Missouri Cotton Insect

Pest Management Program

1973 Annual Report

MP 390, December 1973
Extension Division
University of Missouri

MISSOURI COTTON INSECT PEST MANAGEMENT PROGRAM

ANNUAL REPORT: 1973

THIS ANNUAL PROJECT REVIEW AND PROGRESS REPORT IS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS ESTABLISHED IN COOPERATIVE AGREEMENT NO. 12-16-100-47 BETWEEN THE UNITED STATES DEPARTMENT OF AGRICULTURE AND MISSOURI COOPERATIVE EXTENSION SERVICE, MISSOURI DEPARTMENT OF AGRICULTURE AND MISSOURI AGRICULTURE EXPERIMENT STATION.

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PREFACE

The Missouri Cotton Pest Management Program Advisory Committee was organized in 1972. Program improvement and environmental maintenance became the chief areas of concern of the agencies represented.

The committee included:

Dr. Wilfred S. Craig, Extension Entomologist, University of Missouri

Mr. Ray Thompson, Plant Industries Division, Missouri Department of Agriculture

Mr. Keith Harrendorf, Assistant Professor of Entomology, Missouri Agriculture Experiment Station

Mr. Al Hoskins, Field Service Agent, Missouri Conservation Commission

Dr. A. S. Gubin, Southeast Missouri Medical Association

Mr. Glenn Patton, Area Director, University-Wide Extension

Mr. E. B. Gee, Jr., Missouri Cotton Steering Committee

Mr. Carl Carson, Federal APHIS, United States Department of Agriculture

Mr. John E. Martin, Coordinator, Administration Services, University-Wide Extension

Additional effort in helping conduct the local educational program and assisting growers in interpreting and using the data collected in the respective counties was provided by:

Dr. George Wright, Area Agronomy Specialist, Pemiscot County

Mr. U. U. Alexander, Area Agronomy Specialist, Dunklin County

Mr. Sam Atwell, Area Agronomy Specialist, New Madrid County

Mr. E. B. Nace, Area Farm Management Specialist, Delta Center

Mr. Joe Scott, State Agronomy Specialist, Delta Center

Mr. John Garrett, Area Agronomy Specialist, Delta Area

Mr. Richard McIntosh, Area Farm Management Specialist, Scott County

Mr. John Yount, Area Farm Management Specialist, Stoddard County

Mr. Tom Brown, Area Agronomy Specialist, Stoddard County

Mr. Floyd Wright, Area Agronomy Specialist, Mississippi County

Mr. John Ward, Area Agronomy Specialist, Butler County

We also want to acknowledge:

Dr. Ernest Hilderbrand, Statistician for Computer Center, University of Missouri, for his help in conducting the computer programming phase of our program.

Mr. Paul Gwin, Information Specialist, Extension Information Office, University of Missouri, for his help in editing this report.

Dr. Mahlon Fairchild, Chairman, Department of Entomology, University of Missouri, for his guidance in helping analyze data.

INTRODUCTION

With another year of program activities completed, we want to stop and analyze areas which require additional effort, as a basis for making any necessary changes and adjustments to improve future performances.

Our primary objective this year was directed toward program improvement. New innovations, ideas, program improvements, and additional farmer benefits were the chief areas of concentration.

We felt it was necessary to make a few changes and adjustments in previous operations. These changes were necessary to utilize our program to its maximum capacity and to more closely fit the needs of our particular area.

These slight changes and adjustments were implemented in regard to operation procedures and basic project objectives. The changes enabled us to broaden our initial objectives and produce substantial program improvements.

By modifying last year's program operations and activities, we were able to offer the farmer some additional information and benefits beyond that previously offered. These innovations were obvious program improvements and the success of those changes was evident.

A detailed summary of 1973 program activities, improvements, problems, and plans for next year follows.

SUMMARY OF 1973 PROGRAM ACTIVITIES AND ACCOMPLISHMENTS

Due to adverse weather conditions, the 1973 crop season began on a very insecure and unpredictable basis in Missouri, as in most cotton producing states. Producers had little knowledge of the number of acres they would get planted. Many were forced to cut anticipated acreage to almost half that initially intended. As a result, the scouting program also suffered substantial decreases in acreage and scouting personnel.

ACREAGE SCATTERED

As a direct result of the decreased cotton acreage in this year's program, the problem of scattered acreage arose. Poorly concentrated acreage meant additional travel time between fields, resulting in decreases in the number of fields and acres that scouts could handle.

As the season got underway, six scouts were trained and assigned to an acreage. With the initial training completed, season-long follow-up supervision was provided by the Pest Management Supervisor and Extension Entomology Specialist.

This included various additional group training meetings throughout the summer as new insect situations and changes in program operations were encountered. Additional consultation and assistance were provided in each county by the Area Agronomy Specialists.

COTTON INSECT SITUATION IN 1973

Very few economic cotton insect problems were encountered in Missouri during the 1973 growing season. Only one insecticide

application was applied to 64% of the 9,286 acres in the Pest Management Project. Approximately half of this was for thrips control.

Spider mites were found in many fields. However, chemical controls were primarily limited to "spot" and border treatments.

The plant bug complex caused much concern; however, no chemical control was applied. We feel this complex needs more attention and plans are being made to establish demonstration on control of this pest in 1974. Current information from all sources seems insufficient.

The bollworm caused little economic damage this year. This insect is normally the primary cotton pest in Missouri. Surveys for the past several years indicate that the budworm comprises less than 5% of this complex.

The past three years the boll weevil has caused concern; however, it is late in the growing season before numbers become economic. Past experience has caused farmers to be unwilling to control this pest because the "top crop" is unsure this far north in the Cotton Belt.

In a few cases last year, however, producers failed to acknowledge the earlier than normal late infestations and severe weevil damage resulted in those fields where buildups occurred.

SCOUT SUPERVISION

Leadership by a full-time supervisor has been one of the main contributions provided by the new Pest Management Program.

PROGRAM OPERATIONS

LOCATION

The Cotton Pest Management Program in Missouri is carried out in varying degrees in six delta counties. There are eight cotton producing counties in Missouri, but these six make up what is referred to as the Bootheel District. See Figure 1. The six counties are Pemiscot, Dunklin, New Madrid, Stoddard, Mississippi, and Scott.

1973 STATISTICAL SUMMARY

Acreage planted to cotton was decreased substantially in all six counties in 1973. Figure 2 shows a breakdown of total cotton acreages by county and the number of acres under the Pest Management Program.

Six college students were hired to scout the 9,286 acres scattered throughout the six Bootheel counties. This scouted acreage represented approximately 4.88% of the total cotton acreage. The scatter of the acreages resulted in increased travel time between fields, thereby limiting the amount of actual field scouting for certain scouts. Overall, the average number of acres per scout came to 1,547 with an average field size of 32.69 acres. The average number of fields per scout came to 47.33. See Table 1 for the statistical summary of 1973 operations.

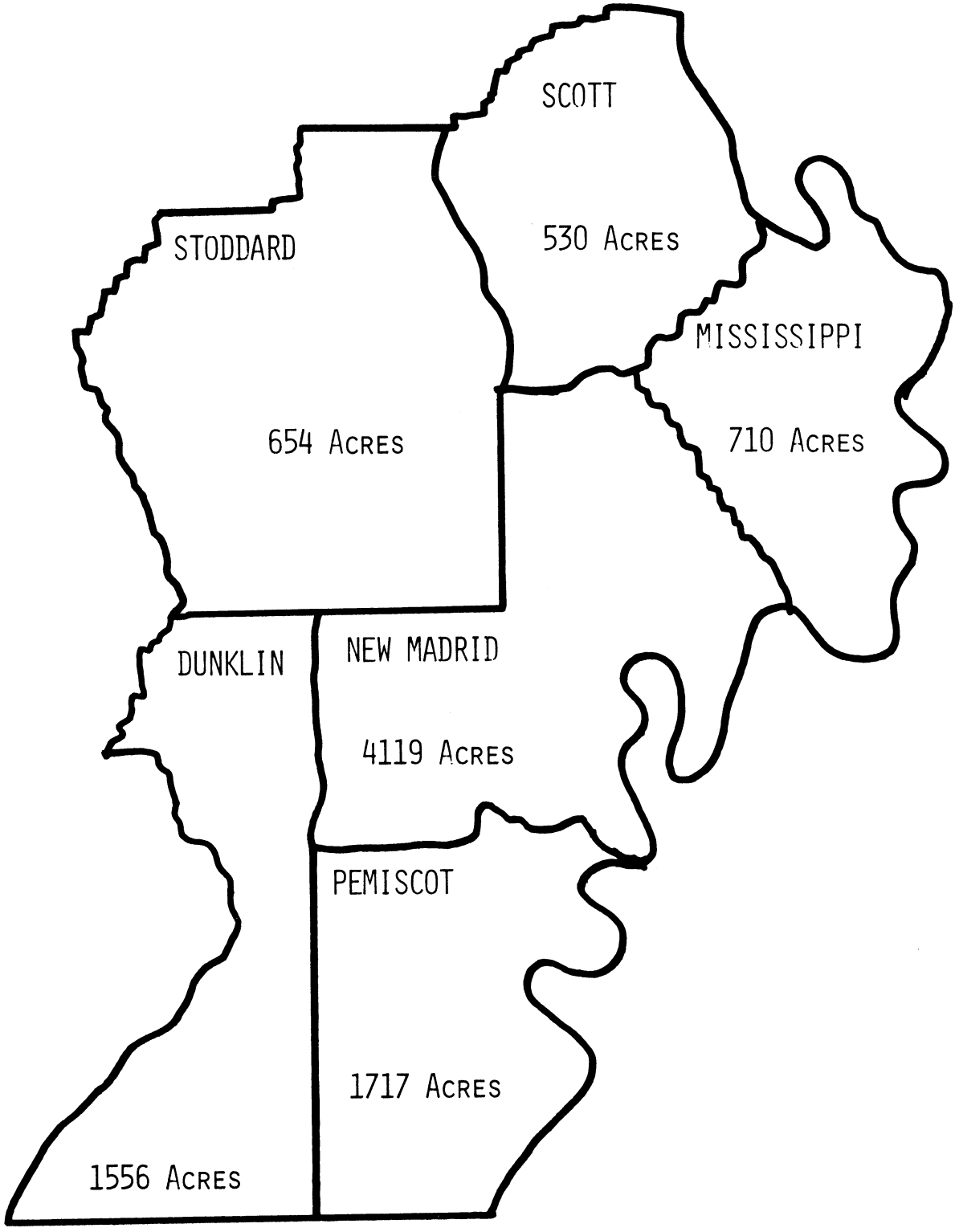
FIRST VISIT TO FARMS

Prior to actual field scouting, the first visit to the farm is made. At this time, the scout records basic information

FIGURE 1. GEOGRAPHICAL LOCATION OF COTTON ACREAGE IN MISSOURI.

FIGURE 2.

