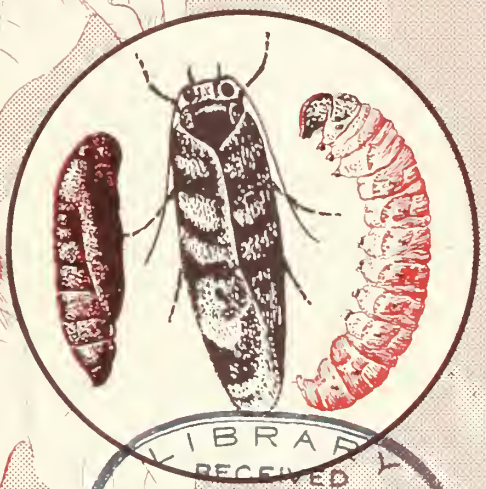
No. 4

PINK BOLLWORM INFORMATION



COOPERATIVE RESEARCH ON THE PINK BOLLWORM AND RELATED COTTON INSECTS

Distributed occasionally by
the Pink Bollworm Research Center,
Brownsville, Texas

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P I N K B O L L W O R M I N F O R M A T I O N

NO. 4

Introduction: This periodic circular of information on the pink bollworm came into existence in May 1954 for the purpose of giving agricultural officials who are concerned with this cotton pest a concrete idea of the status of the insect and keeping them up-to-date on progress on various research projects. It was originally intended to appear rather frequently, or at least biannually. This, the fourth issue, is the only one appearing since May 1955, thus becoming an annual instead of a quarterly or biannual report. It is intended especially for use by the Pink Bollworm Technical Research Committee and for this purpose it will be supplemented by an outline of the pink bollworm research program for 1956.

A great deal of water has flowed under the bridge since the last report. It seems fitting here to call attention to a letter addressed to the "Beltwide Pink Bollworm Committee and Others Concerned," by Dr. H. G. Johnston of the National Cotton Council of America, on April 9, 1956. All parties and agencies concerned in the pink bollworm research program are proud of Dr. Johnston's statements which are quoted below:

> "Research dollars, wisely invested, almost always pay rich dividends. But seldom does the payoff start coming so swiftly or so emphatically as in the case of the expanded pink bollworm research program.
>
> "Already, cotton industry savings from this program come to well over $2½ million every year -- compared with a cumulative research expenditure of just over $1 million since the expansion began in 1951."

Cooperation and Financial Support: The overall financial support for the Pink Bollworm Research Program is about the same for this fiscal year, which ends June 30, 1956, as in 1955. Alabama, Georgia, Mississippi, and the Oscar Johnston Cotton Foundation are continuing to make funds available to the Center. In addition, Alabama provides the services of J. A. Griffin who has leadership in the laboratory and cage testing of systemics and certain biological work. However, considerable concern is felt for the future support, especially since commitments of Mississippi expire this year and those of the Oscar Johnston Cotton Foundation next year.

Cooperation with the Arkansas and Texas Stations continues to be highly satisfactory. Louisiana and Texas cooperate on certain projects. Arkansas has a Bankhead-Jones Project on the pink bollworm

and cooperates with the Brownsville laboratory on hibernation and cultural control research at Mount Pleasant and Texarkana. The Cotton Insects Section's laboratories at College Station and Waco conduct research on certain aspects of the pink bollworm problem. At the former, Dr. Erma Vanderzant, working jointly with the Department of Biochemistry and Nutrition of Texas A. & M. College, has leadership on nutrition studies.

New Developments and Facilities: The sublaboratory at Torreon, Mexico, was closed February 29 and the one at Lubbock, Texas, was closed May 1. Mr. C. S. Rude, formerly in charge at Torreon, has retired and been replaced by a Pink Bollworm Control Project employee who will not continue research at that location. The Lubbock sublaboratory was established primarily for cotton gin and oil mill research. This work has progressed to the point that it can be more economically and effectively handled from the Brownsville headquarters. Mr. O. T. Robertson has been transferred from Lubbock to Brownsville to aid in expanding hibernation and cultural control research.

New hibernation research at Beaumont, Nacogdoches, and Texarkana in which infested bolls are exposed to winter weather and then moved to Brownsville for emergence of adults appears promising. This technique is being considered for greatly expanding cultural control research during winter months.

An emergence room with 600-sample capacity where high humidity and temperature can be maintained is proving a valuable substitute for hand examination. It permits expansion of research that has been limited by man power for cutting seeds.

Four additional bioclimatic cabinets, making a total of nine, will be in operation in 1956. In addition to hibernation research, it is expected that the effect of various weather factors can be investigated. Three of the cabinets will be used primarily for pink bollworm research but hibernating material will be kept in the other six cabinets. Likewise, the Fruit Insects Section will use all of these cabinets in Mexican fruit fly investigations.

A Warburg apparatus is now in operation in the physiology laboratory. Investigations in egg incubation and effect of insecticides on the pink bollworm will be facilitated by this equipment.

A radioisotope laboratory was established at Brownsville and preliminary tests conducted last year. It will be used as a research tool in ecological, biological, and other investigations.

The toxicology laboratory building was almost doubled in size to provide space for the Pesticide Chemicals Research Section's laboratory that was transferred from Anaheim. Mr. G. T. Bottger

heads the pink bollworm toxicology laboratory and serves as advisor to the other Section's laboratory. Mr. B. A. Butt was transferred from Beltsville to take charge of the Pesticide Chemicals Research Section's laboratory. Mr. Butt will conduct primary screening using the two-spotted mite, cotton aphid, boll weevil, and salt marsh caterpillar as test insects. The laboratory has four constant temperature rooms, one with equipment for maintaining constant humidity. A refrigerated cabinet was constructed for holding in dormant condition pink bollworm larvae for use in experiments. It has a capacity of 3,000 pounds of seed cotton.

The Beekeeping and Insect Pathology Section has activated the pathology laboratory with the appointment of R. R. Sluss in charge. This is the first comprehensive effort ever made to investigate diseases of the pink bollworm and determine if any of the causative agents can be employed in controlling the pest.

PINK BOLLWORM CONTROL PROJECT (R. W. White)

