ENTOMOLOGY RESEARCH IN SOUTHEAST MISSOURI 1960

UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE COLUMBIA, MISSOURI

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COTTON INSECT RESEARCH

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The major objective of the present cotton insect research program is to provide cotton producers with the most current insect information possible. Evaluation of insecticides and miticides is an important phase. This is accomplished by field plot testing of commercial materials and promising experimental compounds available from various chemical companies.

Spider Mite Control

Spider mites (mainly *Tetranychus atlanticus* McG.) have been a problem to many cotton producers in southeast Missouri during the past several years. The percentage of scouted fields infested with mites increased to a high of 54 during the second week of August, 1960. This compares with a high of 66 per cent during the first week of August in 1959.

A sudden decline in spider mite populations was noted in many fields during the early part of August, 1960. A similar decline was observed during 1956, 1958, and 1959.

During 1959 and 1960, twenty-two materials or rates of materials were compared for effectiveness in controlling established infestations of spider mites on cotton. The species involved was mainly *Tetranychus atlanticus* McG. Results of these comparisons are shown in Table 1. The percentages of control three, 10, and 17 days after treatment are average percentages determined from the number of tests in which each material and dosage occurred. The materials and dosages are ranked according to their effectiveness 10 days after treatment.

Trithion at 0.5 lb. per acre, ethion at 0.5 lb. per acre and demeton (Systox) at 0.25 lb. per acre are currently recommended for spider mite control. Excellent control has resulted with these materials both in experimental plots and in general use when properly applied.

The 0.25 lb. per acre rate of trithion appears to be too low for obtaining necessary residual control. Tedion, although slower in action than the materials previously mentioned, gave good control 10 days after treatment. The residual action of tedion appears to be adequate although not quite as good as the recommended rates of trithion, ethion and demeton. It should be noted that tedion, chlorobenzilate and kelthane are not organic phosphate compounds and would provide satisfactory control *should* "phosphate resistance" occur in mite populations here as it has in the western United States. (Project 214)

Bollworm Control

The bollworm, Heliothis zea (Boddie), is the major insect pest of cotton in southeast Missouri at present time. Careful scouting is essential in determining when the bollworm population reaches an economic level. Insecticide applications must be properly timed and applied if satisfactory control is to be obtained.

The following research data was obtained from field plot testing of materials for controlling bollworm infestations.

Experiment 1:

Five insecticides were compared for effectiveness in controlling bollworms in cotton August 16, 1960. The cotton was Dixie King, planted May 25; it was fruiting heavily at the time of treatment.

Experiment plots were eight rows wide and 272 feet long. Insecticide applications were made with a high clearance spray machine, using three nozzles per row and calibrated to deliver 6 gallons per acre. The first application of each treatment was applied August 16 and a second application was applied six days later. Bollworm counts were made. The bollworms found in each plot during a 10-minute search were recorded as:

Large - over ½ inch long
Medium - ¼ to ½ inch long
Small - under ¼ inch long

Yields were taken by machine-picking the two center rows of each plot November 2.

Tables 2 and 3 give results.

Two applications of all treatments, applied six days apart, significantly reduced the total number of bollworms compared to the check. Best control was obtained with toxaphene-DDT, SD4402, and DDT. Total bollworm counts after two applications did not differ significantly between these treatments.

All treatments significantly increased the yield over the check. Highest yields were obtained from treatments that resulted in the best bollworm control. Yield differences between toxaphene-DDT, SD4402, and DDT were not significant. (Project 214)

Experiment 2:

Several materials and dosages were compared for effectiveness in controlling bollworms in cotton at Portageville August 25, 1960. The cotton was beginning to "cut out" and had very few squares and had small bolls. Large worms were numerous but few small worms and eggs were present due to the unattractiveness of the field to moths for egg deposition.

One application of the treatments was applied on August 25, using a high clearance spray machine equipped with three nozzles per row and calibrated to deliver six gallons per acre. Bollworm counts were made. The bollworms found in each plot during a 10-minute search were recorded as:

Large - over ½ inch long
Medium - ¼ to ½ inch long
Small - under ¼ inch long

Yields were taken by machine-picking the two center rows of each plot October 10 and November 4.

Results are shown in Table 4.