THE SIX BOOTHEEL COUNTIES INVOLVED IN MISSOURI PEST MANAGEMENT PROGRAM



1973 STATISTICAL SUMMARY

NUMBER OF SCOUTS	6
NUMBER OF ACRES SCOUTED	9,286.00
TOTAL ACRES OF COTTON IN STATE	190,000.00
PERCENT OF TOTAL ACRES SCOUTED	4.88
AVERAGE NUMBER OF ACRES PER SCOUT	1,547.00
AVERAGE NUMBER OF FIELDS PER SCOUT	47.33
AVERAGE NUMBER OF ACRES PER FIELD	32.69
AVERAGE NUMBER OF APPLICATIONS PER ACRE	.66

Table 1. Summary of 1973 Pest Management Program Operations.

SUMMARY OF PEST MANAGEMENT DATA

COUNTY	NO. FIELDS	NO. ACRES	NO. PRODUCERS	AVERAGE NO. ACRES/FIELD	AVERAGE NO. PLANTS/ACRE	AVERAGE NODE 1st FRUITING	AVERAGE TIME FROM EMERGENCE TO FIRST FRUITING
Dunklin	46	1,556	12	33.8	72,152	6.5	41.6
Mississippi	23	710	6	30.8	44,260	6.0	39.5
New Madrid	128	4,119	41	32.2	62,984	7.1	42.2
Pemiscot	52	1,717	19	33.1	54,403	7.7	32.9
Scott	16	530	4	33.1	59,312	6.6	37.1
Stoddard	19	654	8	34.4	55,789	7.3	41.2
TOTALS	284	9,286	90 Averages--	32.9	60,693	7.0	39.4

Table 2. Summary of data collected from individual counties.

regarding each field. This includes such items as planting dates, varieties planted, type of seed treatment, fertilizer applied, adjoining vegetation, and various other items. From that time on, each field is scouted weekly, along with any rechecks which are felt necessary.

FIELD INSPECTION AND SCOUTING PROCEDURES

The scouting procedures presented some degree of variation as growth stage and fruiting pattern changed throughout the season. We felt this was very advantageous for two reasons. First, employing different scouting and monitoring procedures throughout the season added variation to the sometimes monotonous job of scouting, which in turn created good scout morale. Second, this worked out as prime time for collecting some of our newly initiated monitoring items. Many of the monitoring data were collected at times when insect problems were minimal, such as early season and pre-squaring periods. This allowed scouts ample time to implement various monitoring activities without interfering with the normal insect infestation counts.

THREE SCOUTING PERIODS ESTABLISHED

Scouting and monitoring procedures were performed in conjunction with three established scouting periods.

Those periods and the procedures performed are outlined below.

I. Early season (pre-squaring before fruiting branches occur).

Procedures: (1) Close examination of field for cutworms--visual observation of ground surface and plants eaten off.

(2) Thrips counts by use of thrips "box".

(3) Examination for thrips damage to leaves and terminals.

(4) Examination of leaves for aphid damage.

(5) Field bordering and careful leaf examination to detect spider mite symptoms.

(6) Counts of overwintering weevil--examining 200 entire plants per field for adults.

(7) A 100 terminal count--Examining the top 6" of 100 plants throughout field for bollworms, bollworm eggs, plant bugs, and beneficial insects.

II. When fruiting branches and squares occur--but prior to the 200-square counts.

Procedures: (1) Determine the node number of first fruiting by examining ten fruited plants per field.

(2) Determine the date of first fruiting for the particular field.

(3) Determine the time lapse from emergence to date of first fruiting.

(4) Count for bollworms, bollworm eggs, plant bugs, and beneficial insects on 100 terminals.

(5) Examine 100 leaves for mites, loopers, white fly, diseases, etc.

(6) Make stand counts to determine number of plants per acre.

III. When uniform squaring occurs.

Procedures: (1) Make the 200-square count to determine:
(a) Weekly fruiting rate
(b) Bollworm & boll weevil damage
Examine 200 1/4" green squares and record the row feet required to obtain these 200 squares.

(2) Make a 100-terminal count for bollworms, bollworm eggs, plant bugs, & beneficials.

(3) Make a field examination for spider mites, loopers, etc.

(4) Make 200-boll counts to determine:
(a) Weekly boll setting rate
(b) Insect damaged bolls

The Field Infestation Record in Figure 3 and the Cotton Monitoring Record in Figure 4 illustrate how the various insect counts and monitoring data are recorded. These are the records the farmer will receive on each of his fields. They give the producer an indication of the progress and performance of each of his fields on a weekly basis. From these two records, both we and the producer can compare insect infestation levels, in order to make the most economical and most timely decision regarding an insecticide application.

FIELD INFESTATION RECORD _____ YEAR

Field Name or No. _____ Row Pattern _____ Acres _____

Location _____ County _____ Scout & Phone No. _____

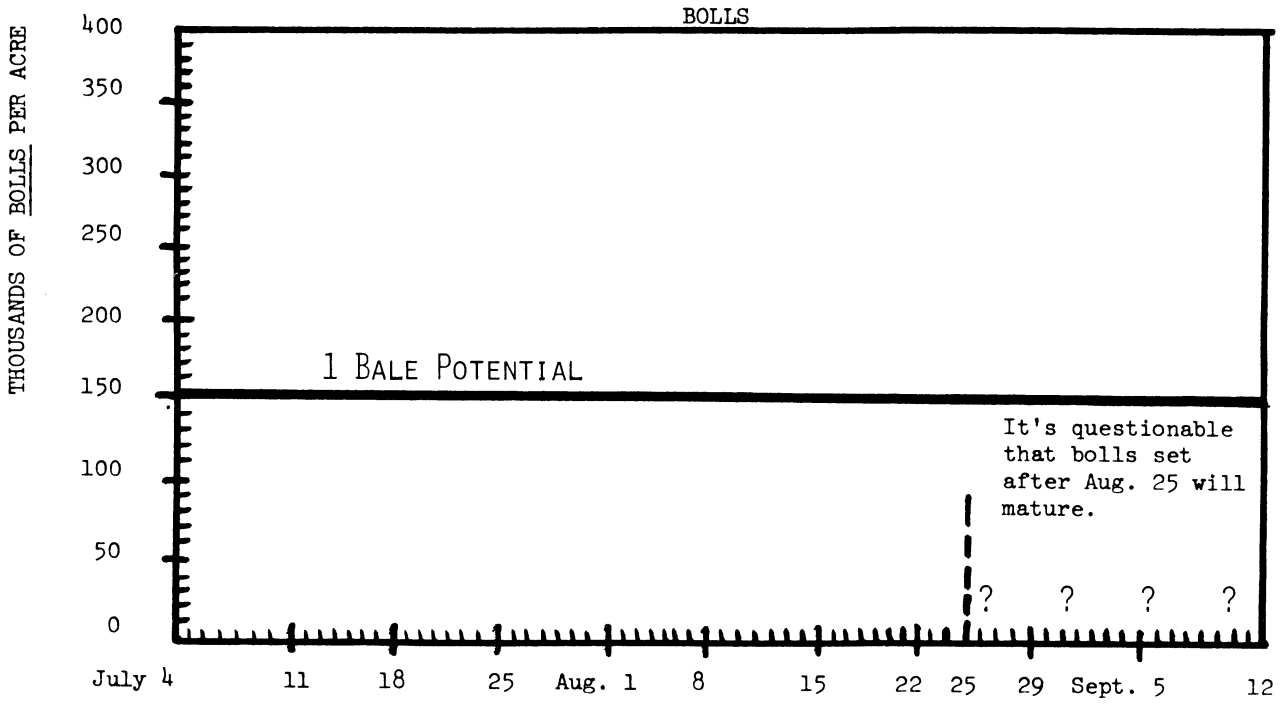
Operator _____ Address _____

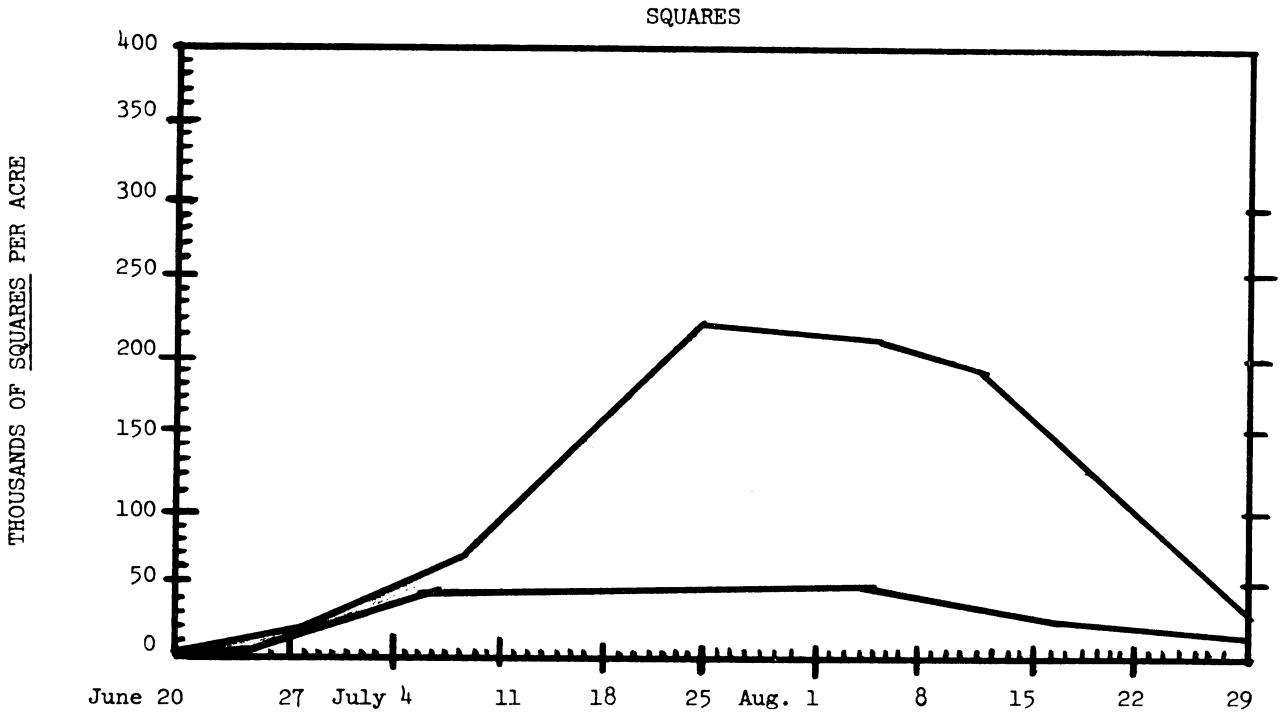
DATE SCOUTED	ROW FT. FOR 200		PER 200 SQUARES			PER 100 TERMINALS				LIGHT MED. HEAVY APHIDS THRIPS SPOT MITES GEN.	COMMENTS
	SQUARES	BOLLS	WEEVIL PUNCT.	BOLLWORM LARVAE	BOLLWORM DAMAGED	BOLLWORMS	EGGS	PLNT BUGS	BENEF.		

