Heat Unit Research

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Summary

Heat unit requirements for early season short staple cotton development, spring emergence and generation times of pink bollworm have been field tested since 1975. These heat unit models can be used to determine 1.) pink bollworm spring population levels in pheromone traps compared to other years and/or other areas, 2.) when to start pink bollworm field monitoring, and 3.) when to time the application of pheromones by confusion or mass trapping for early season pink bollworm mating disruption.

Since insects and plants are "cold-blooded", their development times can be determined and predicted very accurately using heat unit accumulations. By using this system of keeping track of biological events based on heat inputs, we can eliminate most of the guesswork that occurs when we try to compare or predict insect and plant development using calendar dates that are not sensitive to differences in changing temperature patterns from year to year, area to area, and day to day.

The following table presents a summary of results from 6 years of field studies on heat unit requirements for pink bollworm and early season short staple cotton development in Arizona.

Heat Unit Requirements for Pink Bollworm and Early Season Short Staple Cotton Development Using Daily Maximum and Minimum Air Temperatures *

Organism	Event	Average Heat Unit Requirement
Pink Bollworm	Begin continuous spring emergence	500 from Jan. 1st
	50% spring emergence	1180 ± 30 from Jan. 1st
	Complete spring emergence	2200 ± 50 " " "
	Time to complete 1 generation	750 ± 50 from first time 10 day old cotton squares are available in early season, or from egg to egg or adult to adult during mid and late season.
Short Staple Cotton	First pinhead squares	700 ± 50 from planting date
" " "	First flowers	1190 ± 50 " " "
" " "	First 1" diameter bolls	1570 ± 50 " " "

* Heat unit accumulations are based on a computerized system using a base temperature of 55° F and a high cut-off temperature of 86° F. For heat unit tables and further information, contact Roger Huber, Entomology Dept., University of Arizona, Tucson, AZ 85721.

Pink Bollworm Pheromone Mass Trapping Research

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Summary

Comparisons of pink bollworm infestations in pheromone mass trapped long-staple cotton and untrapped long staple cotton showed significantly lower pink bollworm infestations in the mass trapped long staple during 1980. This is the third consecutive year that significantly lower infestations were found in pheromone mass trapped long staple cotton when compared with similarly managed untrapped long staple fields.

Early season pink bollworm pheromone mass trapping has been used on approximately 18,000 acres of Arizona cotton every year since 1976. Research to evaluate the effects of pheromone mass trapping of pink bollworm male moths has resulted in data showing consistently lower infestations in mass trapped cotton when compared to untrapped cotton.

The following table summarizes the results of the 1980 research in the Safford and Wenden areas.

Comparative % Pink Bollworm Infestations in Pheromone Mass Trapped and Untrapped Long Staple Cotton in 1980. *

Type of Sample	Safford Area		Wenden Area	
	Mass Trapped	Untrapped	Mass Trapped	Untrapped
Green Bolls	15.3	48.1	16.9	23.3
Open Bolls	9.7	34.6	5.8	13.2
Open Bolls with Multiple Infestation	0.7	9.0	0.5	1.4

* Based on whole plant samples collected during late October prior to harvest. Total bolls dissected: Safford = 3,700; Wenden = 2,400.

Some Guidelines for Use of Gossyplure in Pink Bollworm Control

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I. Criteria for Selecting Candidate Fields.

The successful use of gossyplure by the mating disruption method depends on the grower and pest control advisor being thoroughly familiar with the unique characteristics, requirements, and limitations of this control technique. Field personnel must carefully and frequently check pheromone traps and take boll samples to determine the effectiveness of the pheromone applications.

A low overwintering population is important for mating disruption, as with any other control program. Low overwintering populations are obtained by early termination of the crop the previous season, early harvesting, disposal of stalks by shredding followed by deep plowing and winter irrigation to aid decomposition of plant wastes, and the growing of a small grain crop following cotton.

Since pheromones do not kill moths, it is important that mated female moths not migrate into gossyplure treated fields. Isolation of treated fields is desirable, with at least 1/4 to 1/2 mile from the nearest stub field, partly to reduce the migration of other pests such as cottonleaf perforator. An ideal way to provide isolation is to treat large areas with gossyplure.

II. Program.

1. Determination of Initial Application.

Emergence of adult pink bollworms from overwintering larvae is affected largely by temperature and moisture. In central and western Arizona emergence begins in early to late March and continues into July, with the peak in April and early May. Generally a substantial portion of the moths emerge prior to the appearance of squares (buds) in planted cotton. This suicidal emergence does not contribute to infestations.

The timing of the first application is made at the time or shortly before plants produce the first squares, as per label directions. This is most important in early planted fields or in fields in which high overwintering populations may be present. In fields with few pink bollworms, the first pheromone application may be delayed after the first squares but no later than one week after the appearance of the first flowers. Dates of squaring and flowering can be predicted by the use of heat units calculated from the daily maximum and minimum temperatures.