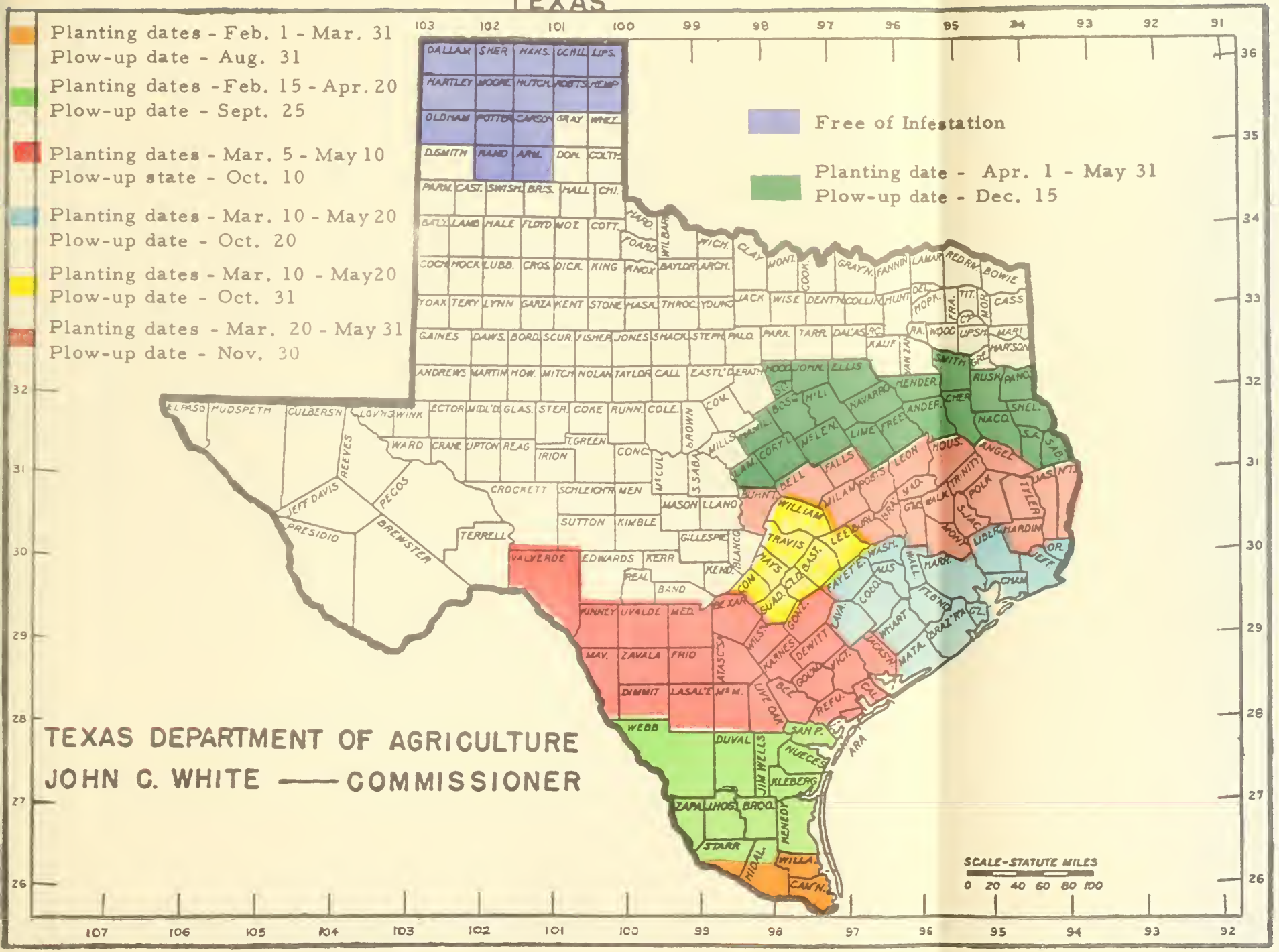
Status of the Pink Bollworm, as of May 1, 1956: Early in the fiscal year inspections to determine the distribution and intensity of the pink bollworm began with gin trash inspections and were completed in late December. Following this survey, inspections to determine overwintering survival began in mid-January and is near completion at this date.

No new areas were found infested by the gin trash inspections. One pink bollworm moth was taken from a light trap at New Roads, Louisiana, the origin of which was never determined. In general, the intensity of the infestations in the cotton areas of northern Mexico was less than in 1954. This general decrease was found in the important cotton growing sections of northern Chihuahua, Nuevo Leon and Tamaulipas. In Tamaulipas, an average of 521 pink bollworms were found per bushel of trash inspected compared to 570 in 1954. A greater decrease was found in the large Matamoros section where the rate was 223 this year and 382 in 1954. In the Lower Rio Grande Valley counties a general decrease in the number of pink bollworms per bushel of trash inspected was found--only Willacy County showed a light increase as compared to 1954. The average for the four valley counties was 478 pink bollworms per bushel of trash inspected, compared to 798 in 1954. In the 49 county group of South Texas (Area 3), exclusive of the Lower Rio Grande Valley, gin trash inspections were made in 29 counties both in 1954 and 1955. Twenty of these counties showed increases over 1954 and 9 decreases. The increases were more consistent in the counties where the cotton acreage was reduced due to drought conditions. In north, east and central Texas, comprising 88 cotton producing counties, increases as compared to 1954 were found in most, although the infestations

in the extreme east and north parts of this area are still very light. The total tabulations for the area show that 103 pink bollworms were found per bushel of trash inspected compared to 18 in 1954. There were decreases in the regulated part of Arkansas, New Mexico, and the newer regulated part of Louisiana. Increases were quite general in the counties of eastern Oklahoma, In Arizona, only one county, Greenlee, showed an increase over 1954.

Inspections of cotton debris to determine winter survival have resulted in no live pink bollworms being found in the newer regulated sections of Arkansas, Louisiana, or Oklahoma. Light survival has been found in Western Oklahoma and in New Mexico. In Mexico, most of the inspection to determine survival has been done in the northeast cotton sections of Coahuila, Nuevo Leon and Tamaulipas. In the three states combined, live pink bollworms were found at the rate of .97 per 100 bolls compared to the rate of 2.17 in 1955, (1954 crop). Tamaulipas showed a reduction from 1.28 in 1955, (1954 crop) to .46 this year. The rate per acre for Tamaulipas decreased from 24.14 in 1955, (1954 crop) to 8.37 this year. In the four lower Rio Grande Valley counties the rate per acre was 5.64 this year compared to 8.60 in 1955 (1954 crop). In the other South Texas counties, 22 showed increases in live pink bollworms per acre, and 9 decreases. The greater increases were in the Coastal Bend Counties and adjoining counties north and west. This included counties most affected by drought conditions which resulted in a sharp acreage reduction. In the 88 county area of central, north and east Texas the area as a whole shows a decrease in survival. The survival rate in 1955 was 165 per acre and 20 this year. There was also a decrease in the number of live pink bollworms per 100 bolls inspected. Credit for most of the decrease is due to the reduction in the amount of material left in the fields from the previous crop. In 1955 (1954 crop), an average of 2,274 bolls were found per acre but only 489 this year (1955 crop). The greatest reductions in this area were found in central Texas, but light increases were found in the extreme north and east counties. In the eastern part of west central Texas inspection of debris in late March and early April showed quite a high survival rate with Llano, Mason, and Menard Counties showing the highest averages. The survival was also quite high in late March in the Midland, Andrews, and the Big Spring sections. El Paso County showed a survival rate of 677 per acre average, with nearly all of the live worms being found in a comparatively few fields in the Ysleta section, where a heavy early season infestation was found.

TEXAS


Planting dates - Feb. 1 - Mar. 31
Plow-up date - Aug. 31
Planting dates - Feb. 15 - Apr. 20
Plow-up date - Sept. 25
Planting dates - Mar. 5 - May 10
Plow-up state - Oct. 10
Planting dates - Mar. 10 - May 20
Plow-up date - Oct. 20
Planting dates - Mar. 10 - May20
Plow-up date - Oct. 31
Planting dates - Mar. 20 - May 31
Plow-up date - Nov. 30
Free of Infestation
Planting date - Apr. 1 - May 31
Plow-up date - Dec. 15
TEXAS DEPARTMENT OF AGRICULTURE
JOHN C. WHITE —— COMMISSIONER
SCALE-STATUTE MILES
0 20 40 60 80 100

THE TEXAS AGRICULTURAL EXPERIMENT STATION (J. C. Gaines)

1. Development of Stalk Cutter-Shredders:

A. Central Mexico.

An experimental machine (#AEX-3) consisting of a stripper unit and a crusher-shredder unit was field tried in the vicinity of Valles, San Luis, Potosi, Mexico during January. A one-row stripper unit using rubber paddled stripper rolls developed by personnel of the Texas Agricultural Experiment Station, Agricultural Engineering Department, was used to strip the boll material from the plant. This in turn was passed through a pair of rubber-covered rollers that crushed the material and dropped it into an experimental one-row shredder. The stripper and crusher roll units were very promising. The one-row shredder was not practical.

On the basis of these tests, a new stripper unit was subsequently fabricated. This unit was designed to (1) handle stalks up to 60 inches high, (2) have an infinite speed range in the stripper rolls to determine optimum roll speeds under various field conditions, (3) embody a positive conveying system for the stripped material.

The crusher roll unit was modified to permit mounting it on the axle housing of a farm tractor, thereby permitting the use of any type of stalk shredder. This machine is hereafter designated No. AEX-6.