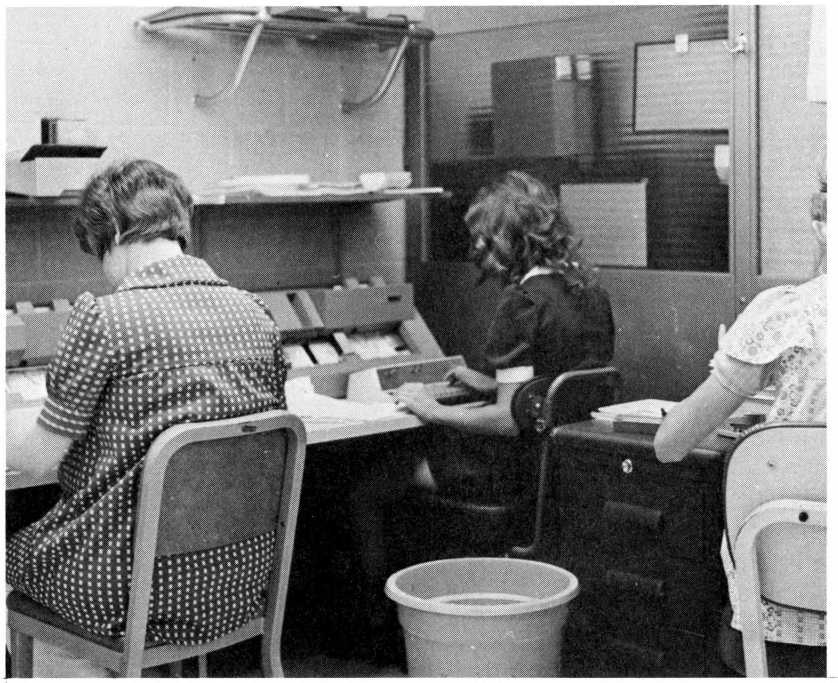
MONITORING RECORD

DATE PLANTED _____ NODE OF FIRST FRUITING _____ VARIETY _____ YIELD _____ (LB./ACRE)

TIME FROM EMERGENCE TO 1ST FRUITING _____ (DAYS) PLANT POPULATION/ACRE _____ SEED TREATMENT _____







DATA PROCESSING

The first phase of the Data Processing Operation begins with Keypunch Operators transferring scouts' field data onto data processing cards.

DATA PROCESSING

A slight modification of the national data gathering format was made to more closely fit the needs of Missouri. Thereafter, this phase of the program was carried out with a minimum of problems.

The informational flow of data from field to computer center and back to Pest Management headquarters was structured to operate the most practical way possible.

Problem of Rapid Turn-Around of Data: Our biggest and seemingly unsolvable problem is that of rapid-turn around of data. This problem stems from the fact that the cotton production area of Missouri is in the southeast portion of the state, whereas the computer center is at the University of Missouri at Columbia, some 300 miles away. This eliminates a quick turn-around of data for an up-to-date weekly summary printout.

THREE DATA TYPES

Three different types of data were devised to handle data collected at different times. Type I, as noted in Figure 5, contained information that was collected only one time. Most of this information was collected in the early season as soon as permanent plant populations were established.

Type II contained information which the scout collected weekly throughout the season. This included the weekly insect infestation counts, the growth stage, any diseases detected weekly, along with an insecticide record. The insecticide record attached to this weekly data sheet was a very effective method of keeping up with insecticides used throughout the year.

Type III contained information primarily related to the monitoring portion of our program. This data sheet was also used to record any defoliants or desiccants added. We felt this would provide an excellent method of keeping tab of insecticide applications for diapause control in the future, should a diapause control program be established beltwide.

Examples of all three are illustrated in Figures 5, 6, and 7, with their corresponding codes in Tables, 3, 4, and 5.

MISSOURI COTTON PEST MANAGEMENT PROGRAM

TYPE I DATA

COUNTY & NO. _____ (1-3) SCOUT & NO. _____ (4-5) OPERATOR & NO. _____ (6-8)

FIELD _____ (9-10)

DATE	NO. ACRES	VAR.	PLANTING DATE	ROW PAT.	1000 PLANTS PER ACRE	SOIL PH	ADJOINING VEGETATION				PREVIOUS CROP	FERTILIZER (LB N, P, K/AC)			THRIPS SEED TRMT.		
							N	E	S	W					INSECTICIDE	LB/AC	# AC
11-13	14-16	17-18	19-21	22-23	24-26	27-28	29-30	31-32	33-34	35-36	37-38	39-40	41-43	44-46	47-48	49-50	51-53

Figure 5. Basic field information was recorded on this Type I data card.

MISSOURI COTTON PEST MANAGEMENT PROGRAM

TYPE III DATA

COUNTY & NO. _____ (1-3) SCOUT & NO. _____ (4-5) OPERATOR & NO. _____ (6-8)

FIELD _____ (9-10) DATE _____ (11-13)

NODE # FIRST FRUITING	DATE OF FIRST FRUITING	TIME LAPSE FROM EMERGENCE TO FIRST FRUITING (DAYS)	DEFOLIENTS OR DESSICANTS			OTHER DATA
			DATE	KIND	(LB) AMT/AC	
14-15	16-18	19-20	21-23	24-25	26-27	28-

Figure 6. Various fruiting data were recorded on this Type III card.

TYPE II DATA

COUNTY & NO _____ (1-3) SCOUT & NO _____ (4-5) OPERATOR & NO _____ (6-8)

FIELD _____ (9-10) DATE _____ (11-13) TIME _____ (14-15) YIELD LINT/ACRE _____ (16-19)

PTS EXAM	ROW FT 200 SQ	WEEV PNCT	NO BOLL (LARVAE) WORMS	WORM PNCT	WORMS 100 T	EGGS 100 T	PLT BUGS 100 T	BENEF 100 T	APHIDS THRIPS MITES			ROW FT 200 BOLLS	GROWTH STAGE	DISEASES & SEVERITY KIND	DISEASES & SEVERITY SEVERITY	INSECTICIDE	NO. ACRES TREATED FOR
																DATE (53-55)	BOLLWORMS (63-65)
1																METH (56)	THRIPS (66-68)
2																KIND (57)	BOLL-WEEVILS (69-70)
3																LB/ ACRE (58-59)	PLT BUGS (71-72)
4																	MITES (73-74)
5																# ACRES (60-62)	APHIDS (75-76)
6																	
TOT																YEAR (78-79)	DATA TYPE 2 (80)
	20-22	23-25	26-28	29-31	32-34	35-37	38-40	41-43	44	45	46	47-49	50	51	52		

Figure 7. Insect infestation data along with square and boll rates were recorded weekly on this form.

Table 3. Coding system employed.

CODES FOR TYPE I DATA

NAME	CODE NO.	NAME	CODE NO.
County		**Adjoining Vegetation**	
New Madrid	072	Cotton	01
Pemiscot	078	Soybean	02
Dunklin	035	Small grain	03
Mississippi	067	Uncultivated grass and weeds	04
Stoddard	103	Alfalfa	05
Butler	012	Hedgerows (brush)	07
Scott	100	Corn	08
Variety		Grain Sorghum	15
Deltapine 16	05	Unimproved Pasture	16
Deltapine 45A	11	Improved Pasture	17
Coker 310	07	Buildings	23
DPL 15	37	Rivers/creeks	24
Rex	13	Ponds/lakes	26
Stoneville 7A	50	Woods (general)	27
Stoneville 213	51	Fallow ground	28
Delcott 277	99	Roads/highways	29
McNair 210	10	Levee	33
Auburn M	26	Ditches	34
Dixie King	27	**Insecticides**	
Row Pattern		Azodrin	1
Solid	01	Bidrin	2
Skip row 2-1	02	Cygon	3
Skip row 2-2	03	Di-Syston	4
Skip row 4-1	04	Methyn parathion	5
Skip row 4-2	05	EPN-Methyl parathion	6
Skip row 4-4	06	Sevin	7
Method of Application		Toxaphene	8
Aerial	1	Guthion	9
Ground	2	**Previous Crop**	
Pre-plant banded	3	Cotton	01
Pre-plant broadcast	4	Soybeans	02
In-furrow at planting	5	Corn	03
Seed Treatment	6	Alfalfa	04
		Small grain	05
		Pasture	06
		Grain Sorghum	07

CODES FOR TYPE II DATA

NAME		CODE NO.
Aphids	Light	1
Thrips	Medium	2
Mites	Heavy	3
	General	4
	Spot	5
Growth Stage		
Presquare		1
Squaring		2
Bloom to first bolls		3
Mature bolls		4
Diseases		
Verticillium		1
Fusarium		2
Boll rot complex		3
Seedling disease		4
Angular leaf spot		5
Nematode		6
Cotton root rot		7

NAME	CODE NO.
Insecticides	
Azodrin	1
Bidrin	2
Cygon	3
Di-Syston	4
Methyl parathion	5
EPN-Methyl parathion	6
Toxaphene	7
Guthion	8
Trithion	9
Severity	
None	0
Light	1
Medium	2
Heavy	3
Method of Application	
Aerial	1
Ground	2

CODES FOR TYPE III DATA

NAME	CODE NO.
Defolients or Desiccants	
Arsenic Acid	01
Def	02
Folex	03
Paraquat	04
Sodium chlorate	05
Sodium borate	06
Bollseye	07

Table 4. Coding system employed.

DATA FLOW

The transmission of data collected by the scouts in the field to the computer center and then back to Pest Management headquarters was carried out in the following manner:

Type II were collected from six scouts on each weekly field visit. These data included the weekly insect counts. Forms containing the data were passed on to the Pest Management Supervisor, either by mail or personal contact on a weekly basis. At the Delta Center (Pest Management headquarters) at Portageville, the data were keypunched by office personnel. This was actually the first and most important point of error detection and correction. Keypunch operators quickly detected most scouting errors, and corrections were made accordingly. After they were punched and verified, the punched cards were shipped by mail to the University of Missouri at Columbia. There at the computer center, the cards were read in and printouts were obtained. At this point, any additional errors were detected and corrected if possible. Any uncorrectable errors were then referred back to the Delta Center for correction by the Pest Management Supervisor or Extension Entomologist.

After correction, printouts were returned by mail from the computer center to the Pest Management headquarters. At this point, all field situations were analyzed for potential insect problems. Here, also, detectable fruiting problems were noted. See Figure 8, for an illustration of the data flow system employed.

