Pest Profile

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Pale cotton stainers, *Dysdercus sidae*

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Cotton stainers are recognised as occassional pests of cotton in Australia. Economic damage is unusual because of their;

- **incidental control when using broad spectrum insecticides for other pests;**
- **inability to survive; temperatures above 40°C.**
- **need for free water to be present.**

However in mild seasons Bollgard II® crops maybe a favourable environment for cotton stainers and they may need to be managed.

Figure 1 (above); D. sidae first instar.

Figure 2 (above); D. sidae third instar.

Figure 3 (below); D. sidae fourth instar

Figure 5 (below); D. sidae adult.

Cotton stainer bugs belong to the Pyrrhocorid group of bugs and are pests of cotton around the world. A range of species are involved, each slightly different in appearance and biology. In Australia two species have been recorded from cotton, the cotton stainer (*Dysdercus cingulatus*) and the pale cotton stainer (*Dysdercus sidae*), which is generally the most common. These species look very similar but the pale cotton stainer is generally a duller brown (see Figure 5, next page).

Lifecycle

Females lay batches of ~100 creamy white eggs in shallow depressions in the soil (Figure 6), under debris or occasionally on the undersides of cotton leaves low in the canopy. Eggs change to orange as they near hatching. The time taken can vary from 5 days at 30°C to 13 days at much cooler or warmer temperatures.

Young cotton stainers moult through five nymphal stages before reaching adulthood. The indicative size of a cotton stainer at each stage of development is;

First Instar	2–3 mm	(Figure 1)
Second Instar	4–5 mm	
Third Instar	6–8 mm	(Figure 2)

Note the small wing buds.

Fourth Instar	9–11 mm	(Figure 3)

Note the larger wing buds.

Fifth Instar	12–14 mm	
Adult	15 mm	(Figure 4)

Figure 6; D. sidae eggs (1 mm diameter) laid on the soil surface.

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First instars remain together and can be observed on the ground near to where they have hatched.

Second instars may disperse in search of food. Their stylets are not yet long enough to penetrate unopen bolls and reach the seed within. Instead they look for ripe, exposed seed or decaying seed. When free water is present they are able to penetrate quite hard, dry seeds. They may be seen to congregate around suitable sourses of food.

Once the third instar is reached, they are able to commence feeding on developing seed within the bolls. From this stage onward the nymphs will disperse to feed and congregate to moult.

Two days after the final moult, adults begin to mate. Fertility will be highest when the temperature is 30°C and low at temperature extremes.

The availability of water and nectar is important for feeding and development during all growth stages. Adults can survive on water alone for several weeks when food is scarce.

There is no resting stage in winter. Survival is dependent on them finding food, water and shelter from frost. Of the cotton stainers,

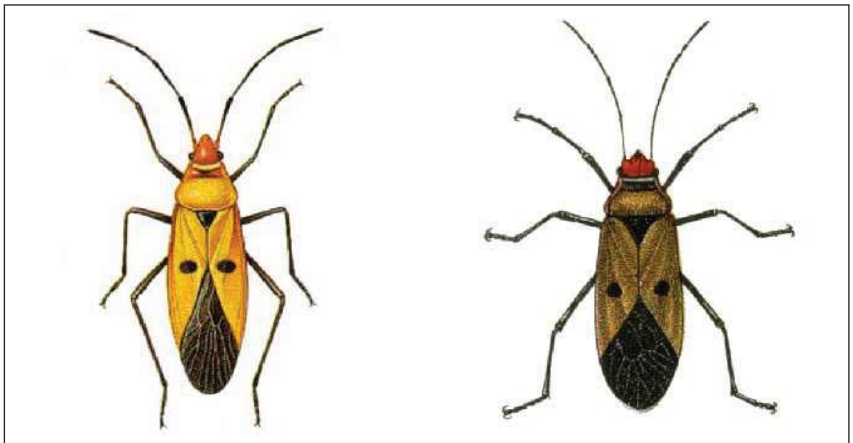


Figure 5; The cotton stainer (Dysdercus cingulatus) (right) and the pale cotton stainer (Dysdercus sidae) (left). Insects are about 15 mm long in the body. Images courtesy of CSIRO.

D. sidae is one of the most frost tolerant species, being able to survive subzero conditions for up to 7 days.

Arrival in Cotton

Usually cotton becomes infested by adults that fly into fields around the time of first open boll, though sometimes, perhaps due to seasonal conditions populations can be found early, during boll maturation. Flights of up to 15 km have been recorded. Adults will mate soon after arrival. The expanding population of developing nymphs will be the cause of economic damage.