B. Rio Grande Valley.

Field trials were conducted at TAES Substation No. 15, Weslaco, in late August with AEX-6. Mechanical difficulties limited the field work.

C. College Station.

Numerous observation trials were conducted during September and October with AEX-6. All of the obvious mechanical difficulties were eliminated during that period.

The following machines were used during tests conducted November 3-4, 1955:

(a) Case Utility Harvester - No. 620
(b) AEX-6 - Experimental Stripper-Crusher
(c) Standard Rotocycle (63" blade)

The tests were replicated five times in a heavily infested field. Results of this test are given, as number of larvae recovered, in the following tabular form.

	Machine			L.S.D.
	A(Case #620)	B(AEX-6)	C(modified rotocyle	(0.05)
Machine and ground samples	1199.8	712.6	973.2	264.3
Before	933.4	619.8	588.4	176.1
After	266.4	92.8	348.8	176.1
Difference	667.0**	527.0**	203.6*	
Machine sample	1172.0	626.6	972.0	258.8
Before	933.4	619.8	588.8	179.2
After	238.6	6.8	383.6	179.2
Difference	694.8**	613.0**	204.8*	
Ground sample	961.2	705.8	589.2	185.0
Before	933.4	619.8	588.4	189.6
After	27.8	86.0	0.8	189.6
Difference	905.6**	533.8**	587.6**	
% mechanical efficiency	97.1	87.8	99.9	
% reduction (total)	71.4	85.0	34.6	
% reduction (machine)	74.4	98.9	34.8	

* Significant
** Highly significant

The stripper unit of Machine B(AEX-6) was used to collect the before cutting samples and averaged 92.5 percent mechanical efficiency, using the number of larvae in stripped bolls and number

of larvae from bolls missed by the stripper. The initial samples from plots treated with Machine A contained significantly more larvae than the initial samples of plots treated with either Machine B or Machine C. Generally, Machine B (AEX-6) was superior to the other machines tested even though it was somewhat less efficient.

D. Experimental Shredders.

An experimental shredder, employing multiple horizontally rotating blades, was fabricated in our research shops. The machine was designed by C. N. Husman of the Pink Bollworm Research Center staff at Brownsville, Texas.

2. Development of Sprayers and Dusters:

Two self-propelled sprayers were designed and constructed in our research shops. The objectives were to develop a machine with (1) low center of gravity, (2) short turning radius, (3) individual wheel brakes, (4) convenient controls to enable one man to conduct field plot work, (5) minimum amount of liquid in spray boom, (6) minimum cost.

These machines cost $885.00 each, including shop labor. They have met the objectives for which they were designed.

Three commercial self-propelled sprayers have undergone extensive modification and/or repairs this year. The Plant Physiology and Pathology Department's Hahn sprayer was completely overhauled and extensively modified. A towing dolly was also fabricated for this machine. The Department of Entomology's Hahn sprayer was modified and some repairs made to it. Another power sprayer belonging to the Department of Entomology was repaired and modified, as was its transport trailer.

M. G. Davenport, Agri. Engineer, TAES
W. J. Magee, Entomologist, TAES,
assisted with stalk cutter-shredder
evaluation tests.

This experiment was located in the Brazos Valley near College Station and was a randomized block design in which 9 treatments were replicated 4 times. The treatments were as follows:

A - Check
B - Dust - 1 nozzle per row
C - Dust - 2 nozzles per row
D - Spray - 3-No. 2 nozzles per row
E - Spray - 3-No. 3 nozzles per row

F - Spray - 3-No. 6 nozzles per row
G - Spray - 3-No. 2 nozzles per row
H - Spray - 5-No. 3 nozzles per row
I - Spray - 5-No. 6 nozzles per row

Five effective applications of DDT were used at the rate of 3 lbs. per acre to control the pink bollworm in the treated plots. Boll weevils and bollworms were controlled in all plots. Analyses of infestation data showed that the reduction of pink bollworm injured bolls, total number of mines per samples and number of mines per injured boll in the DDT-treated plots were significant. None of the treatments were significantly better than the standard nozzle arrangements using 6 gallons of spray per acre applied with three No. 2 nozzles per row. Yield data were not significant among DDT treatments or between treatments and untreated checks. Samples were taken for quality tests and submitted to the Cotton Ginning Research Laboratory at Mesilla Park, New Mexico, and to the ACCO Fiber and Spinning Laboratory at Houston, Texas. Results of these tests indicated that there were no quality differences among DDT treatments or between treatments and untreated checks.

W. J. Magee, Entomologist, TAES

3. Resistance Studies:

Results of the 1954 tests indicated that Gossypium thurberi was resistant to the pink bollworm and that a highly significant number of bolls of G. thurberi escaped damage. During 1955, cage tests were continued in the field with G. thurberi, Pima and Deltapine 15. Higher levels of infestation were used during 1955 than during 1954. The experiment was replicated 5 times. The results indicated no significant difference in the number of larvae recovered per gram of boll weight from any of the cottons, however, many G. thurberi bolls escaped injury.

A series of tests were conducted to determine if G. thurberi was escaping damage due to oviposition habits of the adult. Results of these tests show that the moth prefers the vegetative parts of Pima and Deltapine 15 to the fruit and vegetative parts of G. thurberi for oviposition.

The indicated resistance of G. thurberi to pink bollworm is due, apparently, to the preference of the moths for other cottons for oviposition.

J. R. Brazzel, Entomologist
La. Agri. Expt. Station
R. K. Williams, Grad. Res. Asst. -
Ento., TAES

Evaluation of Pink Bollworm Damage to Cotton:

This work was a cooperative project between the Texas and Louisiana Agricultural Experiment Stations. The purpose was to determine the pink bollworm infestation level at which yields and quality of cotton are damaged. The pink bollworm was isolated on cotton in the field by large screen cages covering 1/200th acre. The test consisted of an insect-free check and 3 levels of infestation, each replicated 4 times. Infestation levels were controlled by releasing different numbers of adults into each cage. The three rates of release of adults consisted of releasing 2, 6 and 15 moths per cage per week for a period of 3 weeks.

Infestations reached 100% in each level before harvest. The number of larvae per boll of the last sample collected August 1 ranged from 6.4 at the low level, 9.6 at the intermediate level to 12.9 at the high level.

There was no significant difference in the yield of snapped cotton among treatments. The lint yield of the check was significantly greater than the yield in the highest level of infestation but not more than the yields of the other two levels. The outstanding feature of this test was the loss in value of the cotton due to lowering of the grade. The value of the lint produced per acre in the check or insect-free plot was $143.61; in the low level of infestation, $116.31; in the intermediate level, $85.04 and in the high level, $47.37.

J. R. Brazzel, Entomologist
La. Agri. Expt. Station
D. F. Martin, Entomologist, TAES

4. Evaluation of Preharvest Chemicals:

Moth emergence from boll residues collected and caged during the fall of 1954 was recorded during the spring and summer of 1955 at Port Lavaca. Analyses of these data showed no differences in moth emergence from plots treated with preharvest chemicals and untreated plots. The moth emergence from early-shredded plots was statistically less than moth emergence from late-shredded plots.