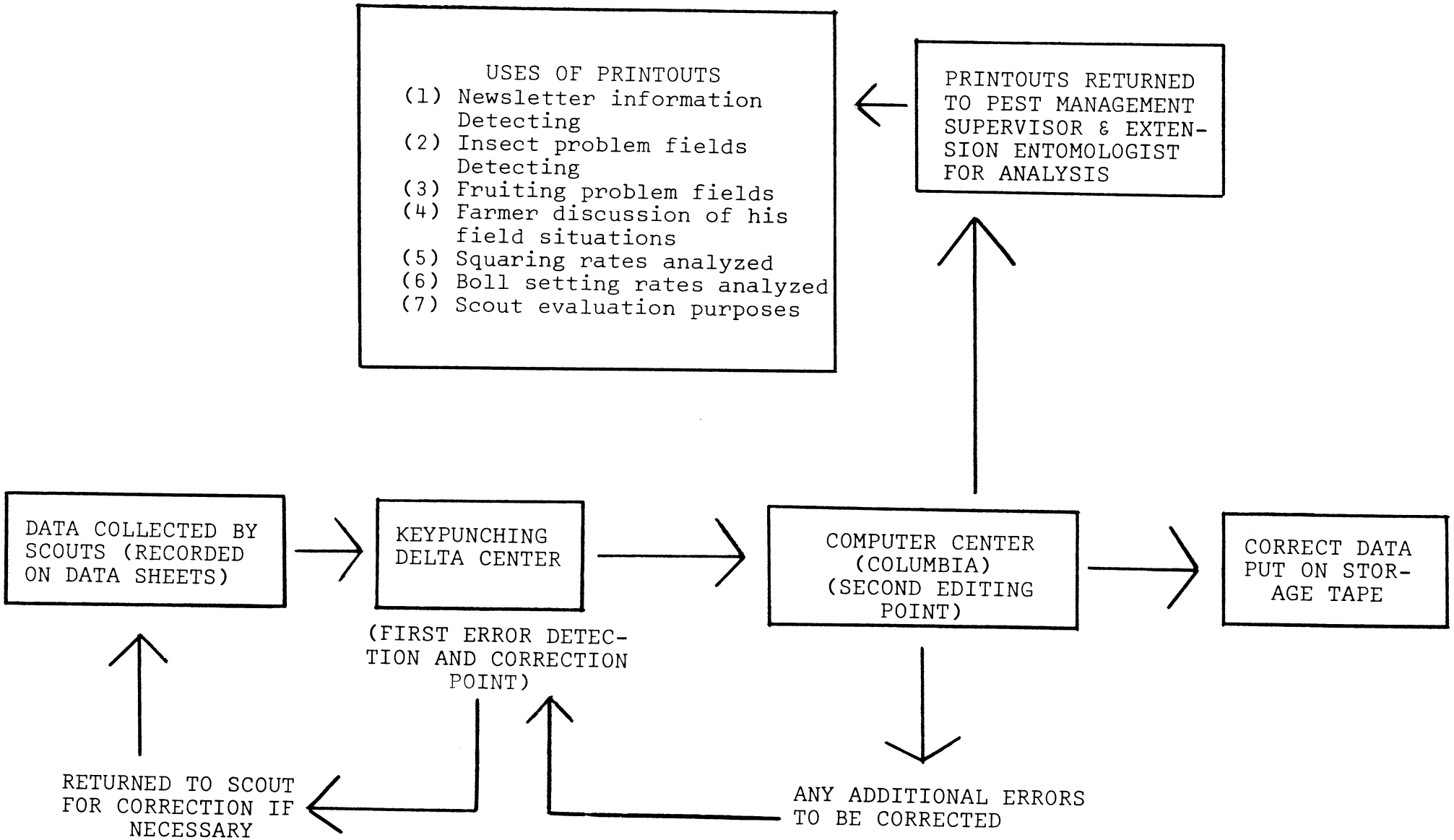


FIGURE 8. Diagram of Data Flow System

TYPES OF PRINTOUTS

Three types of printouts were obtained from the data collected. First, a weekly individual field summary was provided. The second printout consisted of a weekly summarization of all fields scouted that week. This was a very thorough breakdown of all fields scouted to include such items as:

(1) The number of fields scouted in each county.

(2) The number of fields and acres treated for each of the insect pests.

(3) The number of fields infested and the degree of infestation of all fields for boll weevil, bollworms, plant bugs, and beneficial insects.

(4) Bollworm larvae and egg counts as taken from 100 terminal survey.

(5) Bollworm larvae and damage counts and the degree of infestation as taken from the 200 square counts.

This and other information was of significant value in noting trends in insect populations and damage levels.

A third printout consisted of a seasonal accumulative record, illustrating the weekly infestation counts and fruiting rates as recorded throughout the season. This is called the Seasonal Individual Field Summary.

This seasonal summary was prepared on each field in the program. From the summary, the producer could make farm-wide comparisons of his fields and compare practices and performance in different fields. A simulated example of the Seasonal Individual Field Summary is shown in Figure 9.

FUTURE DATA PROCESSING PLANS

Basically, the same operating procedures will be conducted next year regarding data collecting and processing. A few changes will be implemented to improve data flow from field to computer and back to producer. These are only minor changes with more emphasis being placed on systemizing data flow.

Additional emphasis will be placed on interpretation and use of data at the county level. Key roles will be played by Area Agronomy Specialists and Farm Management Specialists as far as the educational aspect is concerned. The success of any program of this type depends upon the coordinated efforts of all involved personnel. As we realize, creating closer extension-farmer relations is the key to success of this program.

Additional training of scouts will be provided regarding data interpretation and use. This phase of scout training deserves more concern, particularly with the returning scouts. It will be much more meaningful to them after a year's experience.

PRINTOUTS AND SUMMARIES

Few changes will be made, with the exception of obtaining some average figures regarding fruiting rates and a few other items in conjunction with the monitoring phase of our program.

MISSOURI PRESENTS PROGRAM IMPROVEMENTS

COTTON MONITORING PROGRAM INITIATED:

In an effort to improve our established scouting program, we initiated what we termed a "Cotton Monitoring" program into our scouting program. This consisted of showing certain information collected in the field, on a monitoring record located on the reverse side of the insect infestation record.

DATA UTILIZED TO FIT LOCAL SITUATION:

We hoped to take complete advantage of the data collected in conjunction with the suggested Pest Management format. We were currently collecting adequate data to meet program requirements, so we added a few additional items which could be collected in conjunction with the insect counts to make the information more useful to Missouri producers.

We felt that by collecting these additional monitoring items, we could incorporate a program which would greatly improve previous efforts. Our objective in this case being to utilize program efforts to more closely fit the needs of our local state situation.

During the past 17 years of our scouting program's operation, the number of insecticide applications has been reduced considerably. This indicates a substantial achievement in economy. We want to continue to show program usefulness by expanding our program throughout the Bootheel to more cotton producers.

By carrying out the Monitoring Program in conjunction with our scouting program, we can accomplish a twofold mission. We must also keep in mind that this will be a complete educational program in itself, and like most programs, will require the test of time to fully prove itself.

MONITORING PROGRAM GOALS:

Goal No. 1: The success of this program as far as the individual producer is concerned will be regulated by two vital efforts which the producer himself must perform. First, he will need to keep a continuing system of records on all fields scouted and monitored. Second, he will need to apply sound farm management practices based on information provided by our program.

These efforts will direct him toward obtaining the projected end of goal of applying the most practical management practices in order to arrive at the optimum performance level for each particular field. Continued record keeping of such monitoring data as planting dates, square and boll fruiting rates, plant populations per acre, and first fruiting dates, etc., combined with other management practices such as maintaining a fertility program, using adapted varieties, maintaining soil pH, etc., he will eventually arrive at an optimum production level for each field. Since each field is a different

situation, each must be analyzed and worked with individually to establish the most practical set of management inputs to obtain maximum output. The value of this type of information is primarily to provide a more business-like approach to any farming operations.

Goal No. 2: While the producer is in the process of utilizing his management operations to their fullest, we want to provide him with season-long insect and monitoring information. With this kind of service, we hope to create a level of confidence among farm managers that will be reflected in their continued belief and cooperation in all Extension program efforts as well as the Pest Management Program.

MONITORING INFORMATION THAT WILL BE OBTAINED ON EACH FIELD

A. The node number on plant where first fruiting occurs.

B. The date of first fruiting determined.

C. The time lapse from emergence to date of first fruiting.

D. The plant population per acre as determined from stand counts.

E. The fruiting rate on a weekly basis to include two graphs.

(1) One illustrating the number of squares present per acre for each week of the season. From this information we can locate the 3 major types of "problem" fields.

(2) Another graph will illustrate the number of bolls present per acre for each week of the season. This will give the producer an indication of the yield potential of that particular field.

MONITORING DATA EVALUATION

A. The node number on plant where first fruiting occurs:

1. This information will be useful in locating problem fields, or fields that aren't fruiting normally.

2. First fruiting normally occurs between nodes 6 and 9. Fields that don't start fruiting until nodes 11, 12, etc., should be noted and watched closely.

3. This node number information merely serves as an "INDICATOR"; for example:

   If a field is not fruiting between nodes 6 and 9, this indicates a problem, although the cause of the problem may not be evident.

   What are some possible causes?

   a. The farmers' most frequent response will be "the insects--plant bugs are getting those first squares and the scout hasn't noticed the insects present."

      This is just a possibility--but there are other causes that are just as capable of bringing the same results.

   b. Plants may be just growing vegetatively due to excessive Nitrogen application.

   c. Poor fertility practices.

   d. Plant population may be too high, resulting in tall plants growing too close together. Such plants are easier for mechanical pickers to harvest, but you may end up with most of the bolls in the top portion of the plant.

B. Date of first fruiting determined.

The first fruiting date will vary somewhat in regard to: (1) variety, (2) soil type, (3) location, (4) soil fertility, and (5) weather conditions, etc.

1. This information will be of value in making COMPARISONS among fields.

   Early fruiting fields may be compared to later fruiting fields in conjunction with the 5 factors above.

2. A particular variety planted on different soil types with different fertility levels and pH, may vary a great deal regarding the date of first fruiting. This may allow a person to determine the best maturing variety for his particular farming operation in relation to the five factors above.

   NOTE: This information does not indicate that these first squares are sticking or shedding, but that they are merely present at that particular time.

C. Time lapse from emergence to date of first fruiting.

1. This information will be interesting to the farmer and also to us for purposes of comparison.

2. By continued record keeping of this information, an average time lapse (in days) may be determined for particular varieties on particular soils, etc.

3. This would allow a producer to be able to anticipate the first fruiting period and, therefore, be particularly alert during that time to detect insects, diseases, etc., which could possibly delay this critical early setting of squares.

D. Plant population per acre from stand counts.

Stand counts will be useful in evaluating different plant populations per acre.

1. This evaluation will be directed toward arriving at an optimum plant population per acre which will perform best for a particular soil type, variety, fertility level, cultivating method, or any other management practice or farming method.

   This will not be determined over a one-year period, but must be evaluated over an extended time period. Here again, well-kept, yearly records will be the key to a successful determination.

2. Stand counts will be of value in estimating infestation levels on a per-acre basis.

   EXAMPLE: Two fields scouted on the same day had 8 bollworm larvae per 100 terminals.

   Field #1 had a stand of 80 plants per 28 row feet, or 40,000 plants/acre. In Field #1, 8 bollworms per 100 terminals would be equivalent to 3,200 bollworms per 40,000 terminals or 3,200 bollworms/acre.

Field #2 has a stand of 60 plants per 28 row feet or 30,000 plants/acre. In Field #2, 8 bollworms per 100 terminals would be equivalent to 2,400 bollworms per 30,000 or 2,400 bollworms/acre.

So on a per-acre basis, Field #1, with 3,200 bollworms/acre has 800 more bollworms than Field #2 with 2,400 bollworms/acre.

