

FACT SHEET

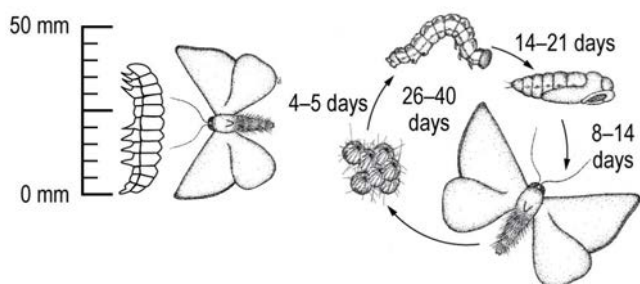
How to find and identify fall armyworm (*Spodoptera frugiperda*) in corn and maize crops



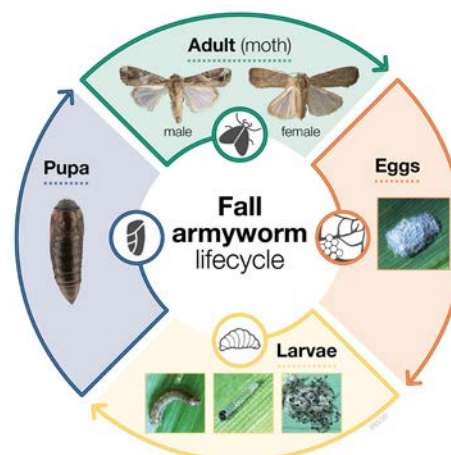
Fall armyworm (FAW) is a noctuid moth similar in appearance to some other noctuid moths already present in New Zealand. Noctuid moths are large, strong-flying, night-active moths. There are three noctuid species that you will find infesting corn and maize crops in the north of New Zealand.

These are *Spodoptera frugiperda* (fall armyworm, FAW); *Helicoverpa armigera* (Heliothis, corn earworm, tomato fruitworm); and *Mythimina separata* (cosmopolitan armyworm). This factsheet is a guide for growers and crop scouts to find and identify FAW and distinguish FAW eggs and caterpillars from the other two species.

A noctuid moth life cycle has four growth stages: eggs, larvae (caterpillars), pupa and adult moth. Caterpillars are the feeding and damaging life stage and may increase in mass by 500 times.



Noctuid moth life cycle (ACIAR). Noctuid pest species include FAW.



FAW life cycle. © State of Western Australia (Department of Primary Industries and Regional Development, WA).

How to search/scout for FAW infestations:

- In corn and maize crops (they are much-preferred host plants) search on the edge of crops.
- Walk diagonally through crops looking for physical damage.
 - Do not walk up single rows because moths lay eggs up rows.
 - One row may be infested, and the next row may not be infested.
 - Move across rows, so not sampling single rows.
 - Search in a 'W' search pattern across the field.

In summary:

- **Upwind edges of crops are likely to be the best sites to find FAW infestations.**
- **OR edge of crop adjacent to older crops/plants.**

Symptoms/damage by FAW:

- The first sign of FAW infestations are small feeding marks on leaves, often caused by dozens of tiny caterpillars (see photos).
- The caterpillars feed on one side of the leaf, causing damage that looks like small windows.
- The area of leaf feeding and leaf damage increases and spreads as the caterpillars grow larger. The caterpillars stop their gregarious behaviour (staying together) and move to the whorl.
- Once established inside the whorl or plant interior, feeding will result in large, jagged holes.
- The established caterpillar in a whorl will grow much larger than its cohorts as it cannibalises them.

How to identify FAW from other caterpillars in corn and maize:

- It is difficult to identify small noctuid caterpillars to species because they all look very similar.
- However, *Heliothis* lays single eggs and is solitary, with a rough skin appearance even at small size due to tiny, short, black spines.
- Small caterpillars of *M. separata* may be a green colour, with a smooth-skinned appearance.

You can also use behaviour and typical damage to identify the species. For example:

- *Heliothis* lays single eggs, and caterpillars are very aggressive and cannibalistic, so caterpillars are always solitary.
- Damage by small and large caterpillars is different for each species (see below).

