A survey of predatory arthropods in a range of dryland refuge crops on the Darling Downs.

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Introduction

Predatory arthropods are important in cotton IPM programs and planting a diverse range of crops may increase the on farm bio-diversity of predators. In some growing regions, it is common for large-scale cotton monoculture to be planted. Mixed cropping is likely to increase the bio-diversity and abundance of predators which may assist in increasing the natural control of pests.

It is important that the potential number of predators produced in different crop habitats is known. Specific crops can then be planted to enhance the numbers of key predatory species. Knowledge of the types of predators produced from different crops is important because some predator species are more significant natural enemies of pests than others.

The research presented here provides information on the numbers and types of predators harbouring in a range of crops on a Darling Downs dryland cotton farm.

Methods

During the 2001-2002 cotton season a refuge at Jimbour was monitored weekly for predatory insects and spiders. The refuge area consisted of, Bonus sorghum, mixed sorghum (hybrids of differing maturity), chickpeas, cotton, soybeans and pigeon pea. Planting occurred from the third to the fifth of November 2001. Weekly sampling of predators included identifying and counting the number of beetles, bugs, hoverflies, spiders and ants in a metre of crop by beating. This sampling method involves beating a one-metre stick ten times (swiftly and vigorously) against a metre row of crop over a sheet. This knocks insects from the plants sampled onto the sheet so they can be counted and identified. Beat samples were conducted at six randomly selected sites in each crop.

Results

Sorghum

During December, Bonus sorghum proved to be a major source of predators. The majority of these were ladybird larvae and hoverfly larvae. Hoverfly larvae were only found early in the season, however other predator numbers continued to increase until early to mid February when numbers declined (Figure 1).

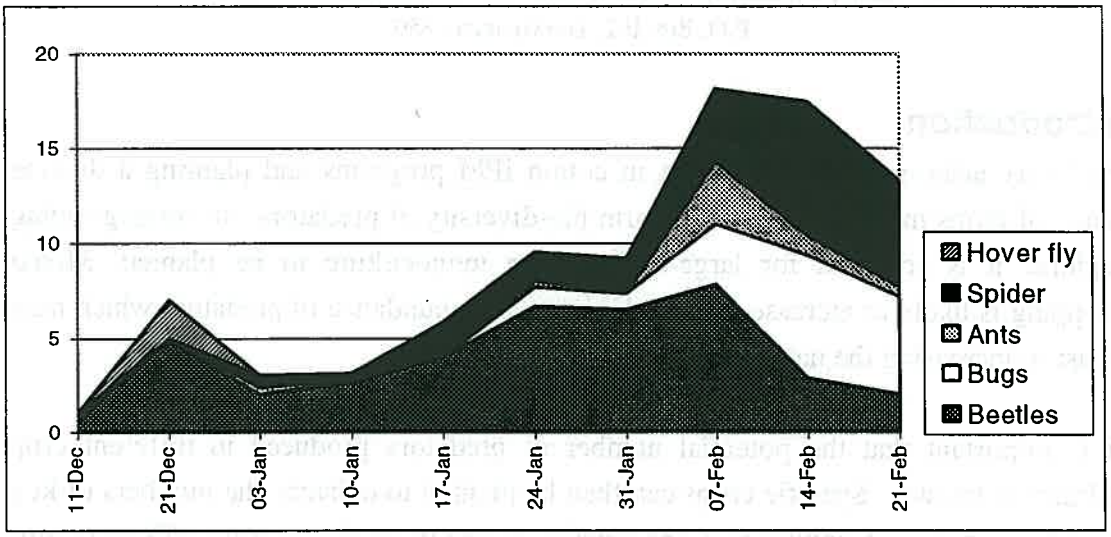

Figure 1: The mean number of predators counted in a Bonus sorghum refuge at Jimbour during 2001-2002.

The mix of three sorghum hybrids also proved to be a good source of predators during December. Unlike the Bonus sorghum the hybrids did not have a steady rise in beetles through the season but their numbers were quite variable. The drop in beneficial numbers in mid January was mainly due to a drop in beetle numbers (Figure 2). Towards the end of the season a majority of the predators in both mixed hybrid and Bonus sorghum were big-eyed bugs, *Geocoris* spp., and spiders.