One application of all treatments significantly reduced the total number of bollworms when compared to the check. There were no significant differences between dosage level treatments of sevin, endrin, SD4402 and DDT. A majority of the bollworms were classified as large as shown in Table 4. The numbers of bollworms in the small and medium classification were not sufficient for a good comparison and differences in Table 4 are not statistically significant. The differences in bollworm populations among the treatments did not affect yields in this experiment. This can partially be explained by the fact that most of the bollworms counted were large. Most of these pupated within a few days after counts were made and within a week after the treatments were applied, populations had dropped to a very low level in all plots. (Project 214)

Thrips Control on Late Planted Cotton

Thrips control on cotton in this area has not resulted in increased yield or maturity in experiments in the past. The question as to the value of this practice arises almost every spring since the climatic conditions and dates of planting are not consistent with those under which previous experimental work was done. If thrips populations can delay maturity or reduce yield of cotton by stunting the plant during the early part of the season, it would seem that late-planted cotton would most likely be affected. With this in mind, a thrips control experiment was designed to determine the value of thrips control on late-planted cotton.

Dixie King variety was planted May 25, this being near the latest date at which cotton can be planted in this area with hopes of securing an acceptable yield.

Treatments were as follows:

(1) June 4.................1.0 lb. Toxaphene
(2) June 11................1.0 lb. Toxaphene
(3) June 4 & 11............1.0 lb. Toxaphene
(4) Check..................No treatment

The treated plots received 1.0 pound of toxaphene applied as a spray, using one nozzle per row. June 4 treatments were applied as soon as the cotton was up to a stand. On June 11, when the later treatments were applied, symptoms of thrips damage were becoming evident.

Table 5 gives results.

Migration of thrips from nearby small grain into the test area began as soon as the cotton emerged. Treatments applied on June 4 reduced the populations considerably when compared to the check, but did not appear especially effective due to continuous migration into the treated area. One week after the June 4 treatments were applied, only slight symptoms of thrips damage were evident. At this time, the check plots and those plots scheduled to be treated June 11 were showing severe symptoms of damage. Two weeks after treatment, plots treated June 11 began to recover. Recovery was somewhat slower in the check plots but by mid-July there were no visual differences among the plots.

Plant dry weights taken June 28 showed no significant differences among the treated plants with all plants from treated plots being significantly heavier than those from the check.

Plant height differences July 1 were not significant and squares per plant did not differ significantly July 14.

Seed cotton yields from first picking from the June 11 treatment and the June 4 and 11 treatment were significantly higher than yields from the check. The differerces among the treatments were not significant. Since only first picking yields were obtained, these differences may indicate maturity differences and not yield reduction due to thrips damage. In this area, especially on late-planted cotton, first pick yields are of most importance since frost may prevent later maturing bolls from opening, as was the case in this experiment. (Project 214)

Boll Weevil Hibernation

Winter survival of the boll weevil under natural hibernation conditions was studied during the fall of 1959 and the spring of 1960. Standard two-square-yard samples of ground trash were inspected for live weevils by running the trash through a U.S.D.A. pink bollworm inspection trash machine. No winter survival was recorded at Morley, Commerce, Bell City, Qulin, or Neelyville. Near Malden an average of 121 live weevils per acre was recorded in March, 1960. This represented a survival of 1.9 per cent. The area sampled near Malden had an excellent ground trash cover and had an average of 6,292 weevils per acre in hibernation in November of 1959.

No live weevils were recovered in the spring of 1960 from five hibernation cages at Sikeston. These cages had been stocked with 500 diapausing weevils each in the fall of 1959. (Project 214)

CORN INSECTS

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European Corn Borer

Chemical Control

Although European corn borer infestations were expected to be low throughout in 1960, an attempt was made to study the effectiveness of various insecticides on first-brood corn borers. Both emulsions and granular formulations were used. Further tests are planned for 1961.

Biological Studies

A date-of-planting study was conducted in combination with weekly insecticide applications. Results indicated that three varieties of corn planted prior to May 24 did not have borer infestations that would warrant chemical control. Corn planted May 24 and June 18 showed significant increases in yield when borers were controlled.

Study of the number of generations of the European corn borer in southeast Missouri was continued in 1960. Previous results have shown that it is possible for the European corn borer to complete three generations in this area. We are now trying to determine whether or not there is a partial or complete fourth generation some years. A series of cages confining borers in natural field environments was used for this study.

Another study was initiated to determine if borers overwinter in weeds common to the southeast Missouri area. Some of the more common weeds were transplanted in cages and infested with corn borer moths. These plants will be dissected during the spring of 1961 to determine whether or not any larvae survived the winter months.

Though farm practices in the area tend to keep field populations in corn at a low level, first-brood populations are usually larger than anticipated. For this reason, it is believed that corn borers overwinter in habitats other than corn.

Cage studies to determine the effect of parasites and predators upon corn borer survival were carried out on the first and second brood at Sikeston again in 1960. Caged and uncaged plants were infested artificially with corn borer egg masses. In the uncaged plants, 9.8 and 4.7 per cent, respectively, of the first and second brood were parasitized. No parasites or predators entered the cages; however, in both cases, the caged plants had lower corn borer infestations than the uncaged plants. There is no explanation for this but the same results were obtained in a similar study on the first brood in 1959.