Identification of eggs and caterpillars:

Fall Armyworm (FAW, *Spodoptera frugiperda*):

Eggs:

- See photos below and various factsheets (Ministry for Primary Industries/Plant & Food Research).
- Eggs are small, <1 mm in diameter, and laid on leaf surfaces in a batch of 100–200 eggs covered with a felt of pale brown scales from the abdomen of the female moth.

Caterpillars:

Young, smaller caterpillars of FAW may be identified by:

- Light coloured with a relatively darker head but difficult to distinguish from other small noctuid caterpillars.
- Small caterpillars are gregarious, staying together (probably as protection from predators and parasitoids).
- Their position on the plant. The egg masses are often laid on large leaves, and bunches of small caterpillars may be located aggregating on these leaves. The caterpillars stay together until larger size when they move to the whorls.

Older, larger caterpillars of FAW may be identified by:

- Inverted white 'Y' shape on the head between the eyes.
- Four large black spots in a square arrangement on top of the back end of the body.
- Four smaller dots in a trapeze arrangement on top of other segments.
- Light-coloured bands on the side with a dark-coloured band between them.
- Larger larvae/caterpillars move to the whorl and bore inside the whorl.
- Other caterpillars try to follow this behaviour but are cannibalised.
- Single caterpillars in the whorl become much larger than cohorts because of feeding on protein (eating other caterpillars).



FAW egg mass on maize leaf. Individual eggs are <1 mm in diameter. © State of Western Australia (Department of Primary Industries and Regional Development, WA).



Hatching egg mass and medium-sized FAW caterpillar.



Typical leaf damage by small/young FAW caterpillars.



Hatching egg mass and large FAW caterpillar.



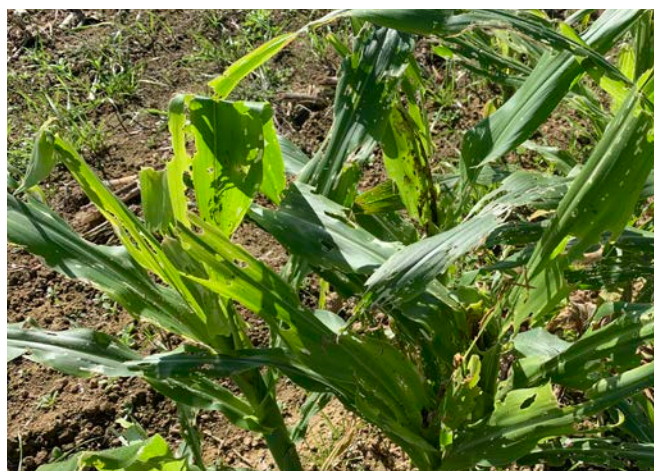
Large caterpillar showing the characteristic square pattern of black markings.



