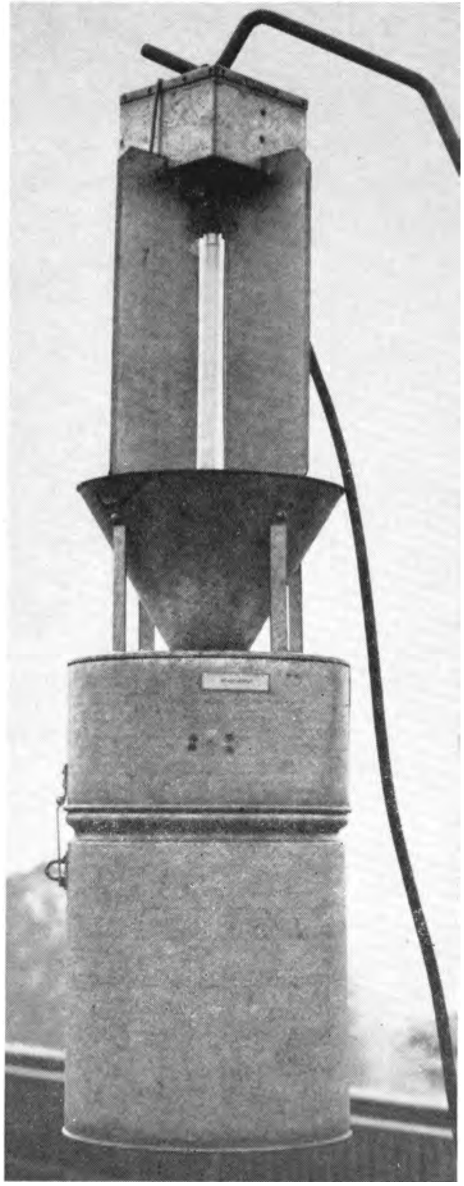

Blacklight insect trap with omnidirectional-positioned 6-watt lamp.

LIGHT TRAPS *for*

L. A. FALCON · R. VAN DEN BOSCH · L. K. ETZEL

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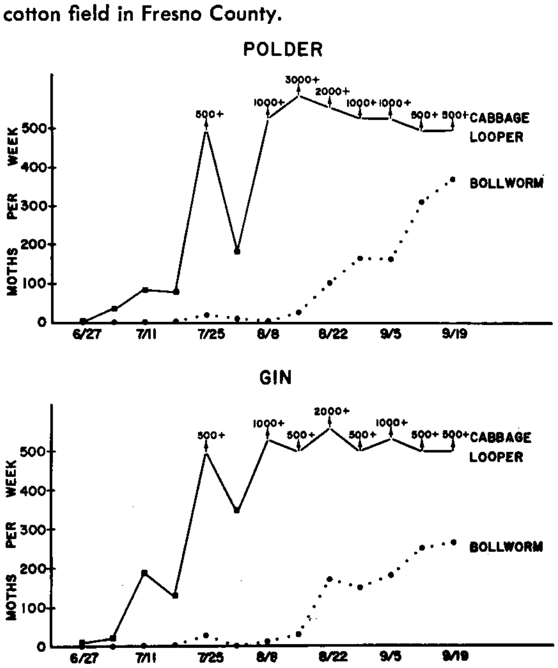
THE CABBAGE LOOPER, *Trichoplusia ni* (Hübner), and the bollworm, *Heliothis zea* (Boddie), threaten cotton production in the San Joaquin Valley each year. The proper timing of appropriate control measures is of utmost importance. Methods employed in assessing the need for control of cabbage looper and bollworm presently rely on detecting the presence of these species in the egg or larval stages in the field. However, eggs and larvae only appear after there has been moth activity. It would therefore be highly useful in the monitoring programs if information were also available on the timing of flights and the abundance of moths of the two species. Such information would alert growers and entomologists to moth activity in the cotton fields and, possibly, to the potential magnitude of larval infestations.

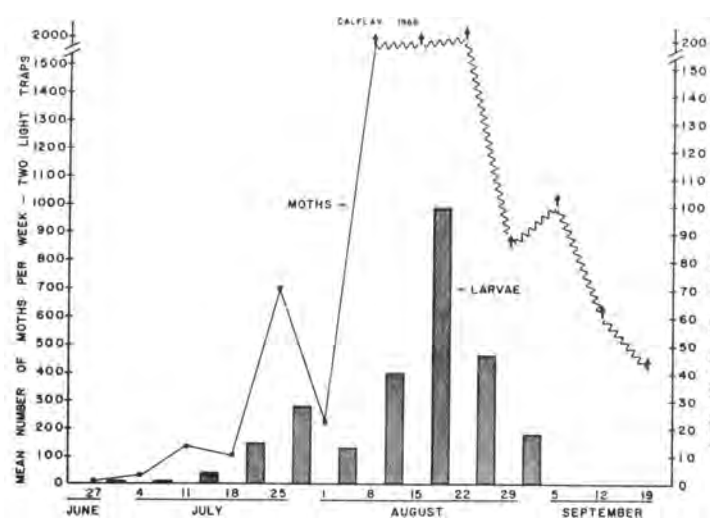
Insect traps utilizing fluorescent ultraviolet "blacklight" lamps attract moths of many species, including those of the cabbage looper and bollworm, and can provide information on the appearance and seasonal abundance of these moths. In 1966, blacklight insect traps, operated in conjunction with a cotton field experiment near Five Points, Fresno County, proved highly useful in detecting threatening infestations of the cabbage looper and bollworm.