Regional Survey

The long range European corn borer survey to study factors influencing borer populations was conducted in 1960 in the same manner as in previous years. The number of cooperators in New Madrid County, 24, was the same as in 1959.

New Madrid County cooperators are listed and a summary of the borer populations at various times of the year may be found in Table 6.

The earliest field was planted April 1 and the corn was all planted by May 15 in the 22 fields with more than 50 per cent of the corn planted by April 12. The stand counts ranged from 8,000 to 20,167 plants per acre with an average of 13,479 plants.

There was an average of only 91.7 borers per acre at the time of the early spring survey and only 8.3 borers per acre when the late spring survey was made, a reduction of 91 per cent. Borer populations in 1959 were 1022 per acre after the second brood and 222 for the fall surveys. Therefore, there was a 78 per cent reduction between the early fall and late fall surveys in 1959, or 96.3 per cent reduction from late fall, 1959, and late spring, 1960, and 99.2 per cent reduction from early fall, 1959, to late spring, 1960. There are various factors which may influence the borer population between these times, such as agronomic practices, weather, diseases, parasites, and effect of a third generation.

When the summer survey was conducted, the borer population in New Madrid County had increased to 145 borers per acre or 17.5 times as high as the late spring population. There was a further increase in the borer population between the summer survey and the early fall survey when there were 3,486 borers per acre. This indicates that the borer population at the end of the second brood was 420 times as high as the population in the late spring.

When the fields were surveyed in late fall, the borer population had dropped to 2,417 borers per acre. This is a 30.7 per cent reduction from the early fall population. Interestingly, a majority of the borers found in the late fall were found in two fields. Although there was an average of 2,417 borers per acre in the county, if these two late fields were omitted there were only 75 borers per acre in the county. When the late fall survey was conducted (after a third brood had developed) only one field of the 24 surveyed had not been picked.

Corn Earworm

Chemical Control

Two experiments on chemical control of corn earworm were conducted at Sikeston during June, 1960. One test involved the screening of various insecticides that are commonly used for control of earworm or have shown promise of effective control. Some of these insecticides were applied at different dosages and with the addition of a spreader-sticker compound. For this test, chemical applications were begun June 25, or two days before silks appeared, and continued on a daily schedule until the corn silks became brown. The applications were then applied every other day until harvest. A total of 16 applications were made. All applications were applied with a high-clearance, self-propelled, spray machine delivering 25 gallons of material per acre at 80 pounds per square inch. Fifty ears were selected at random from each of four treatments for infestation data. Ears showing earworm damage or the presence of a larva, regardless of size, were considered infested. Table 7 gives results. This test was not considered conclusive since the untreated check plots revealed that only a small population of corn earworm was present during the time the corn was in silk.

A second experiment on control of the corn earworm was conducted to evaluate a combination of gallons of spray material and nozzle arrangements. Applications of two pounds of technical DDT at 80 pounds per square inch were applied with all combinations of 20, 40, and 80 gallons of water and 2, 4, and 5 nozzle per row combinations. A total of nine combinations were used. Daily applications were made until the corn silks were brown and applications were then continued every other day until one day before harvest. In all, 10 applications were made over a 15-day period. Infestation records were obtained by random selection of 50 ears from each plot. Again ears showing insect damage or the presence of any size of larvae were considered infested. Results of this test are shown in Table 8. All treatments gave good control. However, again due to a low infestation of earworm during the period when the corn was silking, the results of this experiment are not conclusive.

Biological Studies

A date-of-planting study on sweet corn was conducted in 1960 in the same manner as a similar study in 1959. Purpose is to determine possible dates when sweet corn can be planted to have minimum corn earworm infestations.

Corn earworm hibernation experiments were conducted throughout southeast and central Missouri to determine (a) whether or not the corn earworm will overwinter in Missouri, (b) the extent of overwintering, and (c) which soil types and weather factors within the state are favorable for overwintering. In 1959, cages were placed at Hayti, Portageville, Malden, Charleston, Poplar Bluff, Sikeston, Cape Girardeau, St. Louis, and Columbia. The 1959-60 results indicated that overwintering may occur throughout the southeast Missouri area and as far north as Cape Girardeau during normal years. No overwintering was observed at St. Louis and Columbia. Cages for the 1960-61 study are located at Charleston, Sikeston, Malden, Portageville, Cape Girardeau, St. Louis, Columbia, and Carrollton. This is a basic study that should be of considerable importance to other studies concerning corn earworm.

