

College of Agriculture and Life Sciences Extension Publications

The Extension Publications collections in the UA Campus Repository are comprised of both current and historical agricultural extension documents from the College of Agriculture and Life Sciences at the University of Arizona.

This item is archived to preserve the historical record. This item may contain outdated information and is not intended to be used as current best practice.

Current extension publications can be found in both the UA Campus Repository, and on the CALS Publications website, <http://cals.arizona.edu/pubs/>

If you have questions about any materials from the College of Agriculture and Life Sciences collections, please contact CALS Publications by sending an email to: pubs@cals.arizona.edu

University of Arizona College of Agriculture



Bollworm attacking cotton boll. (After Quaintance and Brues.)

CORN AS A TRAP CROP FOR THE COTTON BOLLWORM

BY A. W. MORRILL

Extension Service, E. P. Taylor, Director, Tucson, Arizona; Co-operative Extension Work in Agriculture and Home Economics, the University of Arizona College of Agriculture and U. S. Department of Agriculture, Co-operating.

ORGANIZATION

BOARD OF REGENTS

Ex-Officio Members

HIS EXCELLENCY, THOMAS W. CAMPBELL, Governor of Arizona.....Phoenix
 HON. CHARLES O. CASE, State Superintendent of Public Instruction....Phoenix

Appointed Members

EPES RANDOLPH, Chancellor.....Tucson
 WILLIAM J. BRYAN, JR., A.B., Treasurer.....Tucson
 JAMES G. COMPTON, Secretary.....Tucson
 WILLIAM SCARLETT, A.B., B.D.....Phoenix
 JOHN H. CAMPBELL, LL.M.....Tucson
 TIMOTHY A. HORDAN.....Flagstaff
 EDMUND W. WELLS.....Prescott
 LOUIS D. RICKETTS, Sc.D., LL.D.....Warren

RUFUS B. VON KLEINSMID, A.M., Sc.D.....President of the University

AGRICULTURAL EXPERIMENT STATION

D. W. WORKING, B.Sc., A.M.....Dean College of Agriculture, Director
 *ROBERT H. FORBES, Ph.D.....Research Specialist
 JOHN J. THORNER, A.M.....Botanist
 ALBERT E. VINSON, Ph.D.....Chemist
 GEORGE E. P. SMITH, C.E.....Irrigation Engineer
 RICHARD H. WILLIAMS, Ph.D.....Animal Husbandman
 WALTER S. CUNNINGHAM, B.S.....Dairy Husbandman
 CHARLES T. VORHIES, Ph.D.....Entomologist
 GEORGE E. THOMPSON, B.S.A.....Agronomist
 FRANKLIN J. CHIDER, M.S.....Horticulturist
 WALKER E. BRYAN, M.S.....Plant Breeder
 CLIFFORD N. CATLIN, A.M.....Research Specialist in Agricultural Chemistry
 FRANCIS R. KENNEY, B.S.A.....Poultry Husbandman
 W. E. CODE, B.S.....Assistant Irrigation Engineer
 A. F. KINNISON, B.S.A.....Assistant Horticulturist
 E. S. HAWKINS, B.S.A.....Assistant Agronomist
 E. H. PRESSLEY, B.S.A.....Assistant Plant Breeder
 H. C. SCHWALEN, B.S.....Assistant Irrigation Engineer
 S. W. GRUFFIN, A.B.....Assistant Chemist

AGRICULTURAL EXTENSION SERVICE

ESTES P. TAYLOR, B.S. Agr.....Director, Asst. Dean College of Agriculture
 Boys' and Girls' Clubs—Junior Extension
 LELAND S. PARKE, B.S.....State Leader
 AGNES A. HUNT.....Assistant State Leader

County Home Demonstration Agents

MARY PRITNER LOCKWOOD, B.S.....State Leader
 HAZEL ZIMMERMAN (South counties).....Tucson
 FLORENCE D. WILLS, B.S. (Maricopa).....Phoenix
 LOUISE SPORLEDER (Cochise).....Douglas
 NYDIA M. ACKER, B.S. (North counties).....Prescott

