

**PESTS IN RAINFED COTTON.**

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**INTRODUCTION**

The Bureau of Rural Resources has estimated the area in central Queensland potentially suitable for raingrown cotton production at 60-80,000 ha. With cotton prices above 1989\$ 400 per bale, raingrown production can be highly profitable with even mediocre management. While the needs, risks, and management options for raingrown cotton have been dissected by other speakers at this conference, what happens to an insect management strategy which is totally dependent on the remedial use of insecticides should this potential suddenly be realized?

Clearly it is important that we develop, now, a management strategy that reduces our reliance on conventional chemical control of insects and which is stabilized by the integration of some alternative pest control methods.

Indeed the raingrown cotton scenario provides an ideal test-bed for alternative control tactics. As yield is ultimately linked to available soil water, the requirement for continual insect control is less rigid than is the case for irrigated cotton. While the crop is planted on the expectation of adequate water availability, seasonal developments demand detailed scrutiny of each decision to apply insecticides. Under a minimum applications regimen, the natural enemies of cotton pests are more likely to express some activity.

INSECT PESTS OF RAINGROWN COTTON

Frequent and Common	native budworm	<i>Heliothis punctigera</i>
	cotton bollworm	<i>Heliothis armigera</i>
	pinkspotted bollworm	<i>Pectinophera scutigera</i>
	mirids (bugs)	various species
Patchy or Occasional	aphids	various species
	two-spotted mite	<i>Tetranychus urticae</i>
	cotton tipworm	<i>Crociosema plebejana</i>
	soil insects ... field crickets &	<i>Lepidogryllus</i> sp.
	false wireworm beetles	<i>Gonocephalum</i> spp.
Infrequent	rough bollworm	<i>Earias huegeli</i>

CURRENT CONTROL METHODS

As control methods are insect-orientated, the methods for any particular pest are usually common between irrigated and raingrown situations.

One difference that may occur is in the soil insects encountered at planting time. Whereas cotton is planted say October in southern districts and larval forms of the false wireworms cause seedling damage, in central Queensland planting times may be as late as mid-January and seedling cotton will more likely be damaged by the adult forms of soil insects. In this case more discretion can be used in deciding whether to apply control, and the need for "insurance" type in-furrow applications is avoided.

While the cotton plant develops through periods of greater and lesser vulnerability to insect damage in a pattern related to its

plant physiology rather than to available soil water, one potential difference between the irrigated and raingrown situations is in the timing of control measures, and indeed whether measures are applied at all.

For raingrown cotton at the point of soil water depletion, two schools of thought espouse opposing opinions as to the correct course of action against a current insect problem. One school says "I must spend more money to protect the investment already made", the other says "to cut my loss I will not spend any more money on this crop". The argument is as much sociological as economic, and will depend largely on the state of the crop in question. This problem is not debated here.

#### **WHAT RELEVANT COTTON ENTOMOLOGY HAS BEEN DONE?**

To briefly review work on the insects listed above, much work has and continues to be done on the ecology of heliothis species, their biology, damage, and the possibilities for alternative control (QDPI, CSIRO, UQ, UNE); the results of which are usually directly applicable to the raingrown cotton situation. Some older work has addressed the problems of pinkspotted and rough bollworms (QDPI) and alternative control of pinkspotted bollworm is currently under investigation (UQ). Strict adherence to cultural control measures can minimize the activity of these latter species.

A major work on the pest status of mirids has recently been completed (UQ) and supplementary research on biology and economic thresholds is presently underway (QDPI).

While little work has been done on aphids, there has been a major study completed on tipworm biology and ecology (UQ). The problem of mites on cotton is presently receiving major attention

(CSIRO). Effective baiting techniques have been developed to control adult forms of soil insects (QDPI), and more effective insecticides have been assessed as in-furrow treatments (QDPI). A Germinating-Seed Bait technique is available to aid in the decision to in-furrow treat or not.

#### THE QDPI INSECT PROGRAM 1989-90 TO 1991-92

As heliothis are consistently the most important pests, our primary aim is to review presently used heliothis damage thresholds and to calibrate or replace these for use on raingrown cotton in central Queensland. The program follows several major lines.

1. Disbudding trials - these experiments precisely simulate the effects of previously defined levels of insect damage to the plant, and demonstrate its capacity to compensate for early season damage. From the perspective of "earliness", disbudding treatments are executed over a period immediately following first squaring.

2. Larval feeding dynamics - how many and which fruiting forms do larvae eat as they develop? The defined levels used in 1 above will be reviewed for applicability in the raingrown situation.

3. Natural survival of the immature stages - through studying the survival rates of the egg and larval stages under natural environmental conditions it is possible to quantify both the rate of heliothis decline and the significance of each of the major controlling influences (predators, parasites, diseases, weather, host plant effects) on this mortality.

Linking 1 and 2 above establishes the larval densities equivalent to various levels of disbudding. By overlaying 3, natural survival, on the numbers of immatures we can construct a more relevant economic threshold for the raingrown situation.

Studies on survival also indicate any worthwhile action by natural enemies. This activity may be augmented in various ways in order to introduce alternative control approaches into an insect management strategy.

Other programmed work includes -

4. Review of insect sampling techniques to attain the maximum suitability for the raingrown situation. This is being done in association with CSIRO.

5. Arthropod fauna survey to document the composition of the insect/spider complex inhabiting raingrown cotton fields.

6. Initial assessment, in association with CSIRO, of the potential to incorporate aspects of CSIRO's water-sensitive cotton fruit-model (HYDROLOGIC) within the dynamic economic threshold outlined above. This relates any insect damage prediction to soil water availability, the importance of which for raingrown cotton has been previously outlined.

7. Initial work to organize the available mass of variously vintaged and sourced information on relevant insect pests into a PC-based expert system covering raingrown cotton insect management.

Another QDPI project aims to test the suitability of the inundative release of egg parasites for heliothis control in raingrown cotton during the 1990-91 season.

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