Sorghum Insects

Grain sorghum insect research was initiated at the experiment station in 1960 to study the yield reduction by certain insects on different types of sorghum heads. Three varieties of grain sorghum were chosen according to their head types. Redlan was chosen for its tight head, RS610 for medium tightness, and DeKalb 56a for its loose head.

The tight-head variety was more severely infested with corn earworm and sorghum webworm than the other varieties. However, infestation of European corn borer was shown, by stalk dissection and tunnel counts, to be the reverse. The tight-head variety may have offered protection to the larvae, making it unnecessary for them to enter into the stalk to complete their larval development. This portion of the population could not be detected by the method used and may account for the lower number of borer tunnels in the stalks.

Toxaphene and endrin were used for chemical control of the insects. Infestations of corn earworm, sorghum webworm, sorghum midge, and European corn borer after treatment and resulting yields are given in Table 9.

Endrin treatment gave a significant yield increase over the check while toxaphene treatment gave a significant decrease. It should be understood that these treatments (2.0 lbs. toxaphene and 0.25 lbs. endrin per acre) were applied seven times during the season. This many applications would not normally be used. Possibly the reduction due to toxaphene was because of the large number of applications.

A significant difference in yield can be attributed to varieties, with DeKalb over RS610 and RS610 over Tedlan.

Sorghum Midge

Control of sorghum midge was studied as in 1958 and 1959. Tests were carried out mainly to screen insecticides that show some potential for control of this pest. More extensive tests are planned for 1961.

NEMATODE CONTROL

Lee Jenkins

Nematode control with chemicals, resistant varieties, and cultural practices, was continued with cotton, soybeans and truck crops. Most of the work was done at Diehlstadt, with the exception of research on the soybean cyst nematode which was done at Conran.

Cotton

Three varieties of cotton were used in the experiments at Diehlstadt using chemical controls for root-knot nematodes. Auburn 56 was again chosen as the variety resistant to the nematode-fusarium complex. DPL15 and Missouri 17-5211 were chosen as the susceptible varieties. Four rows, 168 feet long, of Auburn 56, and four rows of either DPL15 or Missouri 17-5211 were included in each test plot. Records were taken from the two center rows of each variety. The planting date for all the cotton was May 2. However, the DPL15 failed to produce a stand and was replanted May 22.

An area that had been row-treated in 1959 was replanted to DPL15 in 1960 in the exact rows of the 1959 plots. An untreated check was included in the area. Observations were made on the cotton produced on these rows.

Twenty-four rows that had been treated by the broadcast method in 1959 were planted to DPL15 cotton in 1960 without further treatment.

The following chemicals were used as soil treatments: Ethylene dibromide, DD, dibromo chloropropane (Nemagon or Fumazone) and NiA 4606. The pre-plant applications were made April 14 and April 15. The soil fumigants were applied to a depth of six inches using a single soil chisel in the center of each row and bedding over the row. (See Table 10).

Soybeans

The damage to soybeans by the soybean cyst nematode was light in southeast Missouri when compared with 1959. Only a few fields were observed that showed definite symptoms of soybean cyst damage. Most of the fields that had serious damage in 1959 were not planted to soybeans in 1960. Weather conditions were less favorable early for nematode development in 1960 than in 1959. At Conran, where the soybeans were severely damaged in 1959, considerable stunting and some definite symptoms of soybean cyst nematode damage were noted again, but the plants grew out later and had the appearance of near normal plants by harvest time. Plants in a few spots were noticeably stunted at the end of the season.

Three date-of-planting tests were included at Conran to study the effect of planting dates on soybean cyst nematode damage. Each planting included five rows replicated three times. In the first planting all but the fourth rows were treated with dibromo chloropropane at ½ gallon per acre. In the second and third plantings the first three rows were treated and the fourth and fifth left untreated. All treatments were made with a hand injector at planting time. The treated rows grew taller than the untreated ones but all plantings appeared normal except for size of plants. Harvest records are given in Table 11.

Truck Crops

Beets of the variety, Early Blood Turnip, were seeded May 4. Two rows were treated two weeks before planting with DD, eight gallons per acre and two rows were left as untreated checks. Observations June 15 indicated the treated rows had larger beets and were free from nematode damage. Root-knot nematodes were abundant on the untreated rows and the plants were stunted. The yield was almost doubled on the treated rows.

Bush beans of the variety, Top Crop, were planted May 4. Two rows were planted on rows treated with dibromo chloropropane, ½ gallon per acre, and two rows were untreated checks. By June 15 there was a noticeable difference in size and color of the plants on the treated rows. The check rows had smaller plants with lighter colored leaves than the treated plants. By July 7 the plants on treated rows appeared normal but root-knot nematode damage was severe on roots of the check and many of the plants were dying.

Table 12 gives harvest records of bush beans and beets.