County Agricultural Agents

W. M. COOK, B.A.....State Leader
 C. R. ADAMSON, B.S. (Cochise).....Willcox
 F. A. CHISHOLM, B.S. (Coconino).....Flagstaff
 A. B. BALLANTYNE, B.S. (Graham and Greenlee).....Thatcher
 H. C. HEARD, B.S. (Maricopa).....Phoenix
 C. R. FILLERUP (Navajo and Apache).....Snowflake
 C. B. BROWN, B.S. (Pima and Santa Cruz).....Tucson
 C. K. WILDERMUTH, B.S. (Pinal).....Casa Grande
 J. W. LONGSTRETH (Yuma).....Yuma

Extension Specialists

D. A. GILCHRIST, B.S.....Rodent Control Leader,
 Bureau Biological Survey, U. S. D. A.
 †C. U. PICKRELL, B.S.....Extension Livestock Specialist
 DR. J. P. JACKS, D.V.S.....Bureau of Animal Industry, U. S. D. A.
 †S. E. CLARK, B.S.....Extension Agronomist
 †R. N. DAVIS, B.S.....Extension Dairyman

*On leave.
 †Part time Extension.

THE USE OF CORN AS A TRAP CROP FOR THE COTTON BOLLWORM

By A. W. MORRILL

Observations in Arizona since the beginning of cotton production in the State on a commercial scale, have shown that the bollworm is a pest which every cotton grower should take into consideration. While no complete failure of the cotton crop due to this insect has been known to occur in Arizona, several growers have suffered serious losses and the danger is one which should be guarded against as far as practicable. There are several control measures available but careful observations over a period of several years are necessary to determine definitely to what extent it is practicable to go, under Arizona conditions, in the adoption of any of these measures.

The usefulness of corn as a trap crop in connection with cotton has long been known in Texas and the southeastern cotton states and the state experiment stations and the U. S. Department of Agriculture invariably include the recommendation to use corn in this way for the protection of cotton against the bollworm. In Arizona the corn trap method of bollworm control was tested in 1914 when Mr. H. B. Atha planted trap rows of corn in one of his Egyptian cotton fields near Glendale in accordance with the writer's suggestions. The results were strikingly successful. The observations made in connection with this special test have been supplemented by later observations where corn has been grown near cotton fields and has served to some extent as a trap crop for the bollworm although not planted with this object in view. It is the purpose of this circular to present to Arizona cotton growers information in regard to trap crop method of bollworm control, which is the only method the practicability and effectiveness of which in Arizona has thus far been demonstrated.

DESCRIPTION AND LIFE HISTORY

In order to utilize the trap crop method to best advantage a certain amount of knowledge of the life history of the bollworm is essential. Information on this point has been given in publications of the U. S. Department of Agriculture, the Arizona Agricultural Experiment Station and of the Arizona Commission of Agriculture and Horticulture.* To these publications the reader is referred for details beyond the scope of this circular.

*Cotton growers are referred especially to Farmers Bulletin 872 by F. C. Bishop, which will be sent free upon application to the U. S. Department of Agriculture, Washington, D. C.

The cotton bollworm is the same as the corn ear worm—a pest widely known on account of its injury to both sweet corn and field corn. It also attacks green tomatoes, bean pods, tobacco, and many other cultivated and wild plants. It is common in alfalfa fields at certain seasons of the year and here it is not altogether injurious as it destroys many of the green alfalfa caterpillars.

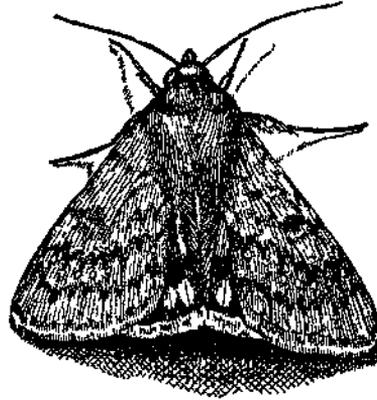


Fig. 1. Bollworm moth, enlarged. (After Quaintance and Brues)

The adult stage of the cotton bollworm is a rather large heavy bodied moth with a wing spread of one and one-third to one and one half inches. It varies in color from olive green to light brown and almost white. The markings shown in the figure vary greatly in conspicuousness in different individuals.