E. The fruiting rate on a weekly basis.

A weekly fruiting rate on each field can be determined from the row feet required for the 200-square count. This will be expressed as the number of squares per acre (in thousands).

1. From this information one can see the seasonal squaring trend of each field as well as a weekly picture of each field.

2. Comparisons among fields may also be made. Fields not squaring well should be noted and watched closely. Slow squaring or poorly squaring fields are indicative of a problem, although the cause of the problem may not be evident at the particular time.

3. Early squaring fields and unusually high squaring fields should also be noted, especially during bollworm and boll weevil periods.

    a. Early squaring fields are more attractive to insects, thus should be noted and watched carefully.

    b. Fields with high squaring levels have a tendency to "mask" a high bollworm or boll weevil infestation.

    For example, a field having 200,000 squares per acre will not appear to be as heavily infested as a field having 150,000 squares per acre, although both fields have the same number of bollworms or boll weevils present.

HOW TO INTERPRET & USE THE COTTON MONITORING RECORD

Upon examination of the Cotton Monitoring Record, you'll immediately notice two large graphs covering most of the page. At the top of the record are some additional monitoring items. These items and their value are discussed in the section on program improvements.

Our main emphasis at this time will be directed toward the two fruiting graphs. These illustrate the fruiting rates on a weekly basis.

1. Weekly Squaring Graph.
2. Weekly Boll Counts.

1. Weekly Squaring Graph:

This graph illustrates the weekly squaring rate for each field expressed as thousands of squares per acre.

The upper line on the curve represents the normally expected fruiting pattern; the lower line represents the estimated minimum squaring rate necessary to realize any profit. Any field that falls within the shaded area is considered satisfactory. The dates across the bottom represent estimated calendar dates which correspond to the expected seasonal growth and fruiting pattern for Southeast Missouri.

What value is the squaring curve? First, the squaring curve serves as an "indicator." It gives the grower an indication of how a particular field is fruiting from week to week and permits analysis of the seasonal squaring pattern. From this information,

individual field comparisons can be made. Fields not squaring well can be detected and given immediate attention.

Three Particular Fruiting Problems Which Can Be Detected:

1. A field which does not begin squaring on schedule can be noted. It may begin squaring 2-3 weeks later than normal.

2. A field that begins squaring on schedule and then abnormally drops off in its squaring rate can be detected.

3. A field that has a very poor rate of squaring. This field would show up below the shaded area on the graph.

The value of this information stems from the fact that these fruiting problems can be detected immediately, allowing time for corrective action if the situation is correctable.

Some causes cannot be corrected at the time of detection. However, regardless of whether the problem is correctable or not, the situation warrants investigation to prevent recurrences.

Properly Fruiting Fields Are Also Detected:

Early squaring and high squaring fields can also be detected. These can be used for comparison with other fields to determine farming practices that are obviously bringing good results.

2. Weekly Boll Counts

This graph serves as another type of indicator. This again being an additional added benefit of the scouting program. Weekly boll counts are made and recorded as thousands of bolls per acre on the graph.

A Potential Yield Indicator: These boll counts will give the producer an indication of the yield potential for that particular field.

Example: A field having a boll count of 150,000 bolls per acre prior to August 25, would have a potential yield of approximately one bale. (It takes an estimated 150,000 bolls to make one bale, varying somewhat with variety, weather, etc.).

Again, this is just an indicator. It's obvious that diseases, weather damage, insects, etc., could destroy large percentages of the bolls, resulting in lower yields than anticipated. This simply serves as a potential yield indicator, which will give the producer an idea of how the field is progressing. Action can then be taken to determine why it did or did not perform well.

Basically, the entire concept behind our monitoring program is to create an awareness of both the successful and the unsuccessful cotton practices employed, as guidelines to the most applicable, practical, and economical action for future production.

SOIL SAMPLING

Soil samples collected from the project area are used to detect pesticide build-up in the environment.

MONITORING FOR ENVIRONMENTAL CHANGE

(1) Soil Sampling

(2) Biological Sampling

OBJECTIVE: A study is being undertaken to see if a trend can be detected in the pesticide load within the environment of Southeast Missouri. Obviously, a thorough investigation of this type would require in-depth monitoring of several components of the environment. Due to the time and expense involved, however, we have been limited to monitoring two major environmental components so far--soil and one biological organism.

Program Operational Description: The program has included taking 50 soil samples and 50 biological samples per year. Half of these samples are collected in the spring prior to any pesticide applications, and half in the fall following the termination of pesticide applications.

Where samples were collected: Of the 25 samples of soil and the 25 biological samples collected in the spring, 20 were collected from within the project area and 5 outside the project area. The same number of samples were again taken in the fall.

Sample Description: (A) Soil sample--Each soil sample consisted of 50 cores two inches in diameter and three inches deep. These 50 cores were taken over a 10-acre site.
(B) Biological sample--Each biological sample consisted of a minimum of five small rodents (either cotton rats, field mice, or deer mice) or 50 to 75 ground beetles. These biological samples were taken from area cotton fields, both inside and out-

side the project area.

Problems Encountered: The greatest problem encountered was that of collecting the biological samples. Perhaps our main disadvantage was lack of experience, coupled with too few personnel and lack of time. Trapping techniques created time delay problems. Traps were also a problem; we were unable to obtain the Sherman type. Next year, effort will be directed toward improving trapping equipment and techniques.

Laboratory analyses of the samples collected were not available in time for this report.

A copy of the sample data sheet is on the following page.

SAMPLE DATA SHEET

1. LABORATORY LOG NO. G–

FIELD DATA

2. STATE	3. AREA NO.	4. BLOCK NO.	5. SAMPLE NO.
6. SAMPLES REPORTED BY		7. DATE SAMPLED	8. DATE SHIPPED
9. MATERIAL INCLUDED IN SAMPLE			10. WEIGHT OF SAMPLE

11. ADDITIONAL INFORMATION

12. CHECK PESTICIDE USED IN AREA

☐	2, 4-D	☐	DDT	☐	Endrin	☐	Monuron	☐	Sulphur	☐	OTHER *(specify)*
☐	2, 4, 5-T	☐	DEF	☐	Heptachlor	☐	Parathion	☐	TDE		
☐	Aldrin	☐	Dieldrin	☐	Malathion	☐	Phosdrin	☐	Toxaphene		
☐	BHC	☐	Diuron	☐	M. Parathion	☐	Sevin	☐	Trifluralin		
☐	Dalapon	☐	DSMA	☐	Merphos	☐	Strobane				

FOR LABORATORY USE ONLY

13. WEIGHT OF SAMPLE PROCESSED AT LABORATORY	14. VOL. OF EXTRACT OBTAINED	15. QUANTITY REPRESENTED BY SAMPLE, IF EXTRACT

16. LABORATORY DATA

METHOD OF ANALYSIS *(TLC, GC, Col., etc.)* — A	PESTICIDE FOUND — B	AMOUNT — C	ANALYSIS DATE — D

17. ADDITIONAL INFORMATION *(use reverse if necessary)*

18. ANALYSIS BY

BLOOD TESTING

Blood tests to determine cholinesterace levels of scout personnel were scheduled at regular intervals. (The facial expression noted in this picture is not typical).

MONITORING PESTICIDE EXPOSURE OF PEST MANAGEMENT PERSONNEL--BLOOD TESTING

In continued compliance with Pest Management plans and requirements, cholinesterace blood testing procedures were carried out at a local clinic. Arrangements were made to monitor plasma cholinesterace activity for six scouts, the scout supervisor, and the Extension Entomology Specialist.

TESTING PERIODS: The testing procedures consisted of taking a pre-exposure activity reading on all personnel involved prior to entering cotton fields. Arrangements were also made to take additional blood tests any time throughout the season should an apparent exposure occur, and it was felt additional readings were necessary. Fortunately, no mid-season readings were required in our area this year. A final post-season activity reading was taken before scouts returned to college.

METHOD OF ANALYSIS: Cholinesterace activity readings were obtained by the ACHOLEST test kit. This is basically a simplified screening test for the determination of plasma cholinesterace activity. It renders a reliable, semi-quantitative determination of plasma cholinesterace activity by indicating it to be "increased," "normal," "suspicious," or "decreased." The ACHOLEST test is a valuable diagnostic aid in the assessment of organophosphorous insecticide poisoning. The results of those tests are shown in Figure 10.

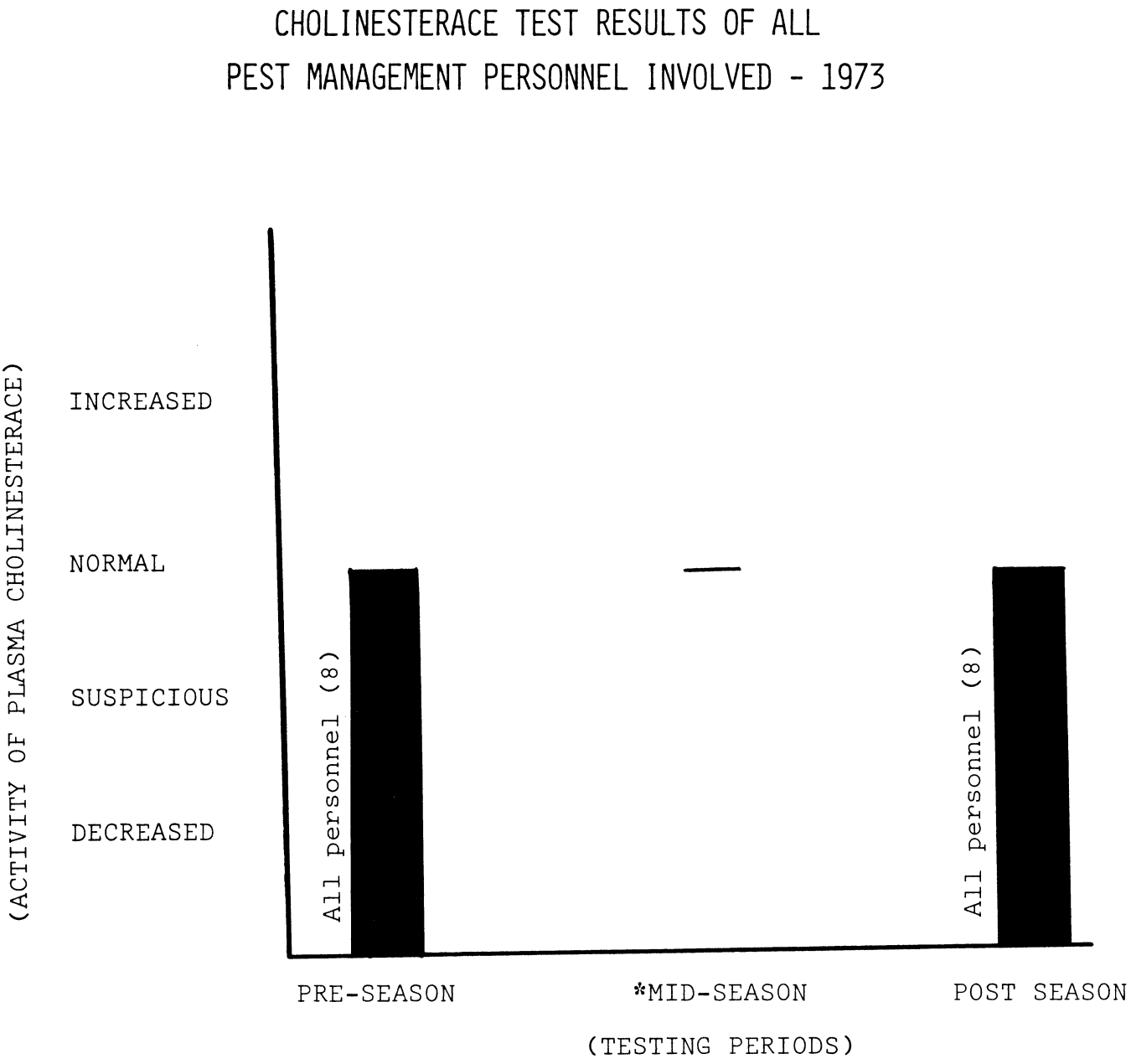


Figure 10. The results of blood tests taken in 1973.

