

Jassids in cotton

There have been recent reports of increasing jassid presence in cotton crops in the Lower Namoi. Usually jassids are first noticed low in the canopy. Prolonged feeding or heavy infestations can result in damage to the mid and upper canopy with the upper leaf surfaces being almost bleached white. Where this is occurring there are concerns about the effects of damage on yield and the subsequent impact on beneficial populations if insecticides are applied for jassid control.

Does jassid damage reduce leaf photosynthesis?

Yes – but not as much as you might think. In February 2002 an on-farm trial at “Weetawaa” compared the photosynthesis of healthy and heavily damaged cotton leaves (80% of the surface damaged – leaf almost white). The trial showed that the photosynthetic rate of young leaves in the upper canopy was reduced by about 20% by heavy jassid damage, shown in Table 1. The older leaves further down the canopy had much lower photosynthetic activity due to their age and shading. Heavy jassid damage did not further reduce the photosynthetic activity of these leaves.

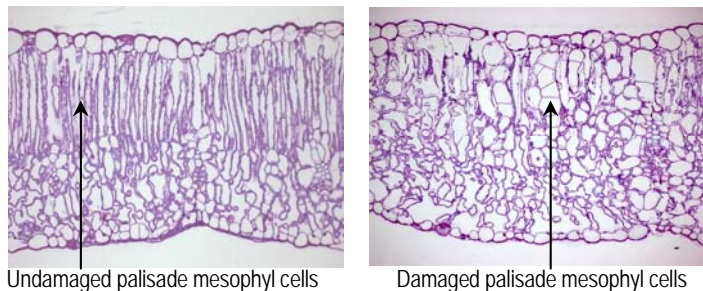
Table 1. Effect of jassid damage on the photosynthetic rate ($\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$) of young and old cotton leaves – Lei, Reddall, Wilson, Heimoana CSIRO.

Leaf Age	Undamaged	Damaged*
Young (node 3 below terminal)	30.1	24.0
Old (node 10 below terminal)	13.5	12.3

*Damaged leaves = 80% of upper leaf surface stippled and white.

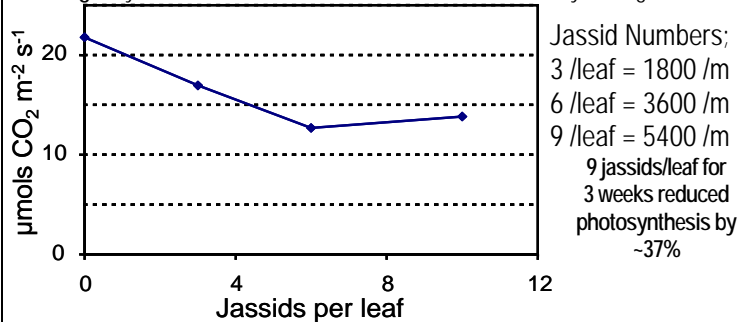
In comparison, leaf symptoms of similar severity in mite trials would stop photosynthesis altogether. The relatively low impact of jassid damage is due to the way their feeding affects the internal structure of the leaf. Jassids feed mainly on the palisade mesophyll cells within the leaf. The collapse of these cells causes the upper surface of leaves to take on the white, stippled appearance. The lower leaf surface remains green and lower leaf cells continue to function as sunlight passes through the damaged upper cells. The cross sections in Figure 1 illustrate jassid damage. Note the divisions in the damaged cells (right) indicating leaf repair.

Figure 1. Healthy (left) and heavily jassid damaged leaves (right)



Kylie Borchardt, an honours student at UNE in 2003, investigated the relationship between jassid density and photosynthesis. In a glasshouse experiment, jassids were confined on cotton leaves for 3 weeks, at the end of which the photosynthetic rates of the leaves was measured. Where there were very high jassid populations, leaf photosynthesis was reduced, shown in Figure 2.

Figure 2. Effect of jassids on cotton leaf photosynthesis after 3 weeks of feeding – Kylie Borchardt, UNE. Note – leaves were extensively damaged.



Does a reduction in photosynthesis reduce yield?

It may – but.....this depends on the distribution, intensity and duration of jassid presence within the crop. Older leaves do not operate at maximum photosynthetic rates, hence yield is unlikely to be affected if damage is confined to the low and mid canopy leaves. Jassid populations occurring post cut-out are also unlikely to effect yield, even when heavy infestations occur. Leaf removal experiments at ACRI (Wilson and Yeates) reinforce this. Populations that occur early and cause extensive leaf damage (eg at least 50% of the area of most upper leaves heavily damaged) have a greater probability of reducing yield.

What is the contribution of beneficials?

A range of parasites attack jassid eggs and nymphs. Predators of adults probably include coccinellids, lacewing larvae, and spiders (especially lynx spiders). In fields where there has been low or selective insecticide use the jassid populations slowly build through the season. Control of jassids should balance the risk of yield loss against the effects of insecticides on beneficial populations. Jassids are very susceptible to a range of insecticides but preference should be given to more selective options. Broad-spectrum products such as the organophosphates omethoate and dimethoate are very effective, even at reduced rates – which may help to conserve beneficial populations. However consideration must also be given to other pests species present. Using low rates of these products against jassids will select for OP resistance in aphids. If jassid infestations are higher near the edges of field, treatment of just these areas is viable.

Anticipating outbreaks

It is likely that jassids colonise cotton from neighbouring legumes, safflower, sunflower and weed hosts – in particular those from the Solanaceae family and *Chenopodium spp.*. In many instances this explains the ‘edge effect’ often characteristic of jassid infestations.

Further research

Research on the effect of jassids on yield is continuing using real jassid infestations and simulated damage (e.g. removing leaves or spraying on a substance that mimics jassid damage – Wilson, Yeates and Heimoana, CSIRO at ACRI). It has always been the intention to repeat the trial done at “Weetawaa” in 2002, but a suitable site has not been located. If anyone is currently seeing high jassid populations and is interested in hosting a trial, contact Lewis Wilson on 6799 1550.

Thanks to Lewis Wilson and Julie O’Halloran for their contributions to this Tale.