The eggs are whitish or yellowish in color, about one-fiftieth inch in diameter, oval in form, with conspicuous ridges running from the base to near the top. These eggs can usually be found on fresh corn silks where they can readily be seen with the naked eye. On other parts of the corn plant and on other food plants they are so scattered that they are not likely to be noticed by anyone not accustomed to looking for them. The larva or worm hatches from the egg in the course of a few days; in warm weather this may take place in as short a period as two and a half days from the time the egg is deposited. The bollworm when first hatched is extremely small but in warm weather in the course of about twenty days it reaches a length of one and a half inches. The worms are very variable in color and marking, including pale green, pinkish and dark brown as the ground color with markings of green and brown.

When first hatched the bollworms feed on the surface, but in the course of a few days they usually bore into some part of the food plant such as the corn ear, a green tomato or cotton boll. When full grown the worms burrow into the soil near the base of the plant and construct a cell from one to six inches below the surface. In this cell the worm transforms into a deep brown colored pupa or chrysalis. The moth appears in about two weeks during warm weather while pupae developing in the cool weather in the fall do not produce adults until the following spring.

The female moths deposit their eggs singly on the various food plants the total number ranging with different individuals from a few hundred to almost three thousand. They deposit eggs on corn in preference to cotton or other food products and it is this attraction to corn which makes it possible to use it for the protection of the cotton crop. The fresh corn silk is much more attractive to the egg laying moth than any other part of the corn plant. In fact it is only when there is fresh silk present that the corn is preferred over other food plants. It is usually advised that cowpeas be combined with the corn in the trap crop method of control, the dense foliage of the cowpeas providing shelter during the day when the moths are hiding and the cowpea blossoms providing attractive food when the moths are on the wing.

Corn silks act as a check on the multiplication of the bollworm through the concentration of the eggs. The silk of a single ear may have fifty or more bollworm eggs. An average of twenty-five bollworm eggs to the silk of each ear is not uncommon. The bollworms when concentrated are their own worst enemies as they are cannibalistic and as they work their way down into the tip of the ear their numbers are so reduced that usually only one worm develops from an ear, less commonly two and rarely three.

WHEN TO PLANT THE TRAP CROP

It is generally considered necessary in the trap crop method of control to time the planting of the corn so that it will reach the silking stage when the cotton is most in need of protection. There is evidence however that corn maturing at any time during the fruiting season of the cotton may serve as a protection for cotton growing in the immediate vicinity. This is a matter which requires further observation under Arizona conditions, particularly with Egyptian cotton.

Following conclusions from investigations in Texas, the U. S. Bureau of Entomology advises cotton growers to plant corn for

trapping the bollworm so that it will be in silk about the first of August. This advice does not apply to conditions in Southern Arizona as is shown by observations made by the writer in the summer of 1919. The heaviest bollworm damage in the Salt River Valley, 1919, occurred near Marinette during the first week in August. An examination of 825 squares selected at random in five different localities within five miles of Marinette on August 4 showed fourteen per cent destroyed by the bollworm. The least injury amounted to 4 percent and the greatest to 23 percent. A sixth cotton field examined the same day adjoined on the east a field of corn and here there was only a trace of bollworm damage. Of 250 squares examined only three or 1.2 percent had been destroyed by bollworms. About one fourth mile west of the corn field an examination showed 10 percent of the squares damaged, to the west a few hundred yards from this second locality damage increased to 12.8 percent and in the fourth location, about half a mile west of the corn the damage was practically the same, 12.5 percent. The corn apparently was decidedly effective in protecting the near-by cotton although the corn was mature with no fresh silks and apparently there had not been any silks attractive to the bollworm moths for the preceding week or ten days. The corn was planted on March 10. The dried silks showed an abundance of bollworm egg fragments and all the ears examined showed worm injury. The worms had left the ears and it was evident that they had hatched from eggs deposited before July 10. From the examinations made in the cotton fields it was determined that adult bollworm moths had been very numerous and very active depositing eggs on cotton between July 15 and July 30. Although the corn had not been silking during this period and was therefore comparatively unattractive the cotton field examinations gave strong evidence that the early corn had been very effective as a bollworm trap crop. It has been generally believed by entomologists that early corn crops grown near to cotton are detrimental, merely furnishing a breeding place for the first and second broods of bollworms, the third brood finding the corn past the attractive stage turning its attention to nearby cotton. In the instance cited the corn planted on March 10 and producing fresh silks through the month of June and half of July was not detrimental to the nearby cotton but appeared on the contrary to have been decidedly beneficial.