Two tests were conducted in the Brazos Valley during 1955. One test was designed to yield information on defoliation, desiccation, regrowth, their effects on current pink bollworm populations and on boll opening. The second test was designed to give information on defoliation, desiccation, regrowth and their effects on pink bollworm populations immediately after application and during the year following application on cotton that was destroyed

(1) early and (2) late. The following chemicals were used at the recommended rates:

A - Untreated
B - Kuron-Arsenite
C - Aminotriazole
D - Sodium Arsenite
E - Pentachlorophenol
F - Shed-a-leaf

All preharvest chemicals promoted boll opening, but this effect was lost 3 weeks after treatment and was not significant. Considerable regrowth had occurred in all preharvest chemical treatments by this time. Slight regrowth was noted 2 weeks after application of preharvest chemicals. Pink bollworm infestation records indicated that the use of preharvest chemicals prevents an increase in the pink bollworm population in bolls for about 4 weeks. Considerable increase in larval population was observed during the fifth week after treatment. The larval population levels in immature bolls and open bolls and in the total boll sample of preharvest chemical treatments were less than the check populations and these differences were significant. It is probable that this prevention of population increase is due to a complex involving less attractive sites in treated plots for oviposition and a possible insecticidal effect of treatment. Fall suicidal emergence from boll residues of treated plots indicates that moth recovery from plots treated with preharvest chemicals which are 80 percent efficient or better is less than the recovery from untreated checks and the less effective materials. This is probably due to pink bollworm population losses at the gin by increasing the harvest in the most efficient treatment, i.e., there was less residual boll material after harvest in plots receiving the most efficient preharvest chemicals. Analyses of fall suicidal emergence data showed that significant treatment effects were obtained with all preharvest chemicals except arsenite when these data were corrected to the same caged period for residues of the early and late shredded subplots. There were no differences in emergence between cutting dates of these corrected data. Sodium arsenite was the only material giving a poor performance in these tests, because the dosage used might have been too low for maximum efficiency. This material has very little latitude between its defoliant dosage and its desiccation dosage. In this test, the dosage for defoliation was used, but apparently weather conditions after application were not optimum for maximum defoliation. At this time, it is recommended that harvest and stalk destruction be completed within 3 weeks after preharvest chemicals are applied to gain maximum benefit in reducing pink bollworm populations.

A number of compounds were screened in the field and greenhouse for their effects on the growth of cotton.

One of these compounds, benzo triazole, inhibited the growth of cotton at low concentrations when applied to the soil. However, because of solubility difficulties, no effect was noted from foliar applications.

Kuron, one of the 2,4,5 trichlorophenoxyacetic acid derivatives, was used in defoliant-desiccant field trial as a desiccant additive. Although the material was used in the same spray system as the other materials of the test, no loss of defoliability of the other materials was noted despite the fact that Kuron is an anti-defoliant. Also, no carry-over from plot to plot was detected. Kuron has promise as a regrowth inhibitor when used as a desiccant additive. However, further testing will be required before it can be recommended.

S. P. Johnson, Plant Physiologist
TAES
W. J. Magee, Entomologist, TAES

A preliminary test of the effect of plant growth regulators on earliness of harvest was conducted at Substation #15, Weslaco, Texas. The materials used were low concentration dusts of 2,4-D, and two related materials, parachlorophenoxyacetic acid and 2,4,5-trichlorophenoxyproprionic acid. The treated plants set an average of 10 percent more bolls on the lower one-third of the plant than did the checks. Two of the materials, parachlorophenoxyacetic acid and 2,4,5-trichlorophenoxyproprionic acid warrant further study. No adverse effect on lint percent seed weight and number of fiber quality was noted in any of the tests.

Preliminary Study of Physiological Factors Affecting Time of Harvest of Irrigated Cotton in Fields in the Lower Rio Grande and Brazos River Valleys:

In these investigations, it was found that date of planting, spacing of plants and soil conditions were major factors to be considered in evaluating the time of harvest.

The results of this study show that a late harvest as indicated by the boll-set pattern of the College Plantation, Brazos River Valley, is not likely to occur in the Lower Rio Grande Valley because: (1) a tendency toward salty soils, (2) the early stalk destruction deadline of August 31, and (3) the mid-summer showers.

Complications of planting to a desirable stand in the Brazos River Valley led to late plantings in many irrigated fields which in turn led to later than normal harvests. With trend toward more irrigation in this Valley, late harvested fields are likely to increase in number.

Under optimum moisture conditions, non-irrigated cotton in the Brazos Valley will set fruit through July while an irrigated field will set fruit through September. This tendency toward late setting of fruit and subsequent late harvest by increasing the irrigated area in this Valley would furnish susceptible material during the period when the pink bollworm population is increasing rapidly. Consequently, these late fruiting fields are likely to require more expensive insecticide programs and are likely to produce a higher overwintering pink bollworm population than has been the case in the Rio Grande Valley.

S. P. Johnson, Plant Physiologist, TAES
W. R. Cowley, Supt., Substation #15, TAES, assisted with tests conducted in the Lower Valley

5. Evaluation of Treatment Combination for Pink Bollworm Control:

An experiment similar to one conducted in 1954, testing all possible combinations of insecticide, defoliant, and stalk cutter-shredder on two different cotton-planting dates, was initiated at Port Lavaca during the spring of 1955. It was apparent by mid-June that the pink bollworm infestation in the Port Lavaca area would be exceedingly light. At that time, it was decided to move the pink bollworm investigations of this Station to the more heavily infested Brazos Valley near College Station, and tests in progress at Port Lavaca were sacrificed.

The cotton-growing season in the Brazos Valley was too advanced to attempt any test similar to that discarded at Port Lavaca, therefore, other practices which might affect a program of combined practices for pink bollworm control were studied.

The proper initiation of treatments with insecticide is important in the evaluation of an economic and efficient insect control program. The greatly increased costs of the present insecticide recommendations for controlling the pink bollworm, especially when it is necessary to add this to costs already expended in controlling other insects on cotton, has been a source of considerable concern. A test was conducted in the Brazos Valley

near College Station to obtain some information on how large an infestation of pink bollworms can be withstood before losses in yield or quality occur. Treatment with DDT was initiated when the following average infestation levels were present:

A - Check - untreated for pink bollworm
B - 10% pink bollworm injured bolls
C - 20% pink bollworm injured bolls
D - 40% pink bollworm injured bolls
E - 80% pink bollworm injured bolls

Analyses of infestation data (percent injured bolls, number of mines, number of mines per injured boll) indicate that the breaking point of insecticidal efficiency in pink bollworm control lies somewhere between an initial infestation of 20 and 40 percent injured bolls. Analyses of yield data indicate that possible yield losses occur if treatment is delayed until the infestation reaches a point somewhere between 20 and 40 percent injured bolls. Quality tests from the two laboratories mentioned above indicate that cotton from treatments B, C, and D tended to grade higher than cotton from treatments A and E. The value of yields from treatments B, C and D indicate that loss in crop value in this test did not occur until an infestation greater than 40 percent pink bollworm injured bolls was present. It is probable that the infestation level causing cash loss was quite close to 80 percent pink bollworm injured bolls.

W. J. Magee, Entomologist, TAES

Cotton Stalk Ensilage:

A cooperative project was set up with Rio Farms, Inc. of Monte Alto, Texas to check the possibilities of feeding cotton stalk ensilage for beef production. Two small trench silos with approximately 30 tons in each were filled the first week of September. Both were from defoliated fields - with considerable regrowth. One had 10 percent ground milo. Cane ensilage was used as a check. Five head of cross-bred stocker calves were fed from each by Mr. John Baker, Animal Husbandman. Weights were made at 28-day intervals beginning February 23.

The average 56-day gains were as follows:

Ration	Average daily gain per animal
Cotton stalks w/out preservative	1.18#
Cotton stalks with 10% ground milo for preservative	1.71#
Cane	2.05#

The average daily silage consumption per head during the 56 days was as follows:

Cotton stalks only	- 32.5#
Cotton stalk w/10% ground Milo	- 38.0#
Cane silage	- 55.0#

These figures all seem unusually high and it is felt that the test should be repeated before drawing any conclusions.

M. G. Davenport, Agri. Engineer,
TAES

Pink Bollworm Adult Toxicity Tests:

A field test conducted in 1954 for pink bollworm control indicated that most control was obtained by killing of the adults instead of the larvae. Therefore, tests were conducted during 1955 to determine the effectiveness of the more important cotton insecticides for adult control. Cotton plants were treated in the field and moths confined on them within 2' x 2' x 2' screen cages. All insecticides were applied as sprays. Records of number of dead moths and number of eggs laid on each treated plant were taken at the end of 5 days.

