TREATING GRAIN FOR HUMAN USE AND ANIMAL FEED. READ THE INSTRUCTIONS.

When using a pesticide, always wear protective clothing and follow the instructions on the product label, such as dosage, timing of application, and pre-harvest interval. Recommendations will vary with the crop and system of cultivation. Expert advice on the most appropriate pesticide to use should always be sought from local agricultural authorities.

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¹Information from Swaine G (1971) *Agricultural Zoology in Fiji*. Her Majesty's Stationery Office, London; and CABI (2012) *Sitotroga cerealella* (grain moth) Crop Protection Compendium (<https://www.cabi.org/cpc/datasheet/50238>); and Jacobs S, Calvin D (1990) Angoumois grain moth. Penn State Extension; and from Plant Pests of the Middle East. *Sitotroga cerealella* (Olivier) (http://www.agri.huji.ac.il/mepests/pest/Sitotroga_cerealella/); and Rickman J, Gummert M (undated) Pest management in storages. IRRI. (<http://www.knowledgebank.irri.org/search-results?gsquery=common+post+harvest+insects>); and from Jackman J (2018) Angoumois grain moth. Extension Entomology, Texas A&M Forest Service. (<https://extensionentomology.tamu.edu/insects/angoumois-grain-moth/>). Photos 1&2 Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org.

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