Tomatoes of the varieties Stone and Fireball were planted May 7. One row of each variety was treated with DD and one row was left as a check. Harvest records are included in Table 2. Several hybrid tomato plants were tested for resistance to root-knot nematodes. These included 15 plants of each of the following: Hawaii N-11, Hawaii N-44, Mozark Anahu, Mortens hybrid, TF+Kalaki, TF+Anahu, and Fireball. These were all planted on untreated soil. Yields are recorded in Table 13.

Sweet potatoes of the varieties All Gold, Nemagold, and NC 171 were grown on rows treated with eight gallons of DD per acre and on an untreated check. The All Gold sweet potatoes on the treated rows were much smoother than those in the check and no nematodes were found in the tubers. The untreated All Gold potatoes were heavily infested with root-knot nematodes and many were very rough. No nematodes were found in the tubers of the untreated check of the varieties Nemagold and NC 171. Table 12 gives harvest records.

Carrots grown on rows treated with ½ gallon of dibromo chloropropane were larger and smoother than those in the check. The untreated check produced stunted, knotty, and deformed carrots. No harvest records were taken due to the poor stand on both the treated and the check rows.

Cucumbers of the variety, Straight Eight, were grown on rows treated with ½ gallon of dibromo chloropropane per acre and on an untreated check. The check was severely damaged by root-knot nematodes while the plants on the treated rows appeared normal. Table 12 gives harvest records.

Okra plants grown on rows treated with ½ gallon of dibromo chloropropane per acre were more vigorous and lived longer than plants on the untreated check. Plants on the check rows were smaller and many died early in the season. Table 2 gives harvest records for okra.

Three varieties of watermelons were grown on rows treated with 1/6 gallon of dibromo chloropropane per acre and on untreated checks (Table 12). Black Diamond plants lived longer on the treated rows but were so severely damaged by wilt that very few matured. The Charleston Grey showed little difference in appearance between the treated and the untreated rows.

Two varieties of muskmelons were included in the tests at Diehlstadt. The variety Hale's Jumbo was severely injured by nematodes, reducing production to about 1/3 of normal.

The variety Market Queen was only slightly reduced in yield by nematodes on the roots.

Table 1. Composite Results of 1959 and 1960 Tests of Materials for Spider Mite Control on Cotton.

Treatment	Dosage Lbs./Acre	No. of Tests	Percent Control After Treatment (Avg. for No. of Tests) 3 Days	10 Days	17 Days
* Trithion	.5	5	97.7	97.1	98.6 1/
Trithion	.25	5	97.5	96.6	79.2
* Ethion	.5	7	93.6	96.3	95.0
Tedion	.75	2	81.9	96.2	86.0
* Demeton (Systox)	.25	2	80.2	95.0	97.8
Delnav	1.00	2	82.6	94.2	99.5
Tedion	.5	3	89.0	91.6	84.3
Chlorobenzilate	1.00	3	97.4	87.9	85.6
Kelthane	1.00	3	88.7	87.9	85.0
Ethion	.25	2	81.6	83.1	-
Bayer 30686	.5	1	92.6	82.1	-
SD5539	.5	2	74.5	77.3	67.3
SD5533	.5	1	74.0	57.3	22.0
Guthion	.25	1	62.4	55.9	-
Phosdrin	.2	1	70.6	55.9	-
Aramite	1.00	2	40.4	53.8	37.5
Delnav	.5	3	44.9	42.6	59.8 2/
Malathion	1.2	1	76.6	39.3	-
Genite	.5	1	76.1	21.9	-
Diazinon	.5	1	96.2	18.9	-
Sulfur Dust	30.0	1	56.5	14.8	-
Bayer 28589	.5	1	68.7	+63.8 3/	-

* Currently recommended.

1/ Avg. of 4 tests

2/ Avg. of 2 tests

3/ Per cent Increase over Initial Infestation

Table 2. Effects of Several Insecticides on Post-Treatment Bollworm Populations, Sikeston, 1960.

Treatment	Dosage Lbs./Acre	Post-Treatment Bollworm Larvae Per 10 Minutes (Time/Search): 4 Days After 1st Application: Small	Medium	Large	Total	4 Days After 2nd Application: Small	Medium	Large	Total
Sevin	1.5	.7	2.3	5.3	8.3	.3	1.3	4.0	5.6
Endrin	.3	1.0	2.0	4.0	7.0	.7	.7	5.3	6.7
SD4402	.3	.3	1.0	2.7	4.0	.0	.0	3.3	3.3
DDT	1.5	.7	.7	4.3	5.7	.0	1.3	3.3	4.6
Tox-DDT	2.0/1.0	.3	1.3	1.3	2.9	.3	.0	2.0	2.3
Check	-	2.3	2.7	6.0	11.0	1.7	2.0	8.3	12.0

Table 3. Effects of Several Insecticides on Bollworm Populations, Square Damage, and Yield of Cotton, Sikeston, 1960.

