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SOYBEAN STEM FLY
FACT SHEET

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NORTHERN REGION

SOYBEAN STEM FLY

Queensland and New South Wales soybean growers should be on the lookout this season for a potentially devastating pest, the soybean stem fly, which in high numbers can cause near-total crop failure.

KEY POINTS

- Stem fly can be present but undetectable. Growers need to carefully monitor crops for early signs
- Growers should look for pinprick holes in leaves and stems, and tunnels in stems containing larvae and pupae; tunnels can only be found by splitting open the stems
- Stem-fly damage leads to smaller seeds and non-uniform grain, and it may prevent grain fill altogether; this reduces yield and increases production costs because seed has to be graded
- Stem fly first appeared in 2013 in northern NSW after sustained hot and humid conditions. If similar conditions occur this year, crops could be at substantial risk of damage
- The GRDC encourages growers to take an integrated pest management approach to controlling stem fly

IMAGE: DAFF

Growers should carefully monitor soybean crops for stem fly. Look for the exit holes in the stem. Tunnels can only be seen by breaking open the stems. Red discolouration inside a fresh stem indicates the presence of stem fly.

Soybean stem fly

Stem fly is a frequent pest of South-East Asian soybean crops. However, before last season it had only been reported once in significant numbers in Australian soybean crops (Mackay, 2009).

In the summer 2012–13 season, stem flies damaged about 4000 hectares of crops in the Casino region of NSW, leading to significant crop losses for many growers. Damage was compounded by the widespread incidence of charcoal rot, which causes similar symptoms, namely leaf wilting and plant death.

This season, growers could see major outbreaks if the weather is hot and humid, as it has been in recent summers.

This fact sheet tells you how to identify stem fly, what treatment options are available and where to find more information.

Level 1, Tourism House | 40 Blackall Street, Barton ACT 2600 | PO Box 5367, Kingston ACT 2604 | **T** +61 2 6166 4500 | **F** +61 2 6166 4599 | **E** grdc@grdc.com.au | **W** www.grdc.com.au

IMAGE: DAFF

Soybean crop showing damage caused by stem fly (Casino, NSW, March 2013). Note that damage can look similar to other diseases such as charcoal rot.

Soybean growing areas

Soybean production extends from northern Queensland down to Victoria. It is grown as a rotation crop because it is highly efficient at fixing nitrogen. In the northern region, it is grown as part of a sugar rotation, a cotton rotation (in irrigated areas), and for improving beef and dairy pastures.

Australia exclusively grows non-GM soybeans, which have a niche market and command premium prices over GM soybeans from other countries.

In Asia, where stem fly is an ongoing problem, a number of soybean varieties reputedly have resistance to stem fly.

However, in last season's Casino outbreak, significant damage was reported for all commercial cultivars. Because stem fly has been a spasmodic pest in Australia to date, no work has been done to develop stem-fly resistant cultivars in Australia.

The Casino region is one of the largest soybean-growing regions in Australia, and there are fears that this season could see a resurgence of the stem fly if weather conditions are conducive.

The pest was also reported in the Clarence Valley last summer, but not at damaging levels. The only previously documented significant Australian outbreak before last season was in early vegetative soybeans in the Mackay region in 2009.

About the soybean stem fly

The adult stem fly is shiny, black, about two millimetres long and looks very similar to the bean fly (*Ophiomyia phaseoli*), which is a major pest of navy bean seedlings. The damage occurs when the white stem fly larva (maggot) feeds inside the stem.

The stem fly lays its eggs on the underside of young leaves. When infested leaves are held up to the light, the egg lay sites show up as pale, pinprick-sized spots. When the larva emerges from the egg, it moves through the leaf tissue towards the midvein, and then down the leaf petiole into the stem where it feeds on the pith.

Before the larva pupates in the stem, it makes an exit hole through which the adult will emerge. These holes in the stem damage the plant's vascular tissues which, in turn, affects growth and reduces yield. The larval stage takes 8 to 11 days and the pupal stage lasts 6 to 12 days (depending on temperature).

Several generations of stem fly can develop in a soybean crop and these successive generations can build up to damaging levels.

Stem-fly damage and charcoal rot

Stem-fly damage should not be confused with damage from charcoal rot. Charcoal rot is a fungal disease, which blocks the plant's vascular (xylem and phloem) tissue and causes similar symptoms, namely leaf wilting and plant death.

Stem-fly activity is increased by warm temperatures, high rainfall and high humidity. While this year's mild winter could favour stem fly this season, continued dry weather will reduce the risk of attack.

Identifying stem-fly damage

Stem-fly damage can affect soybeans by preventing grain fill. Seeds can be smaller than usual and the grain can be non-uniform.

Infected stems are often red inside (sometimes pale) with a distinct zig-zag tunnel containing the larvae or pupae. The soybean plants will initially appear healthy but infestations of three or more larvae per plant may cause wilting. Younger plants can die, particularly if the basal stem section of plant (below the cotyledon) is damaged.

