

Maize insect pest management

Northern grains region



Compiled by Kate Charleston, March 2013

This publication has been compiled by Kate Charleston of Crop and Food Science, Queensland Department of Agriculture, Fisheries and Forestry, and draws on previous publications and original research by Dave Murray and other departmental Entomologists. DAFF and GRDC funding for the IPM Workshops project (DAQ00179) has assisted the preparation of this publication.

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Overview of insect pest management in maize

Maize can be attacked by a wide range of insects, but relatively few are major and/or regular pests. Soil insects can significantly affect establishment as can other establishment pests in some seasons or high risk situations. Although helicoverpa is nearly always present in maize, it is rarely economic to control as crop loss is usually minor in all but higher value seed crops.

Maize pests by crop stage

Pests can occur at one or more growth stages

Pest	Crop stage			
	Emergence	Vegetative	Silking/Tasselling	Grainfill
Black field earwig	█			
Wireworms	█			
Cutworms	█			
Maize thrips	█	█		
Maize leafhoppers	█	█		
Locusts		█		
Whitegrubs		█		
Armyworm		█		
Swarming leaf beetles		█		
Red shouldered leaf beetles		█		
Green vegetable bugs		█		█
Corn aphids		█		
Helicoverpa		█	█	█
Two spotted mites				█
Red banded shield bug				█
Yellow peach moth				█

Establishment pests

The majority of establishment pests are soil dwelling insects. Soil insects can reduce plant establishment, plant populations, plant growth, and subsequent yield potential. Monitor for soil insects prior to planting.

The various cultivation systems and farm management practices can directly influence the composition and abundance of pest species.

- Weedy fallows and volunteer plants encourage soil insect build-up.
- Insect numbers decline during a clean long fallow because of a lack of food.
- Retaining stubble can promote some soil insects, but can reduce the amount of damage to germinating crops as the insects continue to feed on stubble.
- Zero tillage encourages beneficial predatory insects and earthworms.
- Incorporating stubble promotes black field earwig populations.
- False wireworms are found under all intensities of cultivation but decline if stubble levels are very low.

Monitoring for soil insects

Soil insect control measures need to be applied at sowing. Soil insects, particularly damaging juvenile stages, cannot be controlled once the crop is planted. In high risk situations (e.g. following a weedy fallow, high stubble, or history of soil insects), check for pests using the following techniques:

Soil sampling by spade

Take a number of spade samples (deep enough to take in the moist soil layer) from random locations across the field. Hand sort samples to determine type and number of soil insects.

Germinating grain bait technique

Immediately following rain and before planting:

- Soak insecticide free crop seed in water for at least 2 hours to initiate germination
- Bury a small handful of the seed under 1 cm of soil at each corner of a 5 x 5 m square at five widely spaced sites per 100 ha. If the soil is dry, place seed at moisture, or water the baits to ensure germination.
- Mark the bait's position as high populations of soil insects can completely destroy them.
- 5-10 days after placing baits, dig up the germinated seed and check for insects.

Trials have shown that there is no difference in the type of seed used when it comes to attracting soil dwelling insects. However, for practical purposes, using the type of seed to be sown as a crop is likely to indicate the species of pests which could damage that crop.

Using insecticide seed dressings protects the crop from most soil dwelling insects during the seedling stage. However, monitoring at seedling stage is recommended as seed dressings may only partially control some insects such as earwigs, or when soil insects are very abundant.

Black field earwig

A sporadic and potentially major pest of maize.

Black earwigs (*Nala lividipes*) eat newly sown and germinating seed as well as the roots of crops resulting in poor establishment. Feeding on secondary roots may cause plants to fall over as they get larger. Serious damage is usually confined to soils that retain moisture well, and earwigs prefer cultivated soils to undisturbed soil (zero till).



Black earwigs (left) and predatory earwig attacking a *Helicoverpa* pupae. Note: predatory earwigs are usually larger and light brown in colour.

Monitor crops after planting until establishment. Dig and sieve soil to detect adults and nymphs prior to planting. Use germinating seed baits and **control if more than 50 earwigs in 20 germinating seed baits**. Grain baits containing insecticide applied at sowing offer best protection. Insecticide seed dressings provide some protection. In-furrow sprays are not effective in protecting against dense populations. Use press wheels at sowing.