Treatment	Dosage Lbs./Acre	Bollworms/10 Min. Post-Treat Average	Percent Square Damage Post-Treat Average	Yield/Acre Seed Cotton
Sevin	1.5	6.5	9.5	1,251
Endrin	.3	6.1	5.8	1,190
SD4402	.3	3.8	3.5	1,416
DDT	1.5	4.4	4.7	1,456
Tox-DDT	2.0/1.0	3.5	5.1	1,350
Check	-	10.4	8.2	882

Table 4. Effects of Several Insecticides on Post-Treatment Bollworm Populations, Portageville, Mo. - 1960.

Treatment	Dosage Lbs./Acre	Post-Treatment Bollworm Larvae Per 10 Minutes (Time/Search) 4 Days Small	Medium	Large	Total	Average 2-4-6 Days Small	Medium	Large	Total
Sevin	1.5	.3	.3	5.8	6.4	.3	.5	4.7	5.5
Sevin	2.0	.0	.0	6.0	6.0	.0	.3	4.7	5.0
Endrin	.3	.0	.0	4.0	4.0	.1	.3	4.3	4.7
Endrin	.4	.3	.3	3.0	3.6	.2	.4	3.3	3.9
SD4402	.3	.0	.5	3.5	4.0	.0	.5	4.3	4.8
SD4402	.4	.0	.0	3.3	3.3	.1	.4	3.9	4.4
DDT	1.5	.0	.0	2.8	2.8	.0	.3	2.8	3.1
DDT	2.0	.3	.3	2.3	2.9	.1	.3	3.3	3.7
Tox-DDT	2.0/1.0	.0	.3	3.5	3.8	.0	.3	2.8	3.1
Check	-	.3	.5	11.0	11.8	.3	.8	8.3	9.4

Table 5. Thrips Control on Late Planted Cotton, Sikeston, 1960.

Criteria and Date	Treated June 4	Treated June 11	Treated June 4 & 11	Check
Thrips/25Plants				
Pre-Treat-June 4	54.0	41.4	53.0	53.6
June 6	21.2	79.6	21.2	96.4
June 8	20.2	67.8	17.6	80.6
June 10	26.0	106.2	30.0	117.6
June 13	18.2	5.0	4.8	24.8
June 15	15.8	9.2	5.8	27.8
June 17	23.4	11.6	10.0	24.0
June 20	49.6	28.6	22.0	33.2
June 28	39.8	24.0	18.0	51.4
Avg. All Counts	29.8	41.5	20.3	56.6
Plant Dry Weights Grams/25 Plants				
June 28	27.8	28.3	29.7	23.6
Plant Height (in inches)				
July 1	7.9	8.0	8.1	7.5
Squares/Plant				
July 14	3.6	3.7	3.6	3.1
Yields (Seed Cotton)				
1st Pick	1016	1095	1164	865

Table 6. Summary of European Corn Borer Population and Infestation Date; New Madrid County, 1960

Cooperator	Date Planted	Survey: Spring, Borers Per Acre, Early	Survey: Spring, Borers Per Acre, Late	Survey: Summer, Tunnels Per Acre	Survey: Summer, Borers Per Acre	Survey: Early Fall, Tunnels Per Acre	Survey: Early Fall, Borers Per Acre	Late Fall Borers Per Acre
Bader		0	-	1,000	0	11,667	4,333	0
Bell	25 Apr 60	0	-	0	0	3,667	2,667	0
Bennett	15 Apr 60	0	-	0	0	6,000	2,000	0
Blankenship	10 Apr 60	0	-	1,333	0	3,000	1,667	0
Burch	1 Apr 60	0	-	0	0	1,667	1,667	0
Chartrau	27 Apr 60	200	0	333	0	4,000	2,000	1,000
Crouthers, J. B.	Late1/	0	-	-	-	21,000	15,000	36,333
Fisher	23 Apr 60	0	-	333	0	8,333	4,333	0
Gardner	14 Apr 60	0	-	3,000	667	8,000	1,000	0
Halford	18 Apr 60	400	200	1,333	0	1,667	667	333
Hamilton	20 Apr 60	0	-	0	0	14,000	1,333	0
Hulshof	25 Apr 60	0	-	333	0	10,667	1,667	333
Jones	15 Apr 60	400	0	2,000	333	6,333	3,000	0
Keaster	20 Apr 60	0	-	0	0	2,000	667	0
LaPlant	15 Apr 60	0	-	333	333	2,000	0	0
Leirer	15 Apr 60	0	-	0	0	8,000	1,333	0
Lumsden	20 Apr 60	0	-	0	0	1,333	667	0
Mullin	15 May 60	1,000	0	0	0	76,333	23,333	20,000
Penman	15 Apr 60	0	-	333	0	8,333	7,000	0
Rogers	20 Apr 60	0	-	333	333	4,333	1,667	0
Scott, Sr.	20 Apr 60	200	0	1,667	667	8,667	2,667	0
Scott, Jr.	12 Apr 60	0	-	1,000	667	7,000	3,000	0
Taylor	16 Apr 60	0	-	2,000	333	3,000	667	0
Terry	16 Apr 60	0	-	0	0	2,667	1,333	0
Average		91.7	8.3	667	145	9,316	3,486	2,417