Ladybird beetles (the majority consisting of three banded ladybirds, *Harmonia octomaculata)*, were found in large numbers in sorghum, particularly in the Bonus sorghum. This can be seen by the difference in the average number of beetles over the whole season. Bonus sorghum had an average of 4 beetles/m compared with 1.8 beetles/m in the three mixed hybrids. The opposite trend was the case for the bugs, which averaged 3 bugs/m over the whole season in the three hybrids, compared with 1.6 bugs/m in the Bonus sorghum. Most of the ladybird adults moved out of the sorghum and into the INGARD cotton by the 14-Feb. Within two weeks of this migration they moved into a late planting of sorghum that was heading. They proved

to be a very mobile insect and more study needs to be conducted to investigate why they are suddenly attracted to other crops.

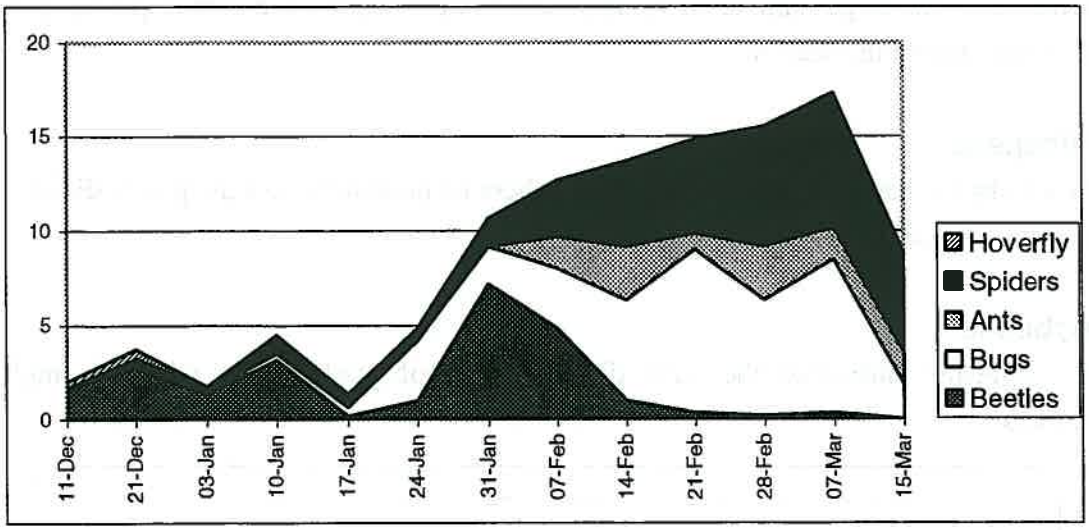

Figure 2: The mean number of predators counted in a mixed sorghum refuge at Jimbour during 2001-2002.

Cotton

During January, and particularly early February the number of predators began to build up in the cotton. The main predators were; damsel bugs (*Nabis kinbergii*) big-eyed bugs *(Geocoris* spp.), lynx spiders (*Oxyopes* spp.), nightstalking spiders (*Cheiracanthium* spp.) and ants. There was a sudden increase in the adult ladybird population for three weeks, peaking on the 14-Feb (Figure 3). We believe these ladybirds came from the adjacent sorghum.