True wireworm

True wireworm (*Agrypnus* sp.) larvae bore into germinating seed and chew on seedling roots and shoots resulting in reduced vigour, wilting or seedling death. Damage is worse when crop growth is retarded by dry, wet or cool conditions. Wireworms generally favour moist areas. True wireworm larvae may also feed on *Helicoverpa* pupae.



Use germinating seed baits or soil sampling to detect larvae prior to sowing. Monitor crops after sowing until establishment. **One larvae/germinating seed bait warrants control**. Seed dressings, in-furrow sprays and granular insecticides offer some control.

False wireworm

False wireworm (*Gonocephalum* spp. and *Pterohelaeus* spp.) larvae attack germinating seeds and seedling roots and shoots in spring, resulting in patchy stands. Damage is most common in early planted crops with low crop residue. Adults may damage summer seedlings by chewing at or above ground level and replanting may be required.



To detect, either hand sift 10 soil samples (30 x 30 cm) or place 10 germinating seed baits throughout the paddock. **One larva per sample (or germinating seed bait) warrants control**.

Prepare ground for even and rapid germination. Use of press wheels at planting provides some control. For larvae, use seed treatments or in-furrow sprays. For adults, use cracked grain baits.

Natural enemies provide little control. Infestations detected after crop emergence cannot be controlled.

Cutworm

Cutworm (*Agrotis* spp.) larvae feed on leaves and stems of young plants, and 'cut' down plants to eat the leaves. Partial damage to stems may cause the plant to wilt. Larvae shelter in the soil during the day and curl into a 'C' shape when disturbed.



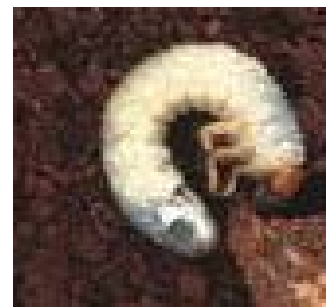
Cutworms are found in all soil types and often move into crops from adjoining fence lines, pastures or weedy fallows. Crop areas attacked by cutworms tend to be patchy and the highest risk period is during summer and spring.

Inspect emerging seedlings twice per week, particularly in higher risk situations. Treat seedlings when there is a rapidly increasing area of infestation or proportion of crop damage (>10% seedling loss). Increasing infestations occur where larvae move from weeds or weedy field edges. **Treat older plants if more than 90% of samples (9 out of 10) have 1 or more cutworms or when plants have 75% or more leaf tissue loss.** Spot treatments (e.g. along field edges) may be successful. Spray late in the afternoon to increase the likelihood of contact with feeding caterpillars (dusk-night).

Keep fallows clean and eliminate weeds from paddock perimeters at least one month before planting. Severe damage to emerging crop can occur when large larvae are forced to move from weed hosts into the crop following spraying of the weeds. Cutworms are attacked by a range of natural enemies such as parasitoids, predators and diseases.

Whitegrubs

These beetle larvae (Coleoptera: Scarabaeidae) feed on roots causing loss of vigour and lodging. Adults may feed on leaves. Damage is often patchy, and there are no effective controls, although a *Metarhizium* fungus and nematodes have been reported to occasionally cause high larval mortality. Avoid sowing new ground with maize after pasture in areas that have a known history of white grubs.



Pests of the vegetative stage

Maize leafhoppers

Maize leafhoppers (*Cicadulina bimaculata*) are most common during late summer, they suck sap and **high populations (>15/plant) can transmit wallaby ear mycoplasma**. Mycoplasma-infected plants are dark green colour with thickened veins on the underside of leaves. Hybrid varieties offer some resistance.

Inspect crops weekly during the vegetative stage, and **control if more than 10 leafhoppers/plant and wallaby ear symptoms are present**.

Maize thrips

Maize thrips (*Frankliniella williamsi*) attack seedling and vegetative growth stages. Thrips in the whorl can stop the growth of small plants. Infected plants may have yellow or silvery patches on the leaves and a desiccated or wilted appearance. Damage is more severe if plants are stressed by drought or water logging and growth is slowed, compounding the damage. Inspect weekly during seedling and vegetative stages, and **control if thrips are found in the throat combined with yellowing of the throat or necrotic stripes on young leaves**.