1/ Actual planting date not known but later than most others.

Table 7. Corn Earworm Control at Sikeston with Various Insecticides

Treatment	Technical Material (Lbs. Per Acre)	No. Ears Infested (200-Ear Sample)	Percent Infested Ears
DDT	1	2	1.0
DDT	2	5	2.5
DDT + Pylac[1]	2	2	1.0
DDT-Tox	1-2	3	1.5
DDT-Tox	2-4	4	2.0
Toxaphene	4	10	5.0
Sevin	1	2	1.0
Sevin	2	4	2.0
Sevin + Pylac[1]	2	0	0
Check	No treatment	58	29.0

1/ A spreader-sticker compound

Table 8. Effect of Various Spray Volumes and Nozzle Arrangements on Corn Earworm Control at Sikeston.

No. of Nozzles Per Row	Spray Material Per Acre (in Gal.)	No. Ears Infested (200 Ear Sample)	Percent Infested Ears
2	20	5	2.5
4	20	3	1.5
5	20	2	1.0
2	40	3	1.5
4	40	2	1.0
5	40	3	1.5
2	80	2	1.0
4	80	2	1.0
5	80	0	0
Check (No Treatment)		69	34.5

Table 9. Insect and Tunnel County, Estimate of Damage by Sorghum Midge, and Resulting Yields; Sikeston, 1960.

Treatment and Variety	Counts Per Ten Plants					Sorghum Midge Damage (Rated 0-10)	Yield (Bu. Per A.)
	European Corn Borer (Total Tunnels)	Corn Earworm		Sorghum Webworm			
		*Before Treatment	**After Treatment	*Before Treatment	**After Treatment		
Toxaphene							
Redlan	5.12	17.25	3.50	0.25	0.00	0.25	20.7
RS610	7.25	3.50	1.50	0.00	0.00	4.00	40.2
DeKalb	6.75	0.50	0.25	0.00	0.00	2.00	63.8
Endrin							
Redlan	2.50	15.50	3.00	0.00	0.25	0.00	59.6
RS610	3.25	3.50	0.75	0.00	0.00	3.50	60.0
DeKalb	4.50	1.00	0.50	0.00	0.00	1.00	80.2
Check							
Redlan	12.75	30.75	13.50	2.75	4.50	0.50	52.5
RS610	13.62	10.25	6.25	0.25	0.25	3.50	55.0
DeKalb	17.25	1.75	2.75	0.00	1.25	2.50	67.8

*Check was made of ten plants from each subplot just previous to treatment September 1, 1960

**Check was made of ten plants from each subplot ninety-six hours after treatment (September 5, 1960)

Table 10. Nematode control on cotton with soil chemicals and a resistant variety

Lbs. Seed Cotton Per Acre		Fumigant	Rate Per Acre	Method of Application
DPL15	Auburn 56			
950	1721	DD	8 gals.	Soil Chisel
1055	1617	Dibromo chloropropane	1/4 gal.	Soil Chisel
1054	1633	Dibromo chloropropane	1/2 gal.	Soil Chisel
1031	1550	Dibromo chloropropane	3/4 gal.	Soil Chisel
955	1147	Ehtylene dibromide 85%	2-1/2 gal.	Soil Chisel
1120	1459	Dibromo chloropropane	*50 Lbs. gran.	Soil Chisel
259	1444	**Niagara Nia4606	1 pint	Garden Sprinkler
613	1614	Check--no treatment		
349	1514	***Dibromo chloropropane dust		Planter Seed Box
Mo. 17-5211				
1450	1845	Dibromo chloropropane	1/2 gal.	Soil Chisel
664	1280	Check--no treatment		

*17-1/2% Dibromo chloropropane granules.
**Nia4606 at 2 lbs. per gallon at planting time.
***This treatment consisted of a mixture of the following rates of chemicals per acre:

1/4 lb. Captan 50W
1/6 lb. Terrachlor 75W
1 lb. Dieldrin 50W
4 lbs. Nemagon 50% dust.