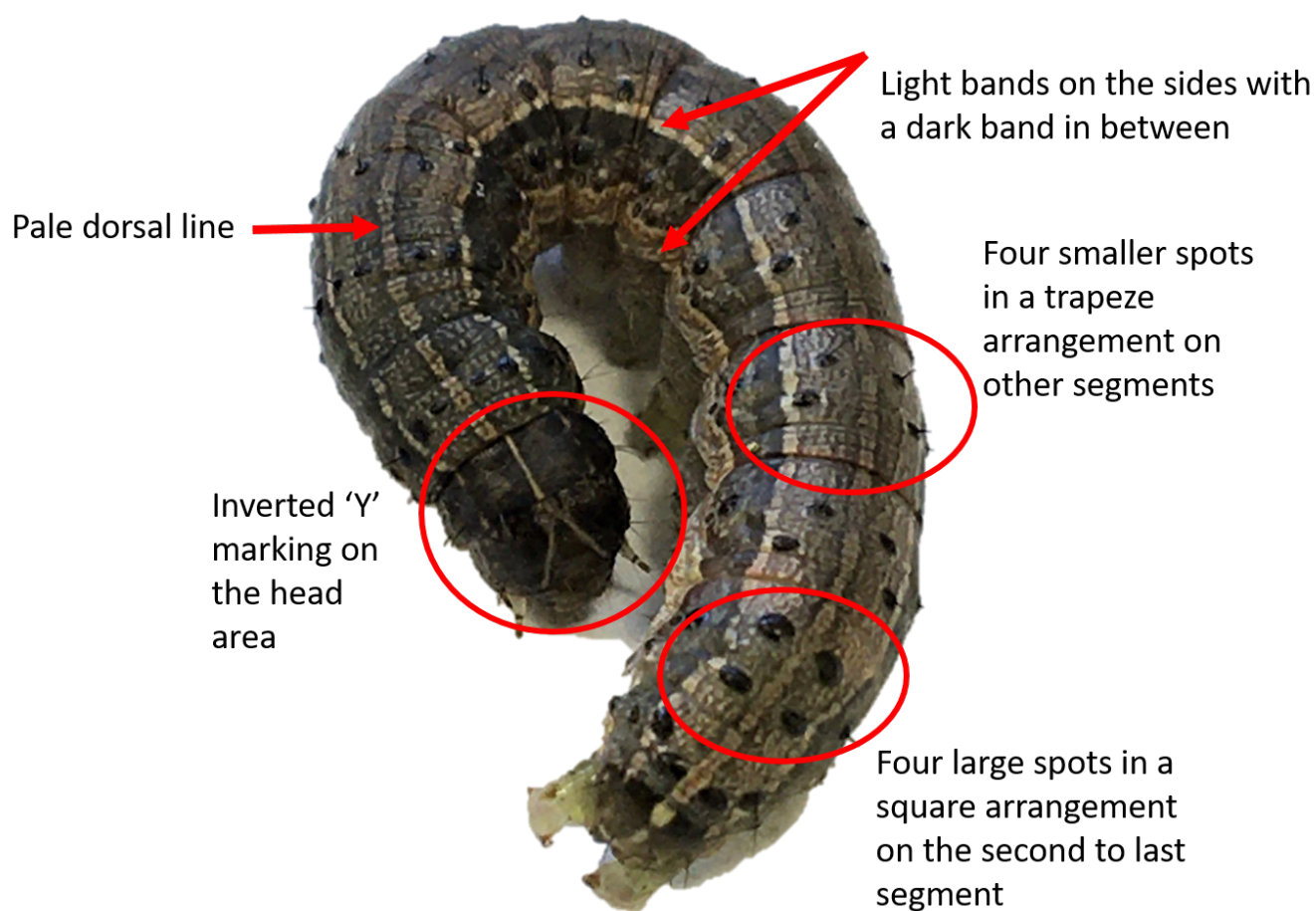
Large FAW caterpillar and frass (droppings).



Large FAW caterpillar, frass (droppings) and damage.



Typical plant damage by FAW.



Large FAW caterpillar with key features. © State of Western Australia (Department of Primary Industries and Regional Development, WA).

Heliothis (*Helicoverpa armigera*, corn earworm, tomato fruitworm):

Eggs:

- Laid singly on silks or the upper surface of leaves.
- Freshly laid eggs are white ribbed domes about 1 mm in diameter (see photo).
- They become yellow as they mature near to hatching.

Caterpillars:

- Small larvae are solitary and feed on top of fresh leaves.
- In corn, small caterpillars are often located in silks, normally only 1 caterpillar per cob.
- They often stay feeding on silks until larger size when they change to a boring behaviour.



Side view of *Heliothis* egg showing domed appearance and ridges.



Heliothis caterpillar in corn cob (Photo: Trevor James).



Heliothis caterpillars in corn cobs (Photo: Mani Mua, The Pacific Community (SPC), Fiji).