Damage

Pale cotton stainers use their strong piercing/sucking mouthparts, shown in Figure 7, to feed on developing and mature cotton seed. Seed weight, oil content and seed viability all decline as a result of cotton stainer feeding. Loss of seed viability can be substantial so should be a careful consideration in pure seed crops.

In bolls up to two weeks old severe attacks can kill developing seeds leading to boll shedding. Where feeding is less severe damaged bolls are retained and lint yield may also be reduced as a secondary effect of feeding. Tightlock, shown in Figure 8, can result around damaged seeds, preventing the lint

Other species that may be confused with cotton stainers are Graptostethus servus, seed eating bug (left) and Leptocoris mitellata, the red eyes bug (right). Note that their wings are generally dark, rather than being orange with a distinct dark spot. G. servus is a pest of sorghum, soybeans, mungbeans and cowpes. L. mitellata has a wide host range including fruit trees and many garden plants. They are attracted to light and will often shelter in large numbers around houses.

Little is known of the behaviour of these species in cotton. If they are present, ensure bolls are monitored for signs of plant bug damage.

from fluffing out as the boll opens.

Unlike mirids and other plant bugs, pale cotton stainers are able to continue feeding on bolls during their later stages of development.

As bolls open stainers will feed on the mature seeds. 'Bald patches' where there is less lint on the seed may become evident as the lint fluffs out. Shown in Figure 9, several seeds within each lock may be affected or only one or two seeds in the boll. At present it is unclear whether this damage is a result of feeding after boll opeing or from earlier feeding during seed development.

Yellow staining of the lint has also been observed. Shown in Figure 10, it is thought to occur as a consequence of watery faeces being deposited on the lint while bugs are feeding in the open bolls.

Overseas, staining of cotton lint has occurred as a result of feeding in young bolls. The bugs transmit a fungal pathogen during feeding causing a reddening of the lint. This has not been documented to occur in Australia.

Staining can also occur as a result of bugs being squashed during picking.

Monitoring for damage

Bolls of varying ages should be cut open to confirm and monitor for signs of damage. Study done by QDPI&F, Kingaroy entomologist Moazzem Khan showed pale cotton stainer bug caused damage to developing bolls that was similar to that of green vegetable bug (GVB). This includes a black spot on the outside of the boll, warty growths inside boll wall and brown coloured lint.

The mild, wet conditions that favour the survival of pale cotton stainers in cotton will also favour the occurrence of secondary infections by yeasts, *Alternaria* and bacteria in cracked bolls. These infections can cause tightlock and lint staining. The presence of pale cotton stainers when such damage occurs may be coincidental.

Monitoring for the presence of bugs

Distribution through the field and through the canopy can be quite patchy. To avoid under/over estimating abundance ensure sampling occurs at multiple sites spread throughout the field.

The beat sheet is a suitable sampling method to monitor the bugs, but as some growth stages favour the lower canopy, visual searching is also a good complementary technique.

First instar nymphs tend to be found on the soil or very low in the canopy. Young nymphs are gregarious and will tend to stay in clusters until about the third instar, making their distribution quite patchy. At the open boll stage nymphs are more visible than in earlier stages of the crop. However they may also hide in the fluffy lint.

Older nymphs tend to be found in the lower to mid canopy and as open bolls appear they will often been seen in the bolls feed on the exposed seeds.

Adults can be distributed through the crop at low densities, often in mating pairs, but sometimes they can also be found in quite dense clusters of mating pairs. Cotton stainers tend to hide during the heat of the day, sometimes in partially opened bolls. They are not easily observed at this time.

Once pale cotton stainers are observed, monitor developing and mature bolls for signs of damage.

Alternate hosts

Pale cotton stainers are considered to be Malvaceae feeders for development. In Australia they have been observed in Malvaceae such as

Figure 7; Pale cotton stainers use their strong probiscus to feed on seed in large bolls and in open cotton.

Figure 9; 'Bald patches' on mature cotton seeds due to pale cotton stainer feeding.

Figure 8; Tightlock associated with pale cotton stainer feeding during boll development.

Figure 10; Lint staining caused by pale cotton stainers feeding on mature seeds after boll opening.