In view of the possibility of greatly extending the value of

corn as a trap crop for the bollworm in Arizona the experiment station does not warn cotton growers against early planted corn near cotton fields as a danger to be avoided. The evidence at hand indicates that corn in silk during June and early in July is not likely to do any harm and may be a great benefit to the cotton crop in a nearby field.

VALUE OF OBSERVATIONS BY THE GROWERS

Cotton growers whose fields are near such corn—even small patches—can secure valuable information for their future guidance by carefully noting the amount of bollworm damage close to the corn in comparison with the damage in locations furthest from such corn. In making such observations a record should be made once a week or once in ten days beginning with the first appearance of corn silk and continuing up to the first of October. In making the records in each locality one hundred or more cotton squares should be selected at random, not more than one on a plant. The record should include the number of squares free from bollworm injury, number injured by bollworms and the number of live worms found feeding. Each time an examination is made in the cotton field as suggested a count should also be made of the bollworm eggs on corn silk as long as new cotton ears continue to develop. A count of the eggs on the silk of ten young ears will give a fair idea of the relative abundance of the adult moths from time to time.

PRACTICAL TEST OF TRAP CROP METHOD

Reference has been made to a practical test of the use of corn in Arizona as a bollworm trap crop. Rows of corn planted at intervals of about 300 feet through a field of Egyptian cotton gave practically perfect protection to the cotton. The corn was planted late in May. The bollworms were not very abundant during the season (1914) in the locality where this test was made but a count of eggs on the silks of ten representative young corn ears gave an average of fourteen eggs per ear. The corn was allowed to mature and stand in the field. When harvested in the fall every ear examined showed worm injury although no worm injury to cotton bolls was found during nearly an hour's examination. It was believed that in this instance there would have been only slight damage to the cotton from bollworms even if no corn trap crop had been planted. However the effectiveness of the corn was unmistakable.

ADDITIONAL OBSERVATIONS IN 1919

Details have already been given concerning records made on August 4, 1919, near Marinette. On August 9, 1919, near Phoenix an examination of corn and adjoining Egyptian cotton for bollworm