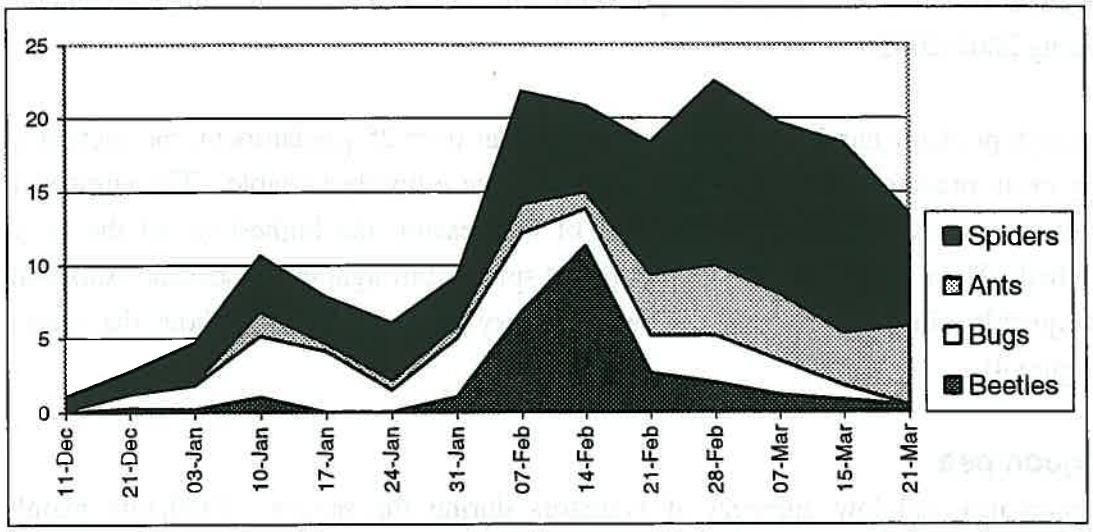

Figure 3: The mean number of predators counted in a cotton refuge at Jimbour during 2001-2002.

From the 7-Feb until the 15-March the average beneficial numbers in cotton were around 20 predators/m. This was higher than any other crop in the refuge. This can be attributed to the large number of spiders, which were the most common predator in the cotton during the season.

Chickpeas

The chickpeas harboured no significant numbers of predators, and the plants died by the end of January.

Soybeans

The soybeans harboured the most diverse range of predators in relatively high numbers.

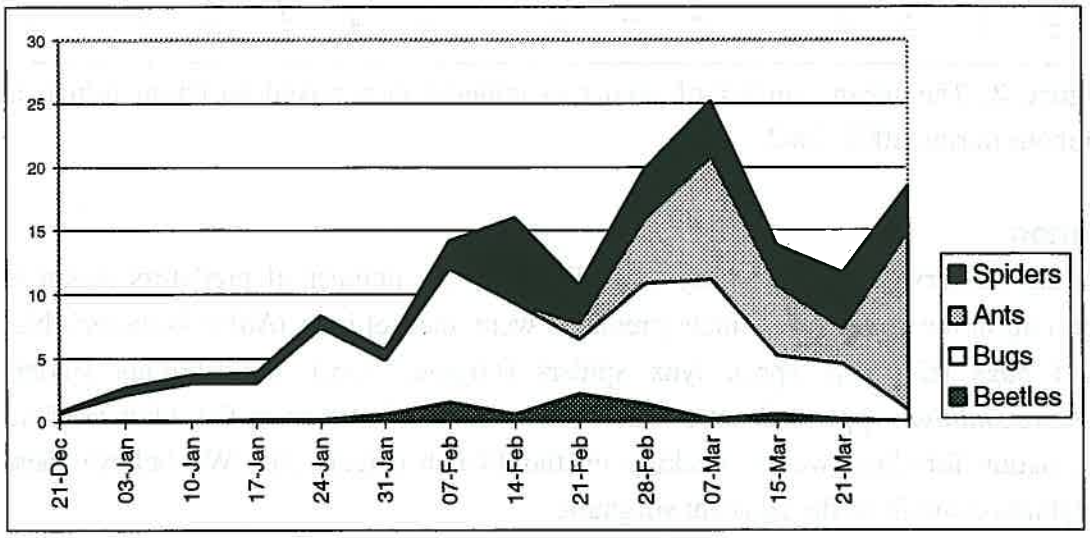

Figure 4: The mean number of predators counted in a soybean refuge at Jimbour during 2001-2002.

Though predator numbers in soybeans peaked at over 25 predators/m, the highest of any crop, predator numbers during the season were highly variable. The number of bugs remained at about 7/m for most of the season, the highest of all the crops studied. There were only a small number of spiders throughout the season. Ants built up quickly after the 21-Feb. There were very few beetles throughout the season (Figure 4).