In the study, single light traps were located approximately 1 mile east and west of the test plot and about 3.75 miles apart. Each trap was equipped with an omnidirectional-positioned, 6-watt F6T5–BL fluorescent lamp as the attractant (see photo). The moths were collected in 70% ethyl alcohol and the catches were examined at daily intervals from June 20 to September 19. The numbers of moths collected were tabulated at weekly intervals as a means of determining fluctuations in abundance (graph 1). The field test arrangement provided a season-long opportunity to compare egg and larval abundance of cabbage looper and bollworm in experimental areas as compared with the number of moths of each species collected in the light traps.

Graph 1. Weekly totals of cabbage looper and bollworm moths collected in light traps at two locations near test cotton field in Fresno County.



Graph 2. Average number of cabbage looper moths collected per week in light traps compared with average number of larvae per 200 sweep-net samples each week.



as detection devices moths of cabbage looper and bollworm

In a 1966 test, blacklight insect traps effectively trapped moths of cabbage looper and bollworm in a Fresno County cotton field. Increased collections of moths in the traps were followed by a rise in egg and larval populations in the field. Light-trap information used together with established field-checking procedures can aid in determining the need for control measures of these pests. More detailed information is available in Leaflet 197, "Light Traps and Moth Identification," available at local Farm Advisor offices.

Cabbage looper

One method used for assessing the abundance of cabbage looper larvae was by sweep samples made with a standard insect net. Four samples of 50 sweeps each were made per plot at weekly intervals from June 6 to August 30. In another sampling method, 100 each mature terminal and middle leaves were examined per plot at weekly intervals from August 8 to September 5 for looper eggs and larvae. Damage to these same leaves was also recorded. Fluctuations in the numbers of cabbage looper eggs and larvae found in four untreated plots by the two sampling methods just described were compared with the mean number of moths collected per week in the two light traps. These data are summarized in graphs 2 and 3.

In the light traps, cabbage looper moths were collected throughout the test period. An initial peak in the number of moths collected occurred during the week ending July 25. A second period of intense activity began during the week of August 1 to 8 and was sustained over the subsequent two weeks. A downward trend in moth collections began the week ending August 29, and continued until the termination of light-trap operation on September 19.

In the field, larvae were found in the net sweeps each week from June 6 to August 30. Two peaks in larval abundance occurred, one immediately following the first heavy moth flight of the week ending July 25, and the other in the week of August 15 to 22, two weeks after the second period of intense moth collections began. The leaf samples were made at weekly intervals from the week of August 8 to 15 through that of August 29 to September 5. The first two leaf samples coincided with the second period of intense moth activity.

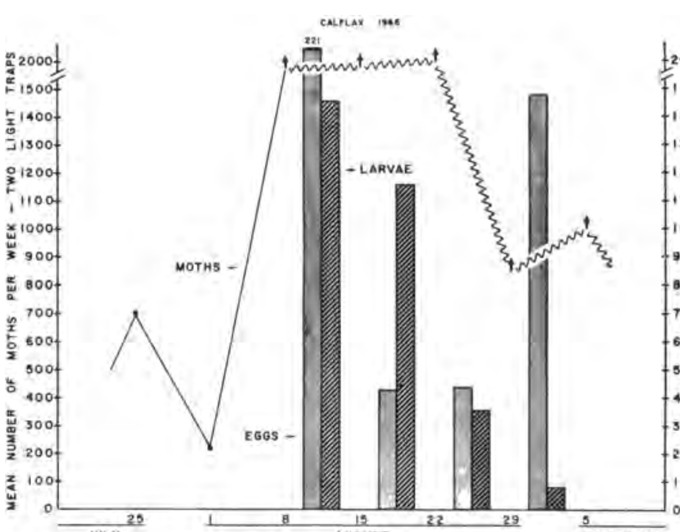
The highest number of eggs and larvae were found in the first leaf sample (week of August 8–15). At this time, 75% of all larvae found were small (½ inch or less in length), which reflected recent hatch. The heaviest leaf damage also occurred during this week. Egg counts dropped considerably in the next two sampling periods despite the continued abundance of moths.