Results of these tests are shown in the following table. These data indicate that Bayer Compound 17147, DDT and endrin are most effective for adult control and that there was a reduction in egg laying on these treatments as compared to the other insecticides used in the experiments.

ADULT PINK BOLLWORM TOXICITY TESTS

Material	Pounds technical per acre	Number moths tested	Percent control	Eggs per moth on treated plants
DDT	1	340	52.93	3.94
	2	350	59.75	2.37
	3	350	77.43	1.38
Bayer 17147	1/32	90	33.58	2.75
	1/16	90	51.69	2.58
	1/8	50	66.45	3.51
	1/4	90	94.84	3.98
	1/2	90	88.68	0.13
	1	30	74.91	0.17
Toxaphene	1	90	29.42	9.51
	2	90	55.15	6.39
	4	90	75.53	3.56
Dieldrin	1/2	90	45.42	9.18
	1	90	68.91	3.68
	1-1/2	80	75.43	7.09
Endrin	1/8	80	62.54	6.02
	1/4	90	85.51	2.90
	1/2	90	80.68	1.30
Malathion	1/4	90	41.64	10.03
	1/2	90	43.13	4.50
	3/4	80	60.36	5.83
Parathion	1/8	90	51.98	13.18
	1/4	90	48.31	7.31
	1/2	90	71.60	2.80
Aldrin	1/4	30	9.49	31.43
	1/2	90	23.95	12.59
	1	90	46.90	12.55
	2	60	73.89	3.00
BHC	1/4	20	0.00	26.00
	1/2	90	32.15	12.21
	1	80	40.61	8.58
	2	50	73.34	4.25

Continued:

ADULT PINK BOLLWORM TOXICITY TESTS
(Continued)

Material	Pounds technical per acre	Number moths tested	Percent control	Eggs per moth on treated plants
Heptachlor	1/4	30	27.62	7.3
	1/2	90	25.65	13.56
	1	90	38.35	18.11
	2	60	38.98	10.13
Toxaphene-DDT (2-1)	1	80	27.84	2.94
	2	90	36.99	5.45
	4	90	69.83	2.87
Dieldrin-DDT (1-2)	1	90	23.39	4.05
	2	90	54.66	1.39
	4	90	85.96	0.33
Bayer 17147-DDT (1-3)	1/2	90	33.92	2.16
	1	90	62.98	0.72
	2	90	92.32	1.03
CHECK		670		21.13

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TAES
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Effect of Pink Bollworm on Quality of Lint and Seed:

A number of samples of cotton were collected from the experimental plots this fall for analyses. The tests on lint are being made by the U. S. Cotton Ginning Research Laboratory, Mesilla Park, New Mexico, and the ACCO Fiber and Spinning Laboratory, Houston, Texas. The seeds are being graded by the Cottonseed Products Research Laboratory, College Station, Texas. Results of these tests will be summarized and reported in a separate manuscript. An attempt is being made to determine the loss due to inferior quality of lint and seed resulting from different levels of pink bollworm infestations.

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PINK BOLLWORM RESEARCH CENTER AND SUBLABORATORIES

ENT f3-1 Insecticides for Pink Bollworm Control

1. Laboratory Screening Tests (Bottger, Tsao, and Lowry)

Laboratory testing of chemicals against the pink bollworm was expanded during the year. A further step, now being developed, in the preliminary testing of new materials is their use on plants growing in cages. Those showing promise in this work will be tested in the field when they become available in sufficient quantity for plot experiments. One-hundred-one chemicals, most of which were experimental insecticides, were tested in the laboratory as contact poisons against pink bollworm moths. Sixty-one of these materials, which were found to be effective, were tested also against the egg and larval stages. Of the chemicals tested, 43 were similar to or better than DDT against the adults. The chemicals considered as promising against this insect are as follows: Those immediately as toxic as DDT and more effective residually are Bayer 16259, 17147, R-1656, Plant Protection R-6199, Carbide and Carbon Chemicals 7744 and the Niagara Chemical Division's 5462; those immediately more toxic than DDT but similar in residual effects are Bayer 16644 and 18510; those immediately more toxic than DDT but slightly less effective residually are American Cyanamid 3911, 12008, and 12009; those immediately highly effective but ineffective residually are Diazinon, purified DDVP synthesized at Beltsville, the ethyl homolog of DDVP, Bayer L-13/59, 16450, Shell OS-1808 and OS-2046. Results of tests with American Cyanamid 12503 indicate that it is similar to DDT when tested either as a direct contact or residual spray. When applied by the topical method, DFDT, methoxychlor, and DDD were all more effective than technical DDT against pink bollworm moths.

2. Field Plot Experiments (McGarr, Smith, and Richmond)

Field plot experiments with insecticides applied against the pink bollworm were conducted in the Lower Rio Grande Valley, Coastal Bend, and College Station areas of Texas. In these tests, Bayer 17147 applied as a spray at rates ranging from 0.5 to 1.0 pound per acre and as a dust at rates from 0.6 to 1.24 pounds per acre gave as good or better pink bollworm control than 2.0 pounds of DDT. The degree of control was outstanding at the higher dosages. Mixtures of 17147 with DDT applied at the rate of about 0.25 pound of 17147 with 1.0 to 2.0 pounds of DDT and 0.5 pound of 17147 with 1.0 pound of DDT also gave very good control of this insect. Bayer compound 16259 applied as a spray at 0.5 pound per acre gave about the same degree of control as 17147 applied at the same dosage. A mixture of DDVP plus Aroclor plus endrin applied at respective rates of 0.5 pound, 2.0 pounds, and 0.25 pound per acre was ineffective against the pink bollworm.

3. Soil Treatment Against Overwintering Larvae (Shiller)

Eighteen chemicals were used in an experiment to determine their effectiveness in reducing the survival of overwintering pink bollworms when used as a soil treatment. At the rates used, 13 of these materials gave a significant reduction in the winter carryover. The more effective ones listed in descending order of their effectiveness were: Endrin, parathion, isodrin, aldrin, lindane, benzene hexachloride, and heptachlor. The dosage required for effective control, however, would make their use expensive but may be warranted where eradication is attempted.

ENT f3-2 Biological Control

1. Imported Parasites and Predators (McGough and Noble)

Five species of parasites, previously imported from India, were reared in the laboratory for release. These species were Apanteles angaleti, Bracon brevicornis, B. gelechia, Chelonus narayana, and C. heliopae. A total of 1,070,401 adults were released in southern Texas and the adjacent area of Mexico. The releases were made at 456 sites in 22 Texas counties and at 26 sites in Mexico. Cotton bolls were collected and caged in attempts to determine whether the parasites were maintaining themselves in the field. These collections consisted of 500 bolls each and were made at 89 different liberation sites. Although many pink bollworm moths, boll weevils, and a number of native parasite species emerged in the cages, there was no evidence that any of the imported species became established. Recovery efforts will be continued in 1956.

A predaceous coccinellid, Chelomenes sexmaculata, imported from India, was liberated in five southern Texas counties and at Torreon, Coah., Mexico. This predator was recovered at two liberation points in Texas after about four generations had developed.

2. Pathogenic Organisms (Sluss)

A laboratory has been recently set up to determine the feasibility of controlling the pink bollworm and other cotton insects by pathogenic organisms. Spore forming bacteria have been found infecting cotton leafworms and cabbage loopers in the field. A polyhedral virus disease has been found naturally controlling up to 82 percent of the cabbage loopers. In preliminary laboratory tests with insect pathogens isolated at the Insect Pathology Laboratory, Beltsville, Maryland, six species of entomogenous fungi were lethal to the pink bollworm, and the spore forming bacteria, Bacillus thuringiensis, gave 100 percent mortality by injection and orally. A nematode

(Neoaplectana sp.), also isolated at Beltsville and reared on wax moth larvae, was found to transmit a bacterium that was lethal to pink bollworm larvae and adult boll weevils. In preliminary experiments this nematode withstood applications of several insecticides at rates normally used in cotton insect control.

