Natural enemies in bush areas

By Scott Hardwick, CSIRO Entomology and the Australian Cotton CRC

Growing numbers of cotton producers are turning to Integrated Pest Management (IPM) to help control their insect pests — especially Helicoverpa. Beneficials are an important component of any IPM strategy, so it is important that growers know which areas in the agricultural landscape act as reservoirs for predators and parasites and which beneficials are present.

While it is known that perennial crops such as lucerne (grown either as large blocks or strips within existing annual crops) can act as refuges for beneficials, little is known about the role that grasslands and native vegetation remnants play in conserving these species.

There is also the question of where beneficial insects overwinter once the cotton or grain is harvested? While a number of predators overwinter in cotton stubble, it is probable that a large reservoir of them overwinters in areas once viewed as waste or non-productive land.

This article presents a brief overview of recent surveys for predators carried out on properties in the Hillston region of southern NSW. The results show that native bush remnants and waste areas may be a valuable source of a number of beneficial insects known to occur in local cotton crops.

Spiders were the most common predators found at all collection sites. Here a yellow night stalker is eating a green mirid. Photo: David McClenaghan.

Damsel bugs were amongst the most commonly found predatory insects in waste areas and native bush remnants. Photo: David McClenaghan.

Beneficial sampling

During the summers of 2001–02 and 2002–03, six on-farm sites adjacent to cotton crops were sampled five times each year for the presence of predatory insects. These sites could be broadly split into two types:

- Native vegetation remnants — in this case river red gum remnants; and,
- Waste areas, which largely consisted of native and introduced grasses and a number of agriculturally important weeds and/or young shelterbelt plantings.

Samples were taken in early September (before planting), late October (after cotton plant emergence), mid December, mid January (before and after the first application of synthetic pyrethroid insecticide) and June (after cotton stubble management) and were collected by pitfall trapping, suction sampling and beat sheeting of the dominant vegetation at each site.

While a range of predators was found in the beat sheet and suction samples, we will concentrate on those known to occur in cotton and grain crops in the region. Predators found included:

- Spined predatory bug;
- Glossy shield bug;
- Minute two spotted lady bird beetles;
- Red and blue beetle;
- Big eyed bug;
- Green and brown lacewings;
- Transverse, striped, and white shouldered lady bird beetles; and,
- Damsel bugs.

There was also a wide range of spiders, some of which may also be important predators within crops. Pitfall trapping in the study areas revealed the presence of ground dwelling spiders, earwigs, carabid beetles and centipedes, all of which are known to occur in cotton and grain crops within the region.

In both years, data from the suction samples taken from the waste areas and bush remnants showed that the highest numbers of predators were present in spring and winter while numbers were lowest during the middle of the summer growing season. There are a number of explanations for this.

One possibility is that predators move into cotton crops after stand establishment in spring, followed by a movement back into waste areas and bush remnants in the late autumn–early winter after cotton has been harvested and the beds have been cultivated and reformed in readiness for the next cropping season. But more research would need to be carried out to confirm this.

20 ▷

Waste areas, grasslands and native bush remnants could potentially contribute to spring populations of predators in cotton.
Photo: Scott Hardwick.

The number of predatory insects in samples taken from the bush remnants during spring and winter was higher than in corresponding samples taken from waste areas dominated by grasses and weeds.

This difference in predator numbers may be because bush remnants provide more sheltered overwintering sites than waste areas that are usually more exposed to climatic extremes and/or differences in the availability of prey in the two environments. In the 2002–03 samples, the numbers of predators in the waste areas sampled remained low throughout the cropping season.

This may have been due to the drought causing a lack of prey species or ground cover and so reducing the ability of these areas to support populations of predators.

Spiders were the most commonly found predator group at both types of site — up to 30–40 per cent of the total number of predators captured. While the spider group contains a wide range of species, all of which have different functions within the agroecosystem, many of the spiders found in the samples belong to families known to occur in cotton crops in large numbers.

The next most common groups of the invertebrate predators were insects — ladybirds, damsel bugs, red and blue beetles, lacewings and predatory shield bugs. Big-eyed bugs and carabid beetles and earwigs were least commonly found.

Closer examination of the results revealed a number of differences in the proportion of different types of predators at each type of site. Lacewings (particular brown lacewings), big eyed bugs and damsel bugs made up a greater proportion of predators found in samples taken from grass dominated waste areas than those taken from native vegetation remnants.

Predatory shield bugs, red and blue beetles, earwigs and carabid beetles were more likely to be found in samples taken from native vegetation. The observation that different types of vegetation support different species of predators is important. It indicates that, within an agroecosystem, any effort to conserve or manage areas as reservoirs of predators must involve a range of vegetation types to maximise the potential benefit.

These results show that wastelands and remnant vegetation are important sources of predators, particularly at times when there is no other vegetation available.

This means there are source populations of beneficial invertebrates available when crops are planted. Research now needs to be done on the movement of predators out of these areas into developing crops and ways to encourage it.

The knowledge that waste areas and native bush remnants could potentially contribute to spring populations of predators in cotton means it is important to protect these areas from factors which may be detrimental to their predator populations such as insecticide drift and over spray.

Furthermore, questions about the role of weeds within these areas and how they should be managed now become important. This is particularly so if they are sources of shelter, nectar or pollen and prey for early season populations of predators at a time when much of the agricultural landscape is devoid of other vegetation.

Thank to the Australian Cotton CRC and GRDC for providing funding, the owners and management at Merrowie, Brooklyn and Cowl Cowl stations for making their properties available for sampling and Kathy Semmler, Pip Whiting, Ben Sinclair and Stanley Southwood for their help with sampling.