In the Casino outbreak, symptoms of damage showed up in as little as four to seven days in early-planted crops. In many later-planted crops, no damage symptoms were visible despite significant stem fly activity being observed in dissected plants.

International studies suggest 20% to 30% yield reductions when crops are infested in the early vegetative stage, as damage reduces pod and seed set. If leaves wilt or die during pod fill, as in the Casino outbreak, significant yield losses can occur due to the reduced size of the seed. However, the damage in many Casino crops was confounded by the presence of charcoal rot.

Other pests that feed inside the stems of soybeans include the larvae of the etiella or lucerne seed web moth (*Etiella behrii*), and lucerne crown borer (*Zygrita diva*). The larvae of these pests are much bigger than, and easily distinguished from, those of the stem fly.

Controlling stem fly

No chemicals are registered to control soybean stem fly in Australia. However, an emergency permit was secured last season for dimethoate (at 800 millilitres per hectare), and could be reactivated in the coming season if required.

GRDC advises growers to avoid spraying, where possible, to conserve the beneficial insects that predate the stem fly. Dimethoate kills natural enemies of stem fly and can flare other pests of soybeans such as silverleaf whitefly, mites and Helicoverpa.

How to identify stem fly

Stem fly are hard to identify in soybean crops. Growers need to carefully monitor their crops for signs.

Look for tiny holes in the leaves made by the stem flies when they lay eggs, and holes in the stem made by larvae from inside the stem. After they have emerged from the pupae, the flies leave the plant through these holes .

Split the plant open to check for larvae tunnels inside the plant, which are otherwise hard to see.

Send larval samples to Hugh Brier at DAFF (see contact details below). Experts can easily distinguish stem fly larvae from ordinary bean fly under a microscope.

Watch for ‘sudden death’ syndrome in heavily infested plants—the leaves wilt rapidly and the plant dies because of damage to its vascular tissue.

Beware of confusing the symptoms—namely leaf wilting and plant death—with those of diseases such as charcoal rot, which blocks the plant’s vascular system.

IMAGE: DAFF

Soybean stem-fly exit hole; larvae are difficult to see when in the plant, so look for exit holes to identify the pest.

IMAGE: DAFF

Soy stem showing stem-fly exit hole and damage caused by larvae.

Stem-fly parasites key in IPM strategy

The natural enemies of the stem fly may be able to keep the pest in check. Stem-fly parasite activity was observed at the end of last summer.

Many other pests that occur spasmodically, such as the soybean moth, periodically flare up in devastating numbers, only to return to low, non-damaging levels in subsequent years, largely due to a surge in the pest's natural enemies.

If growers use the 'go soft early' integrated pest management (IPM) strategy, parasites of stem fly could be conserved.

Growers should not use non-selective 'hard' pesticides unless absolutely necessary, especially synthetic pyrethroids (e.g. deltamethrin), organophosphates (e.g. dimethoate) and carbamates (e.g. methomyl and thiodicarb).

Once widespread damage is observed in a crop, spraying with dimethoate (Permit PER14121 is now lapsed and requires renewal) is unlikely to be effective because the damage is done.

The GRDC funds research into crop pests and advocates an IPM approach that includes:

- conserving beneficial insects by using more selective pesticides
- minimising pest damage, by best practice timing and application of pesticides
- maximising the crop's ability to compensate for damage, by improved agronomic practices that boost crop health.

GRDC-funded researchers are investigating sustainable IPM options for growers. This season, they will be setting up water traps and sticky traps to monitor the stem fly and its natural control agents. They also hope to investigate new generation pesticides with potential against stem fly that have little impact on its natural parasites.

IMAGE: DAFF

Researchers are using water traps to collect insects.

IMAGE: DAFF

Researchers are using sticky traps to collect insects.

Alert your agronomist

When assessing suspected infestations, please also inspect the crop's root development and look for charcoal rot symptoms.

If you suspect you have an affected crop, call Natalie Moore (NSW DPI) or Hugh Brier (QLD DAFF), or contact your local agronomist.

USEFUL RESOURCES

The DAFF Beatsheet blog has up-to-date information on stem-fly outbreaks:

http://thebeatsheet.com.au/soybeans/soybean-stem-fly-outbreak-in-soybean-crops/

MORE INFORMATION

Hugh Brier, Department of Agriculture, Fisheries and Forestry

Kingaroy, Queensland 0741
600 740 or 0428 188 069
hugh.brier@daff.qld.gov.au

NSW Department of Primary Industries
Grafton, NSW
02 6640 1637
natalie.moore@dpi.nsw.gov.au

GRDC PROJECT CODES

DAQ00153 Northern Pulse and Grain IPM

DAQ00184 Grower solution project for QLD Coastal and Inland Burnett and NSW North Coast

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