ENT f3-3 Relation of Cultural Practices to Pink Bollworm Control

1. General Observations (Various staff members)

The current low pink bollworm infestation in the Lower Rio Grande Valley is attributed to the cultural control program requiring stalks to be destroyed by August 31 and a regulated planting date in the spring. A localized high increase in infestation in the El Paso Valley was due to unusually mild winters of the last two years together with failure to carry out recommended cultural practices. See ENT f3-6 for discussion of the effects of various cultural practices used in hibernation experiments.

2. Central Texas (Fife)

It was found, in the vicinity of Waco, that any farm practice which permitted a major portion of the infested bolls to remain on standing stalks or on the soil surface throughout the fall and winter months resulted in a high survival of pink bollworms to infest the next crop. This was true whether a winter cover crop of clover, oats, or rye was planted after cotton or the land was left idle during the winter months and a summer crop of corn, small grain, alfalfa, or cotton was planted the next season. Winter survival was especially high in fields where the cotton stalks were left standing through the fall and winter months. In all cases the survival was low in fields where most of the crop residue was buried in the fall or early winter by plowing.

3. Stalk Shredder Experiment (Robertson)

In an experiment conducted in Pecos County, Texas, December 21, the operation of a stalk shredder was found to kill approximately 40 percent of the pink bollworms remaining in the field. The weighing of samples collected before shredding showed that approximately half of the postharvest waste cotton remained on stalks and the other half had been shattered to the soil surface where it was not subject to impact from the shredder blades. Samples collected before and after shredding were placed in indoor cages held under favorable temperature and humidity conditions for moth emergence to evaluate the effectiveness of the machine. In the emergence cages the preshredding samples were separated as to material on soil surface and

material on stalks. Emergence from these groups showed that 89 percent of the larvae before shredding were on the ground. The total emergence from samples taken before shredding was 331 moths compared to 202 from samples after shredding, or a reduction of 39 percent attributed to the shredding operation. It is not likely that all of this reduction could be the result of impact from the shredder blades, since only 11 percent of the original population was above ground. This presents the possibility that the tractor tires caused some of the mortality. Previous experiments have shown as much as 70 percent mortality due to shredding when the stalks were green with some infested green bolls present.

In evaluating stalk cutters, consideration must be given to (1) temperature of the soil and possibility of getting kill from heat, (2) location of infested bolls and ability to contact them with the machine, (3) value of the machine in preparing the land for the next crop.

ENT f3-4 Varietal Susceptibility to Pink Bollworm Attack (Shiller)

It has been recommended that this project be closed out, but cotton resistance studies will be continued by the Texas station. During the last two years various cottons, species and hybrids, furnished by cotton breeders, have been grown in the large cage at Brownsville where they were exposed to pink bollworm moths together with plantings of a commercial variety. Of the 51 different cottons grown, 21 failed to produce fruiting forms during this period. Many of the others did not bloom at a time when they were exposed to the maximum concentration of moths; therefore the infestation records obtained were not comparable because the plants did not fruit at the same time and were not exposed to the same conditions.

All varieties producing bolls became infested to some degree and no definite resistance to attack was noted in any of the plants. Gossypium thurberi appeared to escape attack to some degree due to the fact that the bolls matured within such a short period that they soon became unattractive or unsuitable for egg deposition and larval development. As a whole, the data obtained confirmed previous observations showing that early, rapid fruiting varieties escape some pink bollworm damage by producing a greater portion of their crop before the infestation builds up to the maximum degree.

ENT f3-6 Hibernation Studies (Robertson, Smith, Fife, Shiller, and Noble)

Hibernation experiments simulating four different cultural treatments were conducted at seven localities in Texas and one in Oklahoma.

The climates at the various localities ranged from subtropical and humid to cold and arid. Similar tests were conducted in bioclimatic cabinets simulating the climatic conditions at Greenwood, Mississippi. The Greenwood climate was relatively cold with heavy rainfall. Fall burial of infested bolls caused the lowest pink bollworm survival at localities with mild temperatures and heavy rainfall - that is, at Brownsville, Port Lavaca, Waco, Greenville, and Mount Pleasant, Texas. In localities with colder winter temperatures - that is, at Lubbock and Vernon, Texas, and Chickasha, Oklahoma, survival was lowest in bolls above ground simulating standing stalks. At all localities except Brownsville survival was highest in bolls that remained on the soil surface throughout the experiments. At Brownsville the early fall soil surface temperatures were high enough to cause some larval mortality and consequently the highest survival was in bolls exposed above ground during the fall and winter. At all localities fall burial decreased survival below that for bolls kept on the soil surface until buried in the spring. Tests conducted only at Mount Pleasant indicated that a winter cover crop caused a slight decrease in survival in bolls buried in the fall but did not influence the survival in bolls on the soil surface. There was a wider range in the survival rate at the different localities this year than last year, with a decrease in survival at Brownsville and Lubbock and an increase at the other places. The insect survived in the cabinet simulating Greenwood climate for the winter of 1954-55, with a substantial percentage survival in bolls on the soil surface and a very low survival in bolls buried in the fall. Infested bolls held under conditions simulating dry storage in the Greenwood cabinet during the winter of 1955-56, and examined in the spring, showed a survival of 77 percent. Similar treatment in another cabinet reproducing the climate at Malden, Missouri, showed a much lower survival, or only 9 percent due to colder weather.

ENT f3-7 Seasonal Abundance and Distribution (Various staff members and Pink Bollworm Control Project)

The pink bollworm, in 1955, failed to move beyond the old infested area in contrast to its widespread invasion of new counties during the previous several years. There was a significant increase in infestation in sections of central Texas and Oklahoma. Moderate to severe crop losses from this insect occurred in the Coastal Bend, central Texas, and in a few fields of the Lower Rio Grande Valley, the Pecos area, and the El Paso Valley of Texas and the Mesilla Valley of New Mexico. Infestation in the Lower Rio Grande Valley has decreased greatly since the severe outbreak of 1952, having reached a low level in 1954 and continuing at about the same level in 1955.

ENT f3-10 Alternate Hosts (Shiller, Smith, and Fife)

The pink bollworm was found breeding on a number of wild hosts in the spring before cotton had begun to produce squares and to continue breeding on some species throughout the season. Because of their sparse distribution or low infestation, however, the alternate host plants do not appear to be an important factor in building up the pink bollworm population to attack cotton. The insect was found this year, for the first time, to breed on croton. Two species, Croton capitatus and C. texensis, were found infested. Although these plants are very abundant, they do not appear to be a great menace because of their lack of attractiveness to the insect. Also, for the first time, Abutilon lignosum and Malva sylvestris were found infested and the insect was found to live through the winter on Malvaviscus drummondii. This makes a total of 28 plant species, other than cotton, on which the pink bollworm is known to propagate in the United States, and 10 on which it is known to live over winter in this country.

ENT f3-13 Physiology (Clark)

Certain histological and physiological characteristics of the haemolymph were investigated as a step toward orientation in needed basic research on the pink bollworm. Three sugars, glucose, fructose, and another unidentified, were found by qualitative chromatographic techniques. There were very obvious differences in the differential counts between active larvae, resting larvae, and pupae although the total counts remained rather constant with no significant differences. A technique was developed for tagging moths with radioactive isotopes, Phosphorus^{32}, for use in research such as flight studies. See ENT f3-14.