Last sample

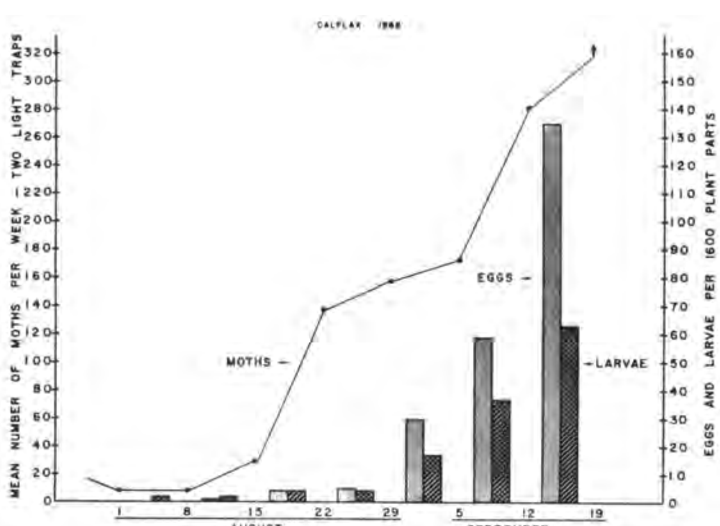
In the last sample (week of August 29 to September 5), an increase in egg abundance was recorded although moth activity decreased. Larval numbers also dropped after the first sampling date and each following week a greater proportion of the larvae found were large (over ½ inch in length). Despite the high egg count in the last sample, the larval population did not increase for the remainder of the season.

A comparison of the larval counts obtained by net sweeps with those found on

Graph 3. Average number of cabbage looper moths collected per week in light traps compared with total number of eggs and larvae found on 800 mature cotton leaves each week.



Graph 4. Average number of bollworm moths collected per week in light traps compared with total number of eggs and larvae found on 1600 plant parts each week in an untreated area.



the leaves differed as to the time of peak larval densities in August. Thus, as previously mentioned, in the leaf samples larval abundance and leaf damage were greatest the week of August 8 to 15 when 75% of the larvae found were small; however, the net sweeps recorded the highest number of larvae the following week, August 15 to 22. The sweep-net method apparently did not collect sufficient numbers of small worms to accurately reflect larval densities of cabbage looper when the majority of larvae present were less than ½ inch in length.

Bollworm

An assessment of the field populations of bollworm eggs and larvae was made by examining terminals, squares, and both small and large bolls at weekly intervals. In each treatment, 400 structures of each category were examined—a total of 1600 plant parts per week. There was good correlation between the field counts of bollworm eggs and larvae and the mean number of moths collected in the two light traps (graph 4). The upward trend in moth abundance began the week of August 15 to 22, and an increase in egg and larval numbers was found in the field counts made the week of August 29 to September 5. Thereafter, the numbers of eggs and larvae recorded increased until the end of the test period.

Conclusions

Two light traps located 3.75 miles apart and each situated about 1 mile from a test field were used effectively to trap moths of cabbage looper and bollworm, and reflected similar patterns in timing, magnitude, and duration of moth flights. Increased collections of moths in the traps were followed by a rise in egg and larval populations in the field. Through a combination of light-trap information and adequate field sampling procedures, a more effective means for detecting the onset of infestations and assessing the population levels of cabbage looper and bollworm in cotton appears possible.

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DUAL-USE RETURN-WATER IRRIGATION SYSTEM

F. K. ALJIBURY · J. W. BROWN · C. E. HOUSTON

This study indicates that where tailwater is a necessity to provide an appreciable increase in production of a relatively high-value crop, a large investment in the irrigation return-water system can still be economically feasible.

RECENT STUDIES in the surface-irrigated citrus areas of southern California have shown that insufficient water application at the lower ends of orchards has sometimes decreased fruit production. To overcome this problem without a prohibitive increase in irrigation labor, it has been necessary to irrigate for a longer period of time—resulting in excess tailwater. With Colorado River water costs as high as $30 per acre foot, it is imperative that the tailwater be reused. Generally when this tailwater is reused, the high content of suspended solids creates silting problems when the water is introduced directly into an irrigation pipeline.

The study reported here is of a dual system constructed for conservation of tailwater and removal of suspended solid material. Applying sufficient water to replenish soil water in the entire orchard resulted in an increase in orange production of about 1.5 boxes per tree on the lower third of the orchard, with tailwater amounting to about 25% of the water applied. Irrigation water applications at a rate of 100 gallons per minute per acre for 24 hours produced about 1⅓ acre-

COST SUMMARY

The installation costs (including $3,500 for material) were approximately	$7,000
Value of land and trees removed for the reservoir	1,100
Total investment	$8,100
Yearly depreciation cost $8,100 × (Capital Recovery Factor-6%-30 yr)	486
Annual maintenance	1,000
Total annual cost	$1,486
Estimated annual cost per acre	$6.30

BENEFITS

1.5 box increase in orange production per tree (30 trees affected per acre, or 45 boxes per acre)	
At $1 per box, value of system per acre	$45.00
Cost for return-flow system per acre	6.30
Return per acre	$38.70
Annual value of tailwater reused	$4,050
About 150 acre-feet at $27.00	

Intake for return-flow irrigation system at Irvine Ranch, Orange County.