- A KEY characteristic is that they are very 'hairy', even when relatively small.
 - Body surface is rough, with tiny short spines.
 - Other noctuid caterpillars do NOT have these short spines.
- A broad pale band along the sides.
- The sides are dotted with black spiracles (circular breathing holes).
- Large caterpillars can be many different colours, from green to pink.
- The caterpillars change to a cob/fruit-boring behaviour as they get older.
- Larger caterpillars bore straight into the side of cobs.



Heliothis is also known as tomato fruitworm, a serious pest of *Solanum* crops.



Heliothis caterpillar showing characteristic stripes and hairs.



Larval (caterpillar) stages of *Heliothis*. Note the colour variations.

Cosmopolitan armyworm (*Mythimna separata*):

Eggs:

- Eggs are pale cream and laid in clusters on the leaves of grasses, corn and maize, usually between blades or in sheaths, the mass being held in place by a sticky secretion.

Caterpillars:

- Small larvae are green/light-brown colour.
- Small caterpillars are often located in the silks where they will remain feeding on the silks and damaging the tips of cobs.
- This behaviour is more common in the newer open-tip super-sweet varieties of corn.



Egg clusters of *Mythimna separata*.

- Larger larvae may be a light or darker brown/grey body colour.
- *Mythimna* caterpillars have a smooth body compared with other caterpillars (a lack of spines and hairs).
- Large caterpillars have two wide black-brown and one intermediate light dorsal stripe (on top of body), with a black-brown lateral stripe along the spiracle line.
- Spiracles are the breathing holes seen along the side of the body and are brown with a black rim.
- The head has a honeycomb pattern to it.



Life stages of *Mythimna separata*.

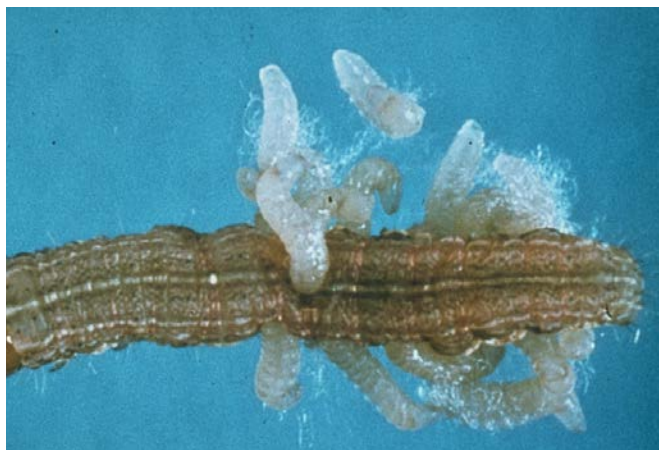


Photo credit: Wikimedia Commons, CC-BY-SA 2.5

A large *Mythimna* caterpillar. Large caterpillars have two wide black-brown and one intermediate light dorsal stripe (on top of body), with a black-brown lateral stripe along the spiracle line (breathing holes along the side of the body). Note the honeycomb pattern on the head capsule.



***Cotesia ruficrus* laying eggs inside a caterpillar of *Mythimna separata*.** This biocontrol agent controls nearly all *Mythimna* caterpillar infestations in corn and maize.



Larval stages of *Cotesia ruficrus* emerging from a parasitised caterpillar of *Mythimna separata*. The caterpillar has two wide black-brown and one intermediate light dorsal stripe (on top of body).



The evidence for killing and controlling *Mythimna* caterpillars is the presence of white cocoon masses, the pupal stage of the parasitic wasp, *Cotesia ruficrus*. There is evidence that this parasitoid will also attack FAW.

**If you believe you have
seen a fall armyworm –
either an adult, larvae or
egg masses:**

Take a photo and call the
Ministry for Primary Industries Exotic
Pest and Disease Hotline on
0800 80 99 66 or report online at
www.report.mpi.govt.nz/pest

For more information

Graham Walker | graham.walker@plantandfood.co.nz | +64 27 208 3077

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Additional information and images sourced from:
<https://www.agric.wa.gov.au/fall-armyworm-western-australia?nopaging=1>
https://en.wikipedia.org/wiki/Mythimna_separata