After a series of discussions on the effects of physical forces on the larvae of the pink bollworm, a study was undertaken on the effects of centrifugation on the larvae. In general, the procedure was to subject third and fourth instar larvae to varying centrifugal forces and then observe them for any short- or long-term effects. The results of these experiments are rather conclusive under the conditions used. The third instar larvae subjected to forces of from 50G to 2500G for one minute invariably died. The short-cycle fourth instar larvae subjected to similar conditions either pupated normally or, with a small percentage of individuals, died. This occurred no matter how old or large the larvae were within this stadium. Centrifugation shortened the period preceding pupation of larvae that had been in diapause for 9 to 12 months, while those that had been in diapause for only a few months did not differ from the check larvae.

ENT f3-14 Ecological Investigations

1. Life History and Habits (Lukefahr, Griffin, and Noble)

In life history studies of the pink bollworm, extrafloral nectar of cotton was found to be an important source of food for the adults and it may greatly increase the number of eggs laid. The absence of food, other than water, did not decrease moth longevity but caused a marked decrease in number of eggs. Mating usually took place the first night after emergence and lasted 1 to 2 hours. It was restricted to the hours from about 3:30 to 5:30 a.m. Many moths were observed to mate repeatedly, one pair being found to mate on three different nights. When moths were confined on cotton plants in screen cages the percentage of eggs laid on various parts of the plant were as follows: Boll, 40.5; stem, 22.9; leaf, 13.2; leaf petiole, 11.5; leaflet, 9.9; squares, 1.0. These records need to be supplemented or confirmed by further observations under normal field conditions. Limited previous records have indicated a much higher percentage of the eggs were laid on the bolls, usually under the calyx where they are protected from insecticides, parasites, and predators. In attempts to determine the effects of various temperatures on the reproductive capacity of the insect, the moths would not oviposit at a constant temperature. The optimum temperature for pupal development was about 80° F. Pupae died when held continuously at 50, 55, or 100° F.

2. Flight Studies Using Radioactive Isotopes (Glick and Clark)

In preliminary tests, radioactive isotopes showed promise for use in pink bollworm research such as moth flight studies. The moths were found to ingest food containing Phosphorus^{32}. Moths tagged with P^{32} in this manner and released were recovered in light traps and readily identified by use of a Geiger counter. It was found that moths will fly at right angles to the wind, even in gusts of 20 miles per hour. Moths were recovered in a 1/6-acre cage up to 14 to 16 days after emergence under adverse weather conditions such as daily rains and wind with little shelter. Two species of carabids and one species of forficulid were recovered which were apparently predacious on the tagged moths. Further, one species of staphylinid and one species of gryllid were caught that assumedly scavenged on weak or dead moths.

3. Field Studies in Central Texas (Fife)

Field observations showed that the overwintering stage of the insect occurred every month of the year in central Texas. Resting larvae were found in the first open bolls collected in July. Overwintering larvae were found in open cotton bolls collected from standing stalks or from the soil surface each month from January through

July 1955. Less than 5 percent of the larvae from green bolls were of the resting type during August, whereas a rapid increase occurred in September. In October and November 93 percent or more of the larvae entered the diapause. To greatly reduce the population of overwintering larvae, and thereby the number that could survive to infest the next crop, it would seem essential to destroy the cotton stalks by mid-September in this area. Since this date occurs too early in the season for practical use, cultural practices and the use of mechanical devices must be directed toward the reduction of populations after a large majority of the larvae have entered the overwintering stage.

ENT f3-15 Methods of Destroying Pink Bollworms in Cottonseed, Seed Cotton and Gin Waste (Husman, Robertson, and various other staff members)

Work to discover or improve methods of killing pink bollworms at the gin and oil mill, undertaken on an extensive cooperative basis three years ago, has brought about changes in quarantine requirements resulting in current annual savings to the cotton industry amounting to well over 2½ million dollars. In the early work it was found that straight blade fans operating under certain specifications were effective in killing pink bollworms in oil mill products and gin trash. As reported in Pink Bollworm Information No. 3, issued in May 1955, the use of such fans for this purpose was adopted instead of other, more expensive methods. The latest findings led to the recent announcement by the Texas Commissioner of Agriculture that the heat treatment of cottonseed at gins in his state is no longer necessary. New Mexico officials have likewise abolished requirements for gin sterilization of seed. Results of experiments making possible these recent developments are summarized below.

1. Ginning Experiments

Experiments to determine the pink bollworm mortality caused by various ginning machinery were continued through the spring of 1956 at the U. S. Ginning Laboratory, Mesilla Park, New Mexico. The machinery used in 12 different ginning set-ups ranged from the smallest amount with which it is possible to gin cotton to the most elaborate gins now in use. In addition to these experiments, observations were made on a wide variety of commercial gins. Any reduction in the population found in ginned seed was attributed to mortality caused by the ginning, although many of the worms are known to enter the flow of gin trash where they are killed by required trash treatment. The simplest saw gins killed 90 percent or more of the worms, and with the gradual addition of other machinery the kill increased to more than 99 percent. In preliminary tests with roller gins for handling Egyptian cotton the survival was

considerably higher than that with saw gins. There are only 16 roller gins in the infested area. In the 1955 and 1956 experiments the kill was increased slightly when the seeds were passed through an air blower system to the seed box. It was concluded that due to the high kill at the gin plus further mortality after ginning either in oil mill processing or - in the case of planting seed - delinting, etc., the survival is of little, if any, importance when the seed are used within the infested area.

2. Moth Emergence from Unsterilized Planting Seed

No pink bollworm moths emerged from 900 pounds of planting seeds produced in central Texas where heat sterilizers are not used in the gins. In 15 pounds of unsterilized seeds from heavily infested cotton, only one moth emerged after the seeds were planted in cages. Neither of the two lots of seeds was delinted. These tests indicate that there is little hazard within an infested area from planting locally produced unsterilized seeds.

3. Seed Delinting Experiments

Heavily infested cottonseed were examined after they had been given the mechanical delinting and flaming process used on planting seeds. There was 7.5 percent survival of pink bollworms after mechanical delinting but no survival after flaming. Seeds containing an average of 23.3 larvae per pound were run through an acid delinting plant. There was no survival in 62 pounds which received the complete process of acid delinting, washing, and hot air drying.

ENT f3-16 Nutritional and Biochemical Research

1. Biochemical Studies (Clark)

In studies of available food possibly used by pink bollworm moths, a chemical analysis was made of the exudate from extrafloral nectaries of cotton. The analysis showed the presence of six sugars but no detectable amounts of amino acids. Of these sugars, sucrose, glucose, and fructose were present in appreciable quantities while ribose, rhomnose, and raffinose occurred only in traces. A synthetic diet containing these sugars was found to be very favorable for pink bollworm moths. See ENT f3-14, Life History Studies.

2. Nutritional Studies (Vanderzant)

Larvae were reared on synthetic media, using aseptic methods. An amino acid medium that will permit the development of normal moths has been devised. Also a purified casein medium has been prepared which will permit development of the insect in the normal period of

time. Variations have been made in the nutrient content of the medium, and larger and more rapidly developing larvae have been obtained. A medium having a protein-carbohydrate-fat ratio similar to that of the cotton boll, at about 20 days after flowering, appeared to be the most satisfactory medium for development of the larvae. All larvae grown on this diet reached maturity and the rate of development was comparable to that of larvae feeding in bolls. As the fat content was reduced, the pupation rate increased with a concomitant decrease in the number of resting larvae. An increase in the vitamin content or the addition of yeast extract, nucleic acid, and thymine had no effect upon growth rate or size of the larvae. Fat could be replaced by linoleic acid or methyl linoleate. The omission of fat and choline prevented larval development. When cholesterol was omitted, many larvae pupated, but the pupae were abnormal. Larval size was increased and the growth and pupation rates accelerated when either the sucrose content was reduced or the Wesson's salts content increased, or both.