* Fortunately, no additional mid-season tests were required this year.

SUMMARY--Each of the eight Pest Management personnel tested fell within the "Normal" activity range of plasma cholinesterace in both the pre-season and post-season tests.

PROGRAM PLANS FOR NEXT YEAR

As we continue to improve the program, some slight adjustments in operational procedures will be necessary.

In most cases, these adjustments will involve additional field information related to economic thresholds, plant bug field studies, and boll weevil overwintering surveys.

The recommended changes will include:

1. Additional field studies will be implemented to monitor close interval infestation levels of both pest and beneficial insect populations to determine the most economical time to apply an insecticide application. These studies will be employed in search of economic threshold determinations.
2. Another area of expanded endeavor will be that of increasing plant bug monitoring studies. Plant bugs are very serious insect pests in our area. They have received little attention because the extent of their damage is largely unknown and goes unnoticed in many cases. The degree of their economic importance will need to be established before growers will be concerned with them. Most growers are totally unaware of the economic loss from plant bugs.
3. We also want to continue efforts toward the comparison of field sampling techniques and scouting methods. We're always seeking improved scouting methods that minimize data collecting problems and at the same time improve the reliability of the scouts' data.

4. An overwintering boll weevil survey will be conducted to evaluate overwintering populations throughout the Bootheel. Infestation levels along the Crowley's Ridge area will be of prime interest since this is the major overwintering area in the Bootheel.

5. Each agronomy agent will be responsible for monitoring one cotton field throughout the growing season. This has been proposed in hopes that agents will gain a more thorough understanding of the new program. Perhaps this will enable them to make some suggestions on how to improve the overall program.

6. Team scouting will be used in Missouri in 1974, if acreage concentration will permit. It is presently intended that a college student will be teamed with a high school student. This is proposed in hopes that the high school student will gain enough experience to handle the entire scouting job after the college student returns to college. This will help solve the problem of leaving farmers scoutless during the latter part of the season.

7. The acreage assigned to each scout will also be reduced. Scouts will be responsible for approximately 1,100 acres in 1974, compared to 1,500 acres in 1973. Emphasis will be placed on more detailed monitoring, scouting, and reporting.

A P P E N D I X

NUMBER OF BOLLWORMS PER ACRE BASED ON DATA FROM 200 SQUARES VERSUS DATA FROM 100 TERMINALS

Table I provides a comparison of bollworms per acre, as converted from the 200 square counts, and bollworms per acre as converted from the 100 terminal counts on a weekly basis throughout the summer.

On an "individual week" basis, the comparison of bollworms per acre as converted from both the 200 square counts and the 100 terminal counts does not appear to be very consistent. (Table I)

However, a bollworm infestation in the terminals generally shows up approximately one week ahead of an infestation in the squares.

Therefore, when bollworms per acre from the 100 terminal conversion are compared to bollworms per acre from the 200 squares conversion one week later, a more consistent pattern develops. (Table II)

Table I. WEEKLY BOLLWORMS/ACRE COMPARISON

DATE	WEEK OF SCOUTING	BOLLWORMS/ACRE (FROM 200 SQ. COUNTS)	BOLLWORMS/ACRE (FROM 100 TERM. COUNTS)
June 10-16	1	0	0
June 17-23	2	0	0
June 24-30	3	0	2.08
July 1-7	4	2.85	10.63
July 8-14	5	10.54	40.15
July 15-21	6	63.95	61.34
July 22-28	7	78.81	78.05
July 29-Aug. 4	8	280.62	444.69
Aug. 5-11	9	1,069.74	545.71
Aug. 12-18	10	956.50	480.68
Aug. 19-25	11	824.83	112.00

Table II.
ONE WEEK LATER--BOLLWORMS/ACRE COMPARISON

WEEK OF SCOUTING	BOLLWORMS/ACRE (FROM 200 SQ. COUNTS)	WEEK OF SCOUTING	BOLLWORMS/ACRE (FROM 100 TERM. COUNTS)
1	0		
2	0	1	0
3	0	2	0
4	2.85	3	2.08
5	10.54	4	10.63
6	63.95	5	40.15
7	78.81	6	61.34
8	280.62	7	78.05
9	1,069.74	8	444.69
10	956.50	9	545.71
11	824.83	10	480.68
		11	112.00

AVERAGE NODE NO. 1ST FRUITING BY VARIETY

VARIETY	AVERAGE NODE 1ST FRUITING
Stoneville 213	7.12
Stoneville 7A	7.33
DPL 16	6.86
Rex (SL)	6.92
Auburn M	6.75
Delcott 277	7.50
DPL 15	6.00
Coker 310	6.00
McNair 210	8.00

Table III. These figures represent the average nodes of first fruiting among the various varieties in the program - 1973.

PERCENT OF VARIETIES PLANTED

VARIETY	PERCENT FIELDS
Stoneville 213	60.0
Stoneville 7A	12.0
DPL 16	6.0
Rex (SL)	5.0
Auburn M	5.0
Delcott 277	3.0
DPL 15	1.0
Coker 310	0.8
McNair 210	0.4
Unknown	0.4

Table IV. Relative percentages of varieties of cotton planted in Missouri Pest Management Program - 1973.

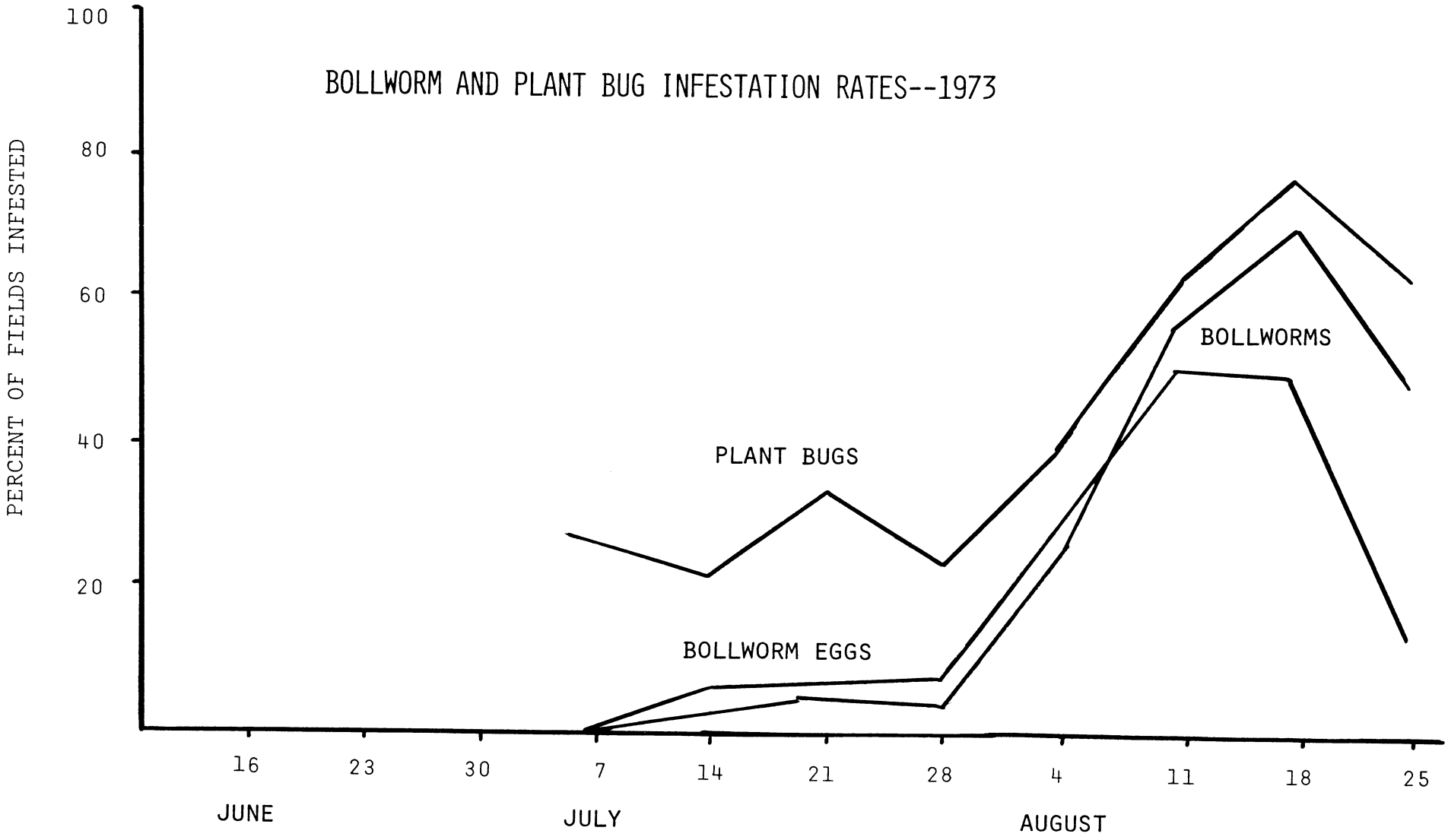


Figure 1. Infestation trends of bollworm and plant bug populations in Missouri Project area.