Gossypium spp., *Malvastrum* spp., *Malva* spp., *Hibiscus* spp. (e.g. Norfolk Island hibiscus), *Sida* spp. and *Abutilon* spp. Adults may be found on a range of species, including *Brachychiton* spp. (eg Illawarra flame tree), *Ceiba pentandra* (Kapok), *Pennisetum* spp. (native grasses), *Geijera parviflora* (Wilga) and in *Sorghum* spp.

Natural Enemies

A range of natural enemies such as Tachinids (parasitic flies) and predatory reduvid bugs (e.g. assassin bugs) have been recorded in Africa. However, they have mainly exerted pressure when cotton stainers have been feeding on native hosts rather than in cropping situations. The role of natural enemies in the control of developing populations of pale cotton stainers in Australia has not been studied.

Action Threshold during Boll Development

When adults and nymphs are observed in the crop and damage to developing bolls is detected, an action threshold of 3 pale cotton stainers/m is recommended. This threshold is based on the relationship between cotton stainer damage and the damage caused by other plant bugs (see Figure 11). The figure shows that pale cotton stainer bugs caused only one third as much boll damage as green vegetable bugs. Since the action threshold for green vegetable bug is 1/m, the action threshold for pale cotton stainer bug should be 3/m.

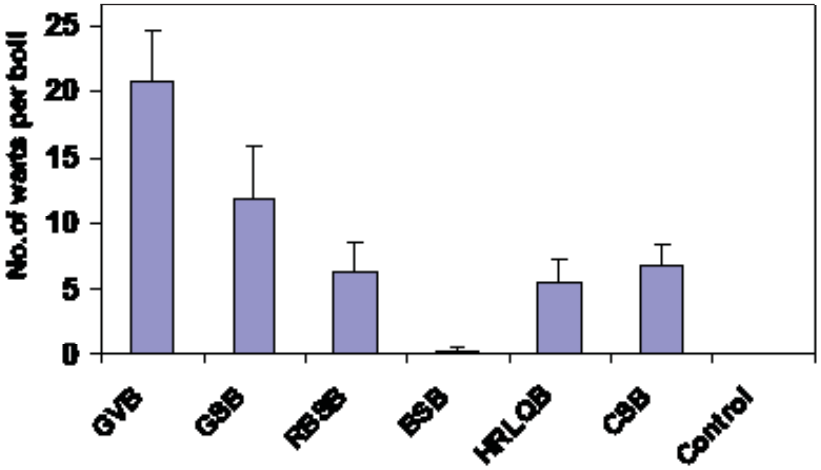
Both nymphs (usually 3rd to 5th stage nymphs) and adults cause similar amounts of damage.

Action Threshold after First Open Boll

When adults and nymphs are observed feeding in open bolls, the threshold must consider the potential for quality downgrades of the lint as well as the loss of seed weight and seed viability.

Where staining is observed as in Figure 9, a threshold of 30% of bolls affected should be used to prevent a colour downgrade.

Figure 11; Comparative damage to 10 day old cotton bolls by different plant bugs.



GVB – green vegetable bug
GSB – green stink bug
BSB – brown stink bug
HRLQB – harlequin bug
RBSB – red banded shield bug
CSB – pale cotton stainer bug

Source: Moazzem Khan, QDPI&F, 2004 unpublished data.

Reaction to Insecticides

As an occasional pest, there are few products registered for their control. The synthetic pyrethroids lambdacyhalothrin (Karate Zeon ®, Matador ®and gamma-cyhalothrin (Trojan ®) are registered; check the labels of these products for more information. However their status as an occasional pest is influenced by their susceptibility to insecticides used for the control of *Helicoverpa* and other pests. Cotton stainers will be incidentally controlled when synthetic pyrethroids, carbamates such as carbaryl or organophosphates such as dimethoate are used.

Worldwide there are few records of resistance to insecticides developing in the field, however cotton stainers will react to selection pressure under laboratory conditions. Any decision to use broad spectrum insecticides such as SPs should take into account their impact on beneficial insects. Particularly in the Darling Downs and St George the risk of flaring whitefly and other secondary pests should be considered.

Controlling Cotton Stainers

As there is no resting stage in the cotton stainer's lifecycle, cultural controls between cotton seasons assist greatly in limiting population development.

Fuzzy cotton seed used for stockfeed is an important alternate source of food for cotton stainers. Avoid storing fuzzy seed in exposed places where cotton stainers can access this food source over long periods.

Controlling ratoon cotton and cotton volunteers is important for limiting cotton stainer's access to alternate food source.

Further Information

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