1-1-1973

Natural control of insect pests on the Ord?

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Current trials conducted by the Department of Agriculture at Kununurra are indicating that there may be an important place for biological control of insect pests of the Ord River Irrigation Area.

Ever since the beginning of agriculture on the Ord River Irrigation Area one of the major problems, and certainly the major cost of farming has been insect control. During 1973 an outlay of $175 per hectare has not been sufficient to prevent damage and yield loss in cotton, while sorghum yields have sometimes been halved by insect damage.

Over the past five years Heliothis species emerged as the major pest of cotton, sorghum and several experimental crops on the Ord, particularly with the development of DDT resistance in Heliothis armigera, which became apparent in 1970. Heliothis punctigera, the major Heliothis species before 1970, has not shown resistance to chemicals.

Since then, it has been shown that natural controlling forces are completely effective against Heliothis under some circumstances.

Parasite (Microgaster species) has finished feeding inside a Heliothis larva and has emerged and spun a cocoon beside the dying victim.

Predator (Oechalia species) sucking a Heliothis larva.

Packsaddle experimental area

The main difficulty in the study of natural control of insect pests in an area such as this is that consistent heavy spraying of neighbouring crops affects both pests and beneficial insects in the experimental crops and prevents the development of natural control.

Small areas of cotton and sorghum and smaller plots of safflower and peanuts were therefore grown on an area of Packsaddle Plains, near the Diversion Dam, specially prepared for observations on natural mortality.

As no insecticides were applied to the area, populations of the pests and beneficial species were allowed to develop and were checked regularly by field counts, by rearing of many specimens and by collecting with a vacuum sampler for sorting in the laboratory.

It was intended to maintain two or more crops of sorghum in differ-
sent stages of growth throughout the year, to attract and retain both pest and beneficial species. Locusts were a problem during the wet season but numbers diminished into the dry season. *Heliothis* was present in moderate numbers but at no stage was the crop severely damaged. The sorghum head caterpillar was present in very large numbers and caused considerable damage to the crop.

The cotton was grown normally but several pests caused moderate to severe damage and the yield was slightly less than half that of the valley average, with a poor quality product. Loopers were numerous but sufficient leaf area was always present. *Heliothis* then removed almost all fruiting parts after a sudden invasion into the area and a huge egglay. A species of thrips severely affected the crop and then, as more fruit was forming, rough and pink bollworms became very damaging.

The peanut crop grew and yielded exceptionally well compared with crops in the valley with only minor damage from *Heliothis*. The safflower has not been harvested but *Spodoptera* and *Heliothis* damage was heavy for a short period.

Parasites and predators

Many beneficial species were present but the value of each one could not be gauged in this short study.

The egg parasite, which attacks many pests, is one of the most significant species and was present in large numbers. *Heliothis* larval parasites were scarce for most of the time.

A parasite of the loopers was found in enormous numbers and seemed to be a very effective controlling agent.

Three larval parasites of the rough bollworm were reared and a pupal parasite of the loopers and the rough bollworm was in large numbers.

A pupal parasite at least helped to reduce the large population of the sorghum head caterpillar. It is interesting that this pest is rarely seen on the Ord Beef Farm and this is one of the indications that the small, new experimental area did not contain a good balance of pest and beneficial species.

Of the general predators the spiders were the most numerous, but several bugs, beetles and a lacewing were present in moderate numbers. The value of at least two of these species was reduced by parasites.

In the coming season it is planned that the experimental area will be doubled. It will still be too small for this sort of work but it is hoped that a better balance will develop there in the coming season and with some of the knowledge we have gained this year, together with the use of some selective control measures, much more may be achieved.

It is hoped that, at least for the coming season, the commercial farming and spraying will not be close enough to the area to greatly influence pest and predator populations.

Commercial sorghum

During the cotton season few observations could be made on the sorghum in the Valley but from July these were intensified. It has been observed at times that while sorghum crops in some parts of the valley are being severely damaged by pests, unsprayed crops on the Ord Beef Farm are almost free of the same pest.

Mortality study

Two short but intensive studies have shown that a very large number of *Heliothis* eggs are laid in the young sorghum heads so that the potential is there for huge populations to develop. In the absence of toxic chemicals, however, more than half, and probably 90 per cent of these eggs are parasitised.

The total mortality in the egg stage from the parasite, predators and other causes may amount to 99 per cent, and the one per cent of larvae which emerge normally may all be parasitised before they cause significant damage.

This is actually what happened in our study: not one caterpillar, out of 500 eggs laid, grew to the damaging fifth or sixth stages.

*Heliothis* virus

A virus disease of *Heliothis* produced in the U.S.A. was imported for testing on cotton but does not appear to be sufficiently effective on that crop to give satisfactory control. However, results on sorghum have been encouraging, and the virus could be a useful tool should the number of predators and parasites be diminished for some reason.

Conclusions

Work conducted over the past year has shown that biological control is not a far off dream but a reality in the Ord area. Many beneficial species are present and two have been shown to be totally effective in destroying huge incipient populations of the major pest, *Heliothis armigera*, in sorghum.

Cotton is highly susceptible to insect damage and is attacked by many pests. Parasites and predators may not be as effective in cotton as in sorghum crops, so the prospects for biological control in cotton are far less promising.