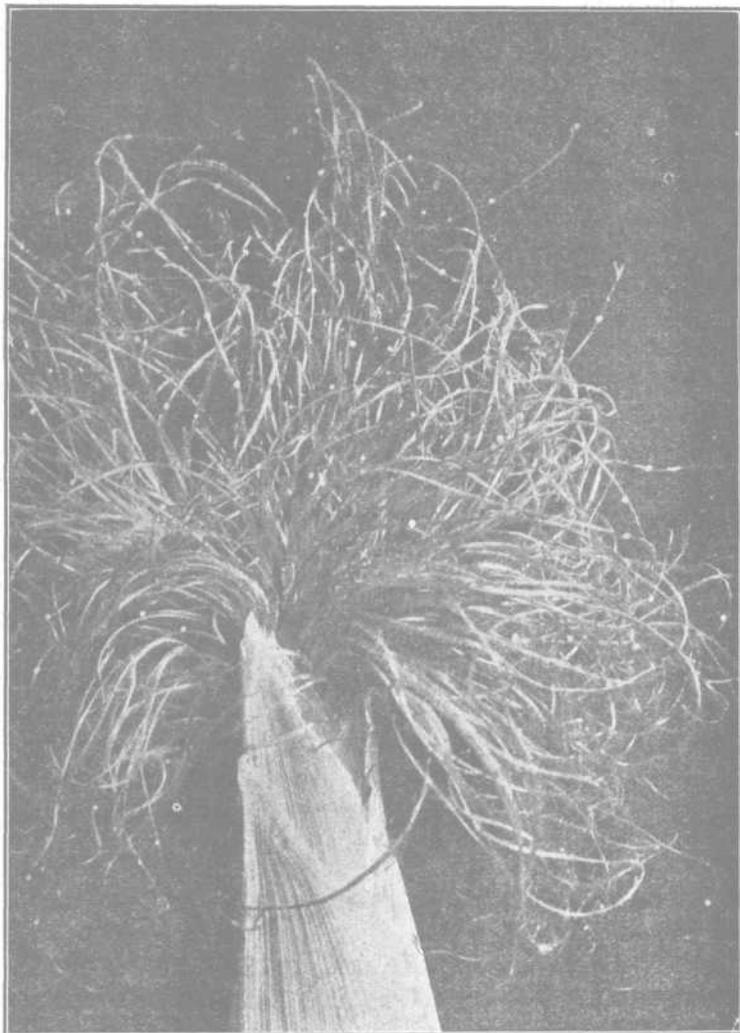


Fig. 2. Bollworm eggs on corn silk. (After Quaintance and Brues.)

injury was made by Messrs. Smith of the Federal Horticultural Board and R. H. Armstrong, an inspector for the Arizona Commission of Agriculture and Horticulture. Sixty corn stalks with

ears in an attractive condition were found to have an average of one live worm per stalk whereas no live worms and less than one percent injured squares and bolls were found on 120 cotton stalks on the two rows nearest to the corn, 60 stalks in the tenth row and 60 stalks in the twentieth row from the corn. Considering the heavy natural mortality from parasitism, cannibalism and other causes, the probability that many worms had become full grown and left the plants and the certainty that not all of the live worms on the plants were found, the average of one live worm counted per plant indicated an abundance of bollworms which would have damaged the cotton crop considerably if the corn had not served effectively as a trap crop.

RECOMMENDATIONS

Several additional examinations of corn and adjoining Egyptian cotton fields were made by the writer and assistants during the season of 1919. As a result of the studies so far made in Arizona suggestions are here given for the use of the trap crop method of bollworm control in a limited form. The following paragraphs quoted from a bulletin of the U. S. Department of Agriculture cover the usual recommendations on this point:

"One plan of planting the trap rows consists of leaving belts from 10 to 40 feet wide across the field at the time the cotton is planted and about June 1, planting this space with Mexican June corn in rows five or six feet apart. About ten days later a row of cowpeas may be planted between the corn rows, thus leaving room for cultivation and at the same time furnishing attractive places for the bollworm moths, which will concentrate in the trap rows in great numbers. While any variety of corn may be used, the Mexican June corn is more desirable in the southwest on account of its resistance to drought.

"Another system is to plant patches of June corn and cowpeas here and there over the plantation following such crops as oats, wheat and potatoes. This provides a trap crop for the bollworm, results often in a good yield of corn, and in a crop of cowpeas, which is valuable as green manure or for food and forage."

Under present conditions the difference in the value of a mixture of corn and cowpeas and of cotton, particularly the Arizona Egyptian cotton, is so great and the likelihood of excessive bollworm damage in any particular field or locality so uncertain that it is not advisable for cotton growers to practically sacrifice as much space in cotton fields as usually advised for the growing of

the trap crop. The advice given in the second paragraph quoted above should be adopted as far as practicable in Arizona. The best opportunity for the most general use of the trap crop system however is in connection with gardens for the cotton grower and his employees and the growing of corn and cowpeas in miscellaneous vacant spaces and along ditch banks for human consumption and for live stock. Small gardens, in the midst of large cotton plantations have been observed to be very beneficial to nearby cotton in attracting the adult bollworms and the more extended production of corn as here suggested should be encouraged in every way.

When experience covering several years has shown that bollworm damage in any locality warrants the use of more space for the trap crops the usual plan in accordance with the advice given to the short staple cotton growers of the southeastern states may be followed. The time of the first planting of corn however should be advanced in Arizona so that corn will be in silk during the month of July as well as August.

Further observations in regard to the trap crop method of bollworm control are necessary in order that the suggestions here given may be extended for the fullest possible benefit of the Arizona cotton crop. To this end cotton growers who make use of this method should co-operate with the Entomological Department of the Arizona Experiment Station by supplying records of observations concerning the effectiveness of corn as a trap crop under the different conditions and circumstances which arise.