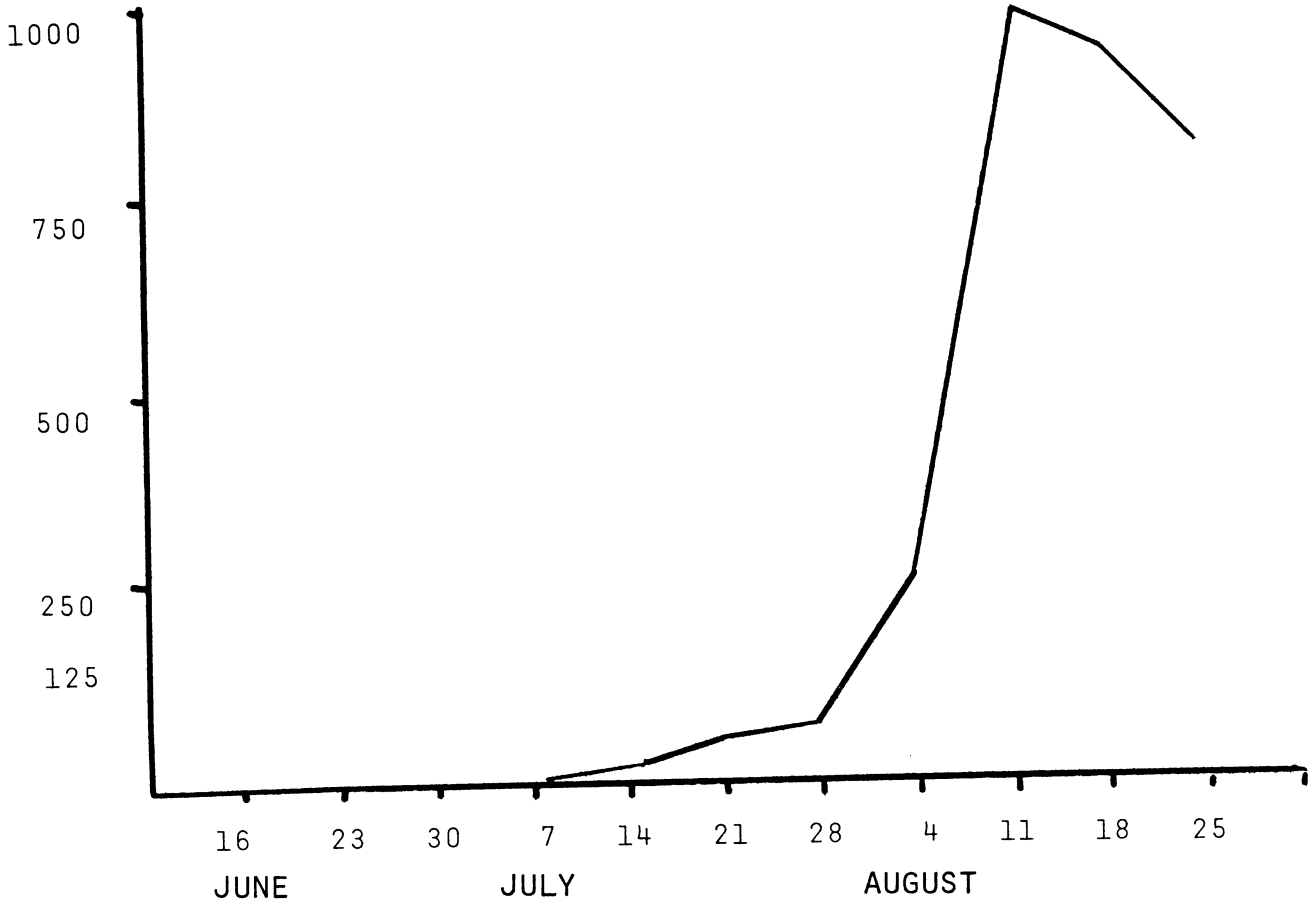


Figure 2. Bollworms/acre as converted from 200 square counts weekly.

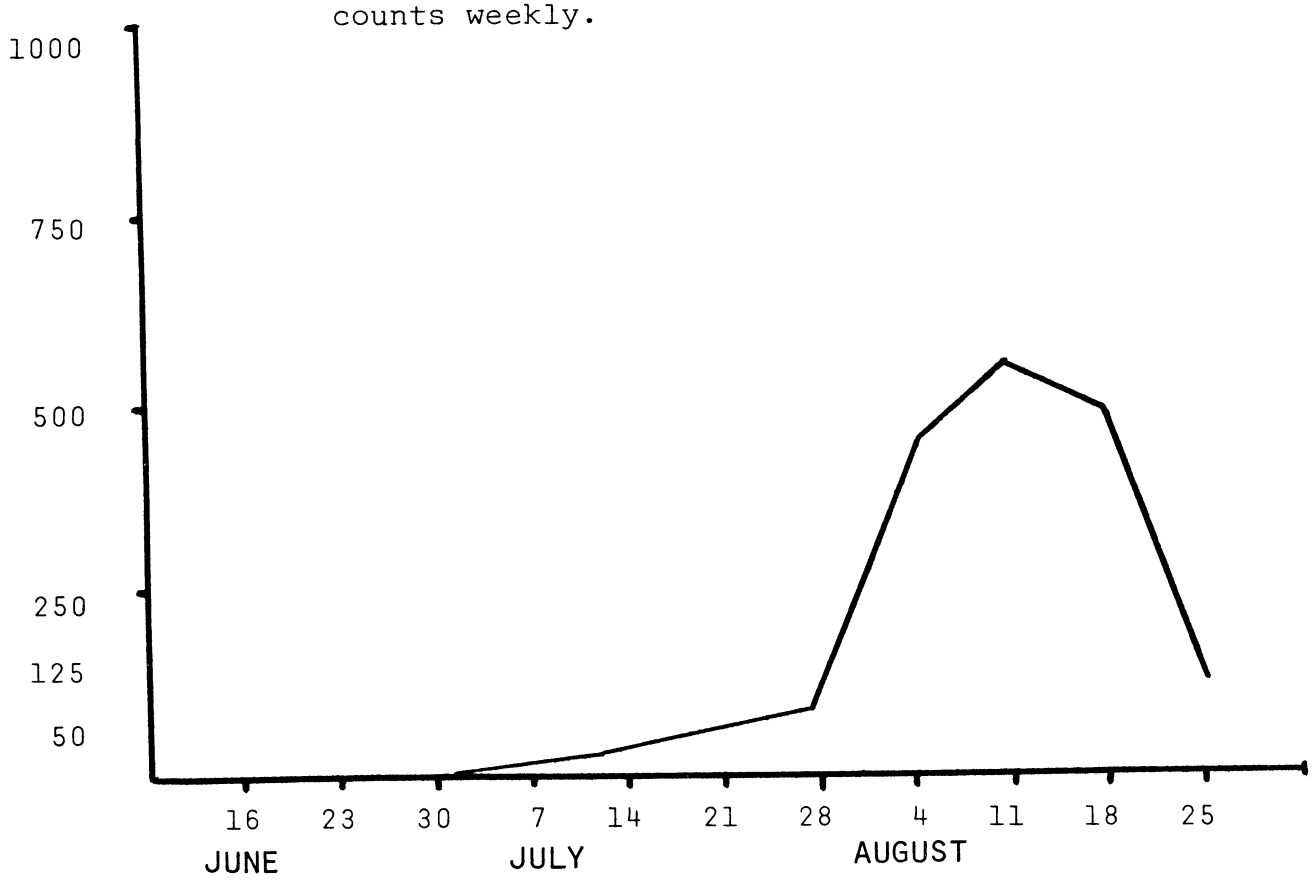


Figure 3. Bollworms/acre as converted from 100 terminal counts weekly.

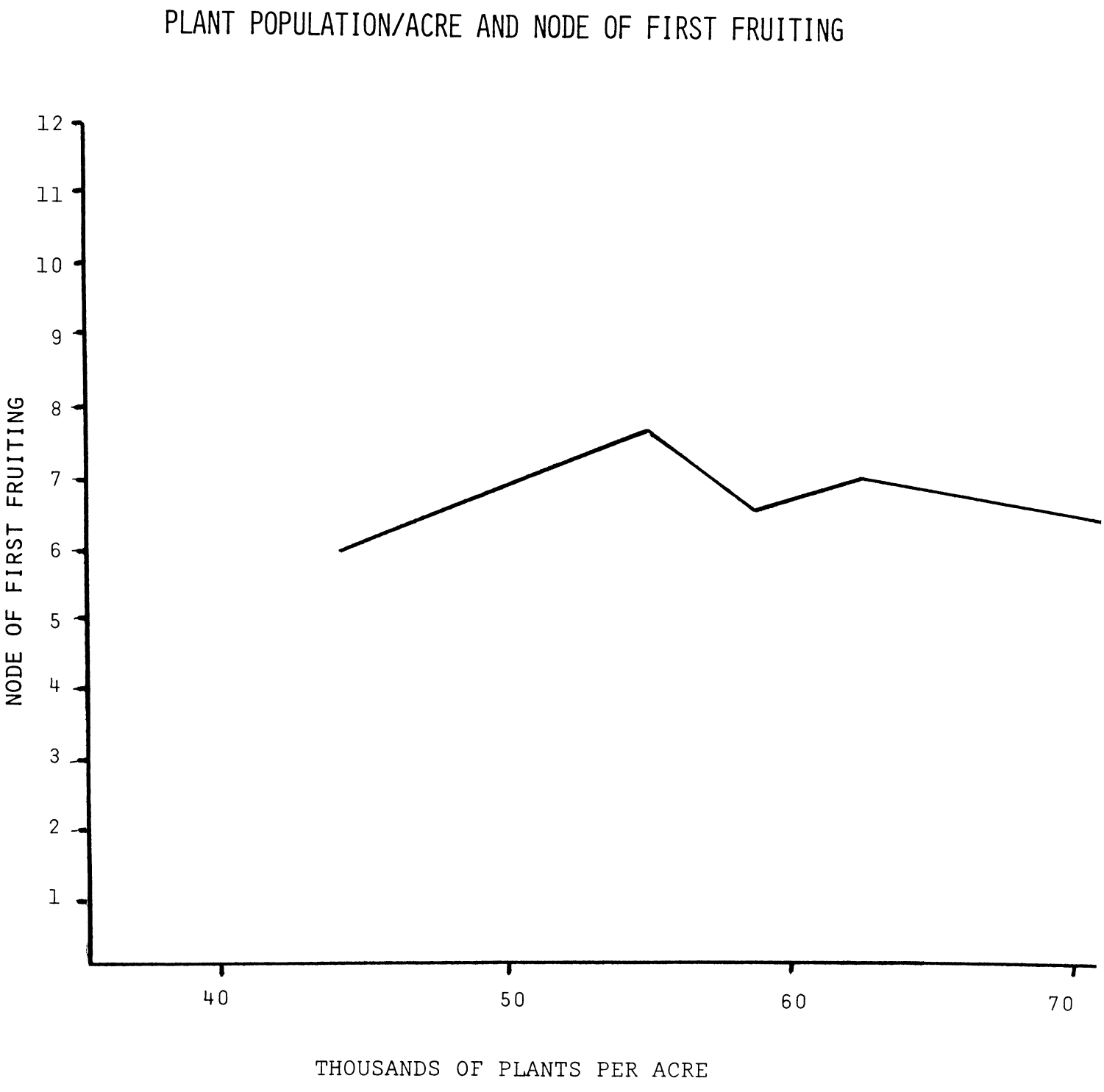


Figure 4. Node of first fruiting in relation to plant population.