Maize leafhoppers and maize thrips are widespread but irregular in Queensland, and can rapidly re-infest crops after spraying meaning more than one spray may be required.

Corn aphid

Corn aphid (*Rhopalosiphum maidis*) is the most common aphid species on maize and can affect any crop stage. Adults and nymphs suck sap and produce honeydew. High numbers can cause plants to turn yellow and appear unthrifty. Yield loss may occur on water stressed plants.

The incidence of damage is generally too low to warrant control. Chemical control options are generally not cost effective and the insecticides that control aphids may negatively impact natural enemies.

Inspect at weekly intervals. Predators of aphids include ladybird larvae, damsel bugs, bigeyed bugs, larvae of green lacewings and larvae of hoverflies. Wasp parasitoids mummify and kill aphids.



Maize leafhoppers



Mycoplasma-infected plants are dark green with thickened veins on the underside of leaves



Podsucking/Shield bugs

- Green vegetable bugs (GVB) (*Nezara viridula*)
- Redbanded shield bug (*Piezodorus hybneri*)

Widespread but irregular pests of maize during summer. Adults and nymphs feed by piercing and sucking on developing cobs, and may severely deform cobs.

Although chemical control may be cost effective, **there are currently no threshold levels for GVB in maize.**



GVB adults and nymphs



Red banded shield bug

Locusts

Sporadic and potentially major pests of maize. Adults and hoppers chew irregular pieces from leaves and stems and can cause complete defoliation overnight at high populations. Species found in maize include: Australian plague locusts, Migratory locusts, and Spur-throated locusts.

The [Australian Plague Locust Commission](#) provides details of hopper migrations.



Whitefringed weevil

Whitefringed weevil (*Naupactus leucoloma*) larvae chew into lateral roots causing death and reduced vigour. Infestations are usually patchy. Mass emergence of adults occurs after rain in November-January, and damage is often worse when two host crops (e.g. maize, peanuts, chickpea, lucerne) are grown consecutively.



Red shouldered leaf beetle

Restricted to coastal areas, red shouldered leaf beetle (*Monolepta australis*) and can infest at any stage of crop growth. Swarms of adult beetles move into a crop and feed on foliage, tassels, silks and the husk at the top of the cob. Injury to silks may reduce seed set. Feeding exposes the cobs to other insects and diseases. Infestations tend to be patchy so thorough weekly checking is required. **Control is warranted if 95% of plants in an area are infested and 70% of flag leaves are eaten.** Chemical control is cost effective at high infestations.



Swarming leaf beetles

Swarming leaf beetles (*Rhyparida spp*) are a minor, irregular pest of maize in Queensland, more frequent in the north. Leaf beetles are likely to be present during the seedling stage. Larvae feed on roots causing up to 40% seedling death. There are currently no recommended methods of monitoring and **economic injury levels have not yet been established**. Avoid planting maize immediately after grass pasture.

Armyworms

- Common Armyworm (*Leucania convecta*)
- Dayfeeding Armyworm (*Spodoptera exempta*)



Armyworms can occur in large numbers, especially when good rain follows a dry period. During the day the common armyworm shelters in the throats of plants or in the soil and emerge after sunset to feed. Dayfeeding armyworm outbreaks typically occur from late December to March, and larvae are active during the day. Young plants may be defoliated or killed. Older plants can outgrow damage but yield may be reduced.

Signs of damage include chewed leaf margins and faecal pellets at the base of young plants or in the throats of older plants.

Monitor during seedling and vegetative stages. Egg lays are often associated with heavy rainfall so check for larvae several weeks after rainfall events. Look for larvae under clods of soil, under vegetation and at the base of plants. As a guide, **control is warranted if out of a count of 30 plants, 27 are infested, and more than 21 have at least 75% flag leaf loss**.

Many chemicals will control armyworms but their effectiveness is often dependent on good coverage, and control may be more difficult in high-yielding thick canopy crops, particularly when larvae are resting under leaf litter at the base of plants. As larvae are most active at night, spraying in the afternoon or evening may produce the best results.