3. Mass Rearing (Vanderzant, Clark, and McGough)

Work was continued on methods of mass rearing pink bollworms for experimental use. The growth of molds in the cultures and the cannibalistic tendencies of the larvae are major difficulties in mass rearing. Thus far, no appreciable increases in numbers have been obtained by the methods used. Larvae were reared on green peas, sprouted peas, beans, and cottonseeds, and on media having cottonseed meal as a base. In seeking an adequate method of controlling molds in these media, 200 combinations of 19 known fungicides or fungistatic chemicals were screened involving some 4,000 tests. Seven of the chemicals proved helpful, but in no case was there a combination that gave 100 percent control of the two major genera of molds contaminating the cultures. Okra shows some advantage over cotton for rearing this insect, since the larvae are more accessible for experimental use.

ENT f3-17 Light Traps (Glick, Eitel, and Noble)

1. Evaluation of Light Traps for Insect Control

A light trap failed to control the pink bollworm in a cage 40 x 60 feet. Infestation in this cage was compared with that in a similar cage used as a check. From equal initial infestations in the two cages, there was practically no difference in rates of build-up in the two cages over a period of 12 weeks. Despite the fact that a large number of moths was caught, the boll infestation reached 100 percent in both cages in the same week, at the end of this period. This lack of any material reduction in infestation, in the light

trap cage, indicates that eggs were laid before the moths were attracted to the trap.

Light traps also failed to control the pink bollworm, bollworm, and cabbage looper at Batesville, Texas, where growers operated 144 traps on five adjacent farms comprising approximately 3,000 acres. Seasonal infestation records were obtained in representative fields of this acreage and in comparable check fields outside of the light trap area. These records were obtained on cotton, corn, and a number of vegetable crops. A heavy corn earworm infestation on corn was found in fields where no insecticides were used, there being no difference between the light trap and check areas. Insecticides were used about equally in the two areas for bollworm control on cotton and the larval population of this insect never reached a seriously damaging degree. However, the insect was found to be abundant as indicated by egg counts, and the number of eggs was slightly, but not significantly, higher in the trap area than in the check area. Pink bollworm infestation did not reach a damaging degree until near the end of the season after most of the cotton was mature, and when green bolls became scarce. Damage from this insect was negligible. Infestation records showed no differences between the light trap and check areas that could be attributed to pink bollworm control by light traps. The cabbage looper was abundant on the fall crops of broccoli, brussels sprouts, cabbage, cauliflower, and lettuce. Insecticides for control of this insect were used equally in the light trap and check areas. Infestation counts showed no difference between the degree of infestation by the cabbage looper in the light trap area and that in check fields.

2. Use of Light Traps as a Research Tool and to Determine Insect Abundance

In preliminary work, light traps showed promise for use in pink bollworm research such as moth flight studies. Examination of light trap catches in the Batesville experiment, discussed above, showed that periodic fluctuation in the number of bollworm moths caught was in direct correlation with the degree of infestation in the area.

ENT f3-19 Effects of Pink Bollworm Damage on Quality of Cotton Lint (McGarr and Richmond)

In previous work some general information on the lowering of grade and staple length from pink bollworm infestation has been noted, and it was learned that extremely heavy infestations resulted in a great reduction in the price obtained for the lint. Seed cotton samples from treated and check plots of insecticide experiments conducted, under conditions of a moderate infestation in 1955, were analyzed by

the Cotton Economic Research Laboratory of the University of Texas. When examined under ultraviolet light, the check samples showed heavy fluorescence due to pink bollworm damage; however, there was only slight or no difference in fiber length, uniformity, fineness, and tensile strength between the treated and check plots. Dry weather during the harvest and the latter part of the production season evidently resulted in less pink bollworm damage than that which would have resulted if wet weather had prevailed.

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The Haemocytes of the Pink Bollworm, Pectinophora gossypiella, Dan S. Chadbourne and Edgar W. Clark, ESA Meeting (Southwest Branch), Ft. Worth, Texas, Feb. 20-21, 1956.

Seasonal Occurrence of Resting Larvae of the Pink Bollworm in Central Texas, L. C. Fife, ESA Meeting (Southwest Branch), Ft. Worth, Texas, Feb. 20-21, 1956.

An Insect Assay for Essential Fatty Acids, Erma S. Vanderzant, Dundappa Kerur, and Raymond Reiser. Presented at the 129th meeting of the American Chemical Society, Dallas, Texas, Apr. 8-13, 1956.

PERMANENT PERSONNEL

Brownsville, Texas

Name	Title	Assignment
F. C. Bishopp	Coordinator	Coordinator, Pink bollworm research (Appointment terminated 6/30/55).
S. E. Jones	Station Leader	Coordinator, succeeding F. C. Bishopp.
A. J. Chapman	Entomologist	Assistant station leader.
L. W. Noble	Entomologist	Research planning, interpretation of results and preparation of reports.
G. T. Bottger	Entomologist	Leader, toxicology laboratory (Transfer to Brownsville effective 9/12/55).
E. W. Clark	Entomologist	Leader, physiological research.
C. N. Husman	Equipment Engineer	Leader, development of research equipment and machinery for control of pink bollworm.
R. L. McGarr	Entomologist	Leader, field insecticide research
P. A. Glick	Entomologist	Migration and light trap investigations.
W. L. Lowry	Entomologist	Toxicological research.
J. M. McGough	Entomologist	Pink bollworm parasites.
C. A. Richmond	Entomologist	Insecticide research.
Ivan Shiller	Entomologist	Hibernation experiments; host plants.
C. H. Tsao	Entomologist	Toxicological research.
O. L. Walton	Entomologist	Gin studies (Died 6/7/55).
W. J. Eitel	Entomologist	Light trap investigations (Resigned 3/23/56).
M. J. Lukefahr	Entomologist	Biology studies; repellents and attractants.
R. R. Sluss	Microbiologist	Insect pathogenic organisms (Section of Bee Culture & Insect Pathology).
M. A. Taylor	Admin. Officer	Fiscal administrative.
E. O. Schunter	Secretary	Clerical.
F. W. Weeks	Clerk-Typist	Clerical.
L. L. Borja	Clerk-Typist	Clerical.
J. E. Houghtaling	Biological Aid	Bioclimatic cabinet studies.
J. C. Gonzales	Laborer-Unalloc.	Labor as assigned.
M. Marroquin	Laborer-Unalloc.	Labor as assigned (Resigned 9/30/55).
D. Mayans	Laborer-Unalloc.	Labor as assigned.
B. H. Zamora	Laborer-Unalloc.	Labor as assigned (Resigned 3/23/56).

College Station, Texas

Name	Title	Assignment
E. S. Vanderzant	Biochemist	Nutrition and biochemistry

Lubbock, Texas

O. T. Robertson	Entomologist	In charge of sublaboratory. Hibernation experiments, light trap investigations and ginning studies. (Transfer to Brownsville effective 5/1/56).
B. D. Pell	Biological Aid	Hibernation and ginning studies. (Appointment terminated 12/16/55).

Port Lavaca, Texas

G. L. Smith	Entomologist	In charge of sublaboratory. Hibernation and insecticide experiments; host plants.
T. P. Cassidy (Part-time)	Entomologist	Ecology.

Torreon, Coah., Mexico

C. S. Rude	Entomologist	In charge of sublaboratory. Insecticide experiments and studies of pink bollworm infestation level in the area. (Retired 2/29/56).

Waco, Texas

L. C. Fife	Entomologist	Hibernation and cultural control studies.

PERSONNEL ASSIGNED BY STATES

Alabama

J. A. Griffin	Entomologist	Insecticides and ecology.

Arkansas

J. D. Sherrer	Entomologist (Port Lavaca)	Insecticide experiments; host plants (Assignment terminated 9/1/55).