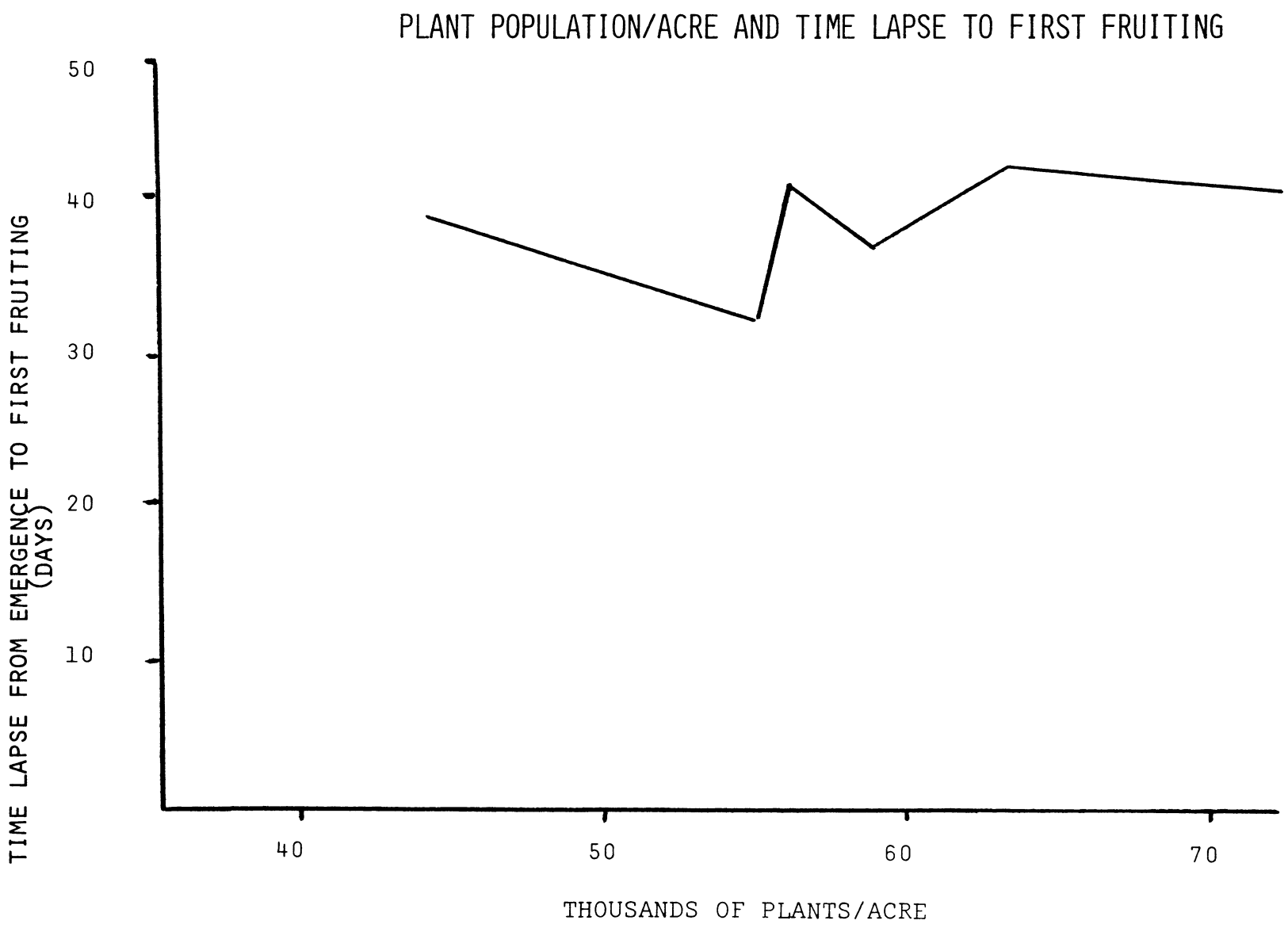


Figure 5. The mean plant populations/acre and the mean time lapse from emergence to date of first fruiting of the six Bootheel counties under Pest Management Program - 1973.

1973 SEASONAL INDIVIDUAL FIELD SUMMARY

PETERS & BROWN
BERTRAND, MO. 63823

COUNTY MISSISSIPPI
FIELD 2
SCOUT 1
ACRES 28
VARIETY STONEVILLE 213

DATE PLANTED 5-10
ROW PATTERN SOLID
PLANT POPN / ACRE 34000
SEED TREATMENT NOT SPECIFIED
NODE 1ST FRUITING 6
DATE 1ST FRUITING 6-29
TIME LAPSE 39
LBS. LINT / ACRE 0

ADJOINING VEGETATION
NORTH - ROADS & HIGHWAYS
EAST - TRUCK CROPS
SOUTH - SOYBEANS
WEST - DITCHES
PREVIOUS CROP COTTON
SOIL PH 6.0
LBS. N 57, LBS. P 57, LBS. K 57

ACTUAL FIELD OBSERVATIONS

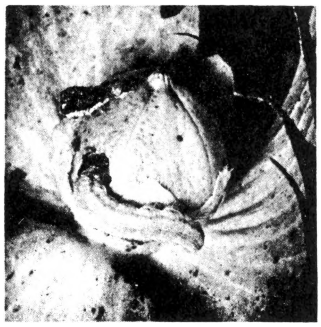
DATE & TIME SCOUTED	ROW FEET FOR (200 SQ)	WEEVIL PUNCTURE (200 SQ)	BOLL WORMS (200 SQ)	WORM PUNCTURE (200 SQ)	BOLL WORMS (100 T.)	WORM EGGS (100 T.)	PLANT BUGS (100 T.)	BENEFICALS (100 T.)	APHIDS	THRIPS	MITES
6-15, 8 AM	0	0	0	0	0	0	0	7	NONE	NONE	NONE
6-22, 8 AM	0	0	0	0	0	0	0	5	NONE	NONE	NONE
6-29, 9 AM	175	0	0	0	0	0	10	19	NONE	NONE	NONE
7- 6, 9 AM	120	0	0	0	0	0	6	6	LIGHT	NONE	LIGHT
7-13,	63	0	2	3	0	0	9	18	NONE	NONE	LIGHT
7-20, 8 AM	42	0	2	17	0	0	12	14	NONE	NONE	LIGHT
7-27, 8 AM	29	0	1	18	1	2	9	13	NONE	NONE	LIGHT
8- 3, 9 AM	21	0	1	11	1	4	7	12	NONE	NONE	LIGHT
8-10, 9 AM	24	0	1	37	8	4	14	9	NONE	NONE	LIGHT
8-17, 8 AM	28	0	4	8	4	2	11	6	NONE	NONE	NONE

PER ACRE FIELD OBSERVATIONS

DATE SCOUTED	SQUARES	WEEVIL PUNCT. (SQU)	BOLLWORMS (SQU)	BOLLWORM SQU DAMAGED	BOLLWORMS (TERM)	EGGS (TERM)	PLANT BUGS (TERM)	BENEFICALS (TERM)	COTTON BOLLS
6-15					0	0	0	2380	
6-22					0	0	0	1700	
6-29	15725	0	0	0	0	0	3400	6460	
7- 6	22933	0	0	0	0	0	2040	2040	
7-13	43682	0	436	655	0	0	3060	6120	
7-20	65523	0	655	5569	0	0	4080	4760	
7-27	94896	0	474	8540	340	680	3060	4420	18346
8- 3	131047	0	655	7207	340	1360	2380	4080	65523
8-10	114666	0	573	21213	2720	1360	4760	3060	94896
8-17	98285	0	1965	3931	1360	680	3740	2040	144842

INSECTICIDE APPLICATIONS

DATE APPLIED	INSECTICIDE	METHOD APPLIED	LBS / ACRE	ACRES TREATED
7- 6	NOT SPECIFIED	AERIAL	.75	1
8- 1	TRITHION	AERIAL	1	1



COOPERATIVE EXTENSION SERVICE-UNIVERSITY OF MISSOURI EXTENSION DIVISION

WEEKLY MISSOURI COTTON INSECT REPORT

PREPARED BY

Flernoy G. Jones

FLERNOY G. JONES, SE AREA ENTOMOLOGY SPECIALIST

With cooperation of Keith Harrendorf, Cotton Research Entomologist, and Gary McWilliams, Supervisor - Cotton Scouts, Delta Center, Box 160, Portageville, Missouri 63873

REPORT #8 FOR WEEK ENDING AUGUST 3, 1973

IN THIS REPORT:

(1) The insects in your field.
(2) Bollworm scouting
(3) Monitoring boll setting and/or shedding.

THE INSECTS IN YOUR FIELD

SPIDER MITES: Scouts reported an increase in the number of fields having spot mite infestations. These acres were detected early and spot treated. Now that we are experiencing hot, dry weather in most areas, an increase in mite infestations is expected, since these conditions are very conducive to mite spread.

PLANT BUGS: A gradual increase in plant bugs, particularly in the earliest planted fields was reported last week. We are closely watching these pests, especially the clouded plant bug. Scouts are checking for damaged blooms and bolls, but no apparent damage is evident at this time.

NOTE: Fleahopper nymphs are showing up in unusually high numbers in isolated areas. By use of sweep nets, scouts are able to detect these plant bug populations, particularly the nymphs which are often overlooked.

BOLLWORMS: No significant change in larvae and egg counts over last weeks' reports. Eggs and small worms are being found in many fields, but numbers remain below economic levels. The second generation of moths are now beginning to lay eggs on corn, and on cotton. Where no corn is available, you should check fields closely now for the first detection of eggs and small worms.

BOLLWORM SCOUTING

Emphasis is now being placed on bollworm control as the season is now upon us. With the size of the bollworm egg being so small (1/2 size of pinhead), careful examination of plant terminals is so important.

HOW DO YOU SCOUT FOR BOLLWORMS? To arrive at a decision regarding bollworms, two phases of scouting is essential.

PHASE ONE - Examine the terminals (top 6" of plant) of 100 plants throughout the field. Examine closely for eggs and small newly hatched worms. Also note beneficial insects in these terminals.

PHASE TWO - Examine 200 squares throughout the field. Note the number of worms and the number of worm damaged squares. From this count, you can arrive at a percentage of damage.

(CONTINUED ON BACK)

BOLLWORM CONTROL RECOMMENDATIONS: Apply control measures when eggs and 6-8 worms are found per 100 terminals. In fields that have not been treated previously and where beneficial counts are still abundant, spraying may be delayed a few days to give beneficials an opportunity to control them.

MONITORING BOLL SET AND/OR SHED

We have previously been concerned primarily with the squaring rate and the early square setting. However, it is of utmost importance to note at this time, whether these first bolls are being set or shed.

Scouts have been making boll counts on some fields for 2-4 weeks. Since the time required from square to boll is about 25 days, those fields with a high rate of square set 25 days ago should show a corresponding high rate of boll set.

Any severe shedding may be due to plant bugs or unfavorable weather conditions, such as high temperatures and drought stress etc. Check the boll monitoring on your cotton scouting records and be alert to those fields which aren't setting bolls normally.

NOTE: It is questionable whether those bolls set after August 25 will make a mature boll.

BE CAREFUL ABOUT RE-ENTERING FIELDS IMMEDIATELY AFTER AN INSECTICIDE
APPLICATION

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File types	tiff
Notes	

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Editing software	Adobe Photoshop
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