Armyworm larvae are attacked by a number of parasitoids that may assist in reducing the intensity of outbreaks, although are unlikely to give timely control if armyworm numbers are high. Predators include green carabid beetles, predatory shield bugs and perhaps common brown earwigs. Viral and fungal diseases are recorded as causing mortality of armyworms.

Silking/tasseling stage pests

Corn earworm

Corn earworm (*Helicoverpa armigera*) is a regular occurrence in maize, but only occasionally does it warrant control.

Female moths lay eggs on the stem, leaves (both sides) tassels, silks and husks on the upper two-thirds of plants. Caterpillars hatching prior to silking cause little damage to tassels but may cause damage when migrating to cobs.

Larvae from eggs laid on silks or husks may cause significant damage. However, the most damaging scenario is when large larvae that have developed in the vegetative crop move to the silks and sever them as they feed. Silk damage reduces pollination and grain-set. Feeding damage also occurs on the top 1-3 cm of the cob and may result in the presence of mycotoxins.



Leaf damage can indicate the presence of *Helicoverpa* larvae in vegetative crops. Armyworm damage is similar. Parallel rows of holes are signs of feeding on unopened leaves.

Helicoverpa are usually not considered economical to control, except in high value seed maize. Occasionally grain maize crops are severely damaged by *Helicoverpa* and warrant treatment. These rare events occur when large numbers of *Helicoverpa* larvae develop in the vegetative crop. The large larvae move up onto the silks, severing them which results in poor pollination and seed set. **Where damage to silks is evident, an action threshold of more than 2 medium – large larvae is proposed.**

Chemical control should target small caterpillars (up to 7 mm) and be directed at tassels and emerging silks. Nucleopolyhedrovirus (NPV) is an option for *Helicoverpa* control with the benefit of preserving beneficial insects that will contribute to ongoing suppression of *Helicoverpa* and other pests.

Maize varieties with husks extending 50-80 mm beyond the top of the cob and closing tightly around the silks restrict the entry of larvae into the cob. Watering during dry weather prevents the husks from loosening.

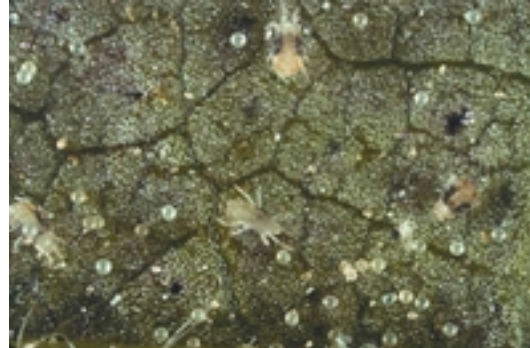
Maize crops often have high levels of beneficial insects (predators and parasitoids) that may be harmed by insecticide applications. The combined action of natural enemies (including predators of eggs, larvae and pupae, parasites of eggs and larvae, and caterpillar diseases) can have a significant impact. Cultivation to a depth of 100 mm destroys overwintering pupae.

Moderate to high levels of egg parasitism by *Trichogramma* are common. Typically, the level of parasitism increases in later crops, and can be as high as 90%.

Pests of the grain fill stage

Two-spotted mite

Two-spotted mite (*Tetranychus urticae*) is a widespread but irregular pest of maize during seed fill to maturity. Mites are usually present towards the end of the crop cycle during late summer/autumn and are favoured by hot, dry weather. Adults and nymphs pierce and suck on lower leaf surfaces, causing silvering on the upper leaf surfaces. Fine webbing on the lower leaf surface indicates their presence, and heavy infestations will result in leaf desiccation, leaf drop and yield loss. Use a hand lens to examine lower leaves for mites. Initial infestations can be patchy. **No thresholds are available for mites in maize and control is not cost effective.** The use of broadspectrum insecticides is associated with outbreaks of mites. Broad spectrum insecticides disrupt the activity of beneficial insects (particularly thrips) which suppress mite populations.



Yellow peach moth

Yellow peach moth (*Conogethes punctiferalis*) is a minor and irregular pest of maize. Eggs are laid during silking. Larvae tunnel into stems or cobs producing masses of webbing and excreta at the tunnel entrance. There are no chemical controls available. The habit of mining into stems and cobs makes insecticide application ineffective as larvae cannot be contacted within tunnels.