The chemicals above were mixed together and then mixed with the cotton seed in the planter box.

Table 11. Soybean yields from three dates of planting on soil infested with soybean cyst nematodes

Date of Planting		Yield Per Acre		
		Plot 1	Plot 2	Plot 3
April 23	- Treated	17.7 bu.	19.5 bu.	19.5 bu.
	Check	16.6 bu.	15.3 bu.	15.9 bu.
June 3	- Treated	18.2 bu.	18.2 bu.	27.1 bu.
	Check	7.5 bu.	17.8 bu.	22.6 bu.
June 16	- Treated	17.4 bu.	18.7 bu.	25.5 bu.
	Check	9.8 bu.	8.9 bu.	28.2 bu.

Dibromo chloropropane was applied to the treated rows by the use of a soil injector at the time of planting.

Table 12. Results of Nematode Control Soil Treatments for Truck Crops at Diehlstadt

Crop	Variety	Treatment: Chemical	Treatment: Rate/Acre	Yield/Acre
Muskmelon	Hales Jumbo	Dibromo choropropane	1/4 gal.	22,269 lbs.
Muskmelon	Hales Jumbo	Check--no treatment		7,800 lbs.
Muskmelon	Market Queen	Dibromo chloropropane	1/4 gal.	21,996 lbs.
Muskmelon	Market Queen	Check--no treatment		20,728 lbs.
Peppers	California Wonder	DD	8 gals.	14,118 lbs.
Peppers	California Wonder	Check--no treatment		14,586 lbs.
Cabbage	All season	Dibromo chloropropane	1/2 gal.	19,266 lbs.
Cabbage	All season	Check--no treatment		17,940 lbs.
Beets	Early blood turnip	DD	8 gals.	4,095 lbs.
Beets	Early blood turnip	Check--no treatment		2,223 lbs.
Bush beans	Top Crop	Dibromo chloropropane		7,371 lbs.
Bush beans	Top Crop	Check--no treatment		2,909 lbs.
Tomatoes	Stone	DD	8 gals.	663 bu.
Tomatoes	Stone	Check--no treatment		704 bu.
Tomatoes	Fireball	DD	8 gals.	361 bu.
Tomatoes	Fireball	Check--no treatment		272 bu.
Sweet potatoes	All Gold	Check		189 bu.
Sweet potatoes	Nemagold	Check		363 bu.
Sweet potatoes	NC 171	Check		346 bu.
Sweet potatoes	All Gold	DD	8 gals.	306 bu.
Sweet potatoes	Nemagold	DD	8 gals.	389 bu.
Sweet potatoes	NC 171	DD	8 gals.	611 bu.
Cucumbers	Straight eight	Dibromo chloropropane	1/2 gal.	17,940 lbs.
Cucumbers	Straight eight	Check--no treatment		1,404 lbs.
Okra	Perkins dwarf	Dibromo chloropropane	1/2 gal.	4,758 lbs.
Okra	Perkins dwarf	Check		2,959 lbs.
Watermelons	Charleston Grey	Dibromo chloropropane	1/6 gal.	39,134 lbs.
Watermelons	Charleston Grey	Check		33,014 lbs.
Watermelons	Black Diamond	Dibromo chloropropane	1/6 gal.	2,418 lbs.
Watermelons	Black Diamond	Check--all plants dead		0
Watermelons	Seedless	Dibromo chloropropane	1/6 gal. 11 plants	344 lbs.
Watermelons	Seedless	Check	10 plants	183 lbs.

Table 13. Untreated planting of tomatoes to test for variety resistance to root-knot Nematodes

Variety	Number of Plants	Nematode damage to roots	Yield per acre
Hawaii N 11	15	Trace	1,056 bu.
Hawaii N 44	15	Trace	983 bu.
Mozark Anahu	15*	Severe	315 bu.
Mortens Hybrid	12	Severe	902 bu.
TF +Kalaki	15	Trace	912 bu.
TF +Anahu	15	Trace	1,191 bu.

These plants were started in the greenhouse and were transplanted to the field May 19. By June 15 five of the 15 plants of the variety Mozark Anahu were dead. All of the plants of the other varieties grew well and showed no signs of wilting. Observations on the condition of the plants on September 22 were:

Hawaii N 11--Large plants with green leaves at tops. These were the best looking plants of any variety.

Hawaii N 44--Very few leaves; stems and leaves diseased.

Mozark Anahu--All plants dead.

Mortens Hybrid--Large plants with very few leaves.

TF +Kalaki--Similar to Hawaii N 11.

TF +Anahu--Very few leaves; stem green.