Pigeon pea

Pigeon pea had low numbers of predators during the season. Predators mainly consisted of ants and spiders after the 31-Jan while the bugs remained low for the

entire season. Much like the soybean, there were very few beetles throughout the season (Figure 5).

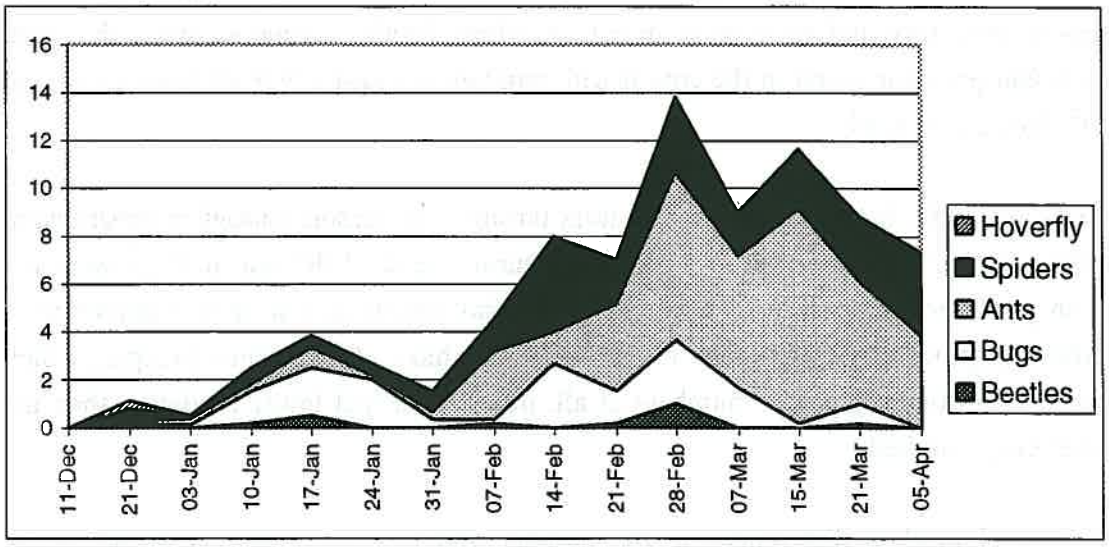

Figure 5: The mean number of predators counted in a pigeon pea refuge at Jimbour during 2001-2002.

Discussion and Conclusions

The numbers of predators in all crops increased progressively over the season, with sharp rises in late January and early February. More specifically, hoverfly larvae had rapid but unsustained population growth during December preferring young vegetative sorghum. Ladybird numbers also increased quickly early in the season in the sorghum and remained on the farm for the rest of the cotton season. They seemed to move readily between crops.

Spiders were found in low numbers early in the season. During early February spider populations increased quite dramatically, particularly in cotton and sorghum, staying at high levels until the last sampling date.

Bug numbers were reasonably constant in the cotton and pigeon pea for most of the season, while in the soybeans there was a slow but generally progressive increase throughout the season. However in sorghum bug numbers were very low until the 7-Feb, when the numbers increased markedly.

Ants were prominent from the start of February, particularly in the pigeon pea and soybean. The large numbers of ants found in these crops may have displaced other predators.

Sorghum and cotton proved to be the most effective predator refuges as these crops consistently harboured the highest number or predators. Sorghum produced early season predators and they were mainly ladybird beetles. Spiders were the most abundant predator found in the cotton with numbers averaging 9.6 spiders/m from the 14th January onwards.

Soybeans had a high number of predators through the season, though numbers were more variable than in cotton or sorghum. During most of the season bugs were the main predators in soybeans. Both soybeans and pigeon pea were not attractive to ladybirds, possibly because they harboured few aphids. Aside from chickpea, which had no significant predator numbers at all, pigeon pea had fewer predators than the other crops studied.

We found marked differences in the number and type of predators found in the different crops. Traditional monoculture planting will not produce the variety of predators that a mixed cropping system will. Increasing the diversity of predatory arthropods by planting different crops may be important in future IPM programs, particularly once the key predators of the primary pests have been identified.

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