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CONTROL of COTTON INSECTS with DUSTS and SPRAYS

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The boll weevil, **Anthonomus grandis** Boh., was more abundant and more destructive in Alabama during 1949 than in any other season during the 23 years that control experiments have been conducted. Other cotton insects were of minor importance, except in localized areas or where populations of cotton aphid, **Aphis gossypii** Glov., developed from use of calcium arsenate without an aphicide.

The previous winter was exceptionally mild, and a large population of over-wintering weevils emerged in the spring and early summer. Cloudy weather and frequent rains produced ideal conditions for multiplication of boll weevil during the cotton-growing season. Rainfall made control of insects extremely difficult in some sections. Applications of insecticides were washed off and the soil was frequently too wet to repeat applications with ground machinery before additional rainfall occurred.

This progress report gives results of control experiments with organic insecticides in 1949 and summaries of some principal results during the 3-year period, 1947-1949.

1949 EXPERIMENTS

Experiments in the control of boll weevil and other cotton pests were performed at five localities in the State, namely: Monroeville and Atmore in the southwestern section, Headland in the southeastern area, Prattville in the central area, and Tallassee in the east central part.

Dusting at Monroeville

The 1949 cotton-growing season was more nearly normal at Monroeville than in any other part of the State. Although a high population of boll weevil adults emerged from hibernation, weather was favorable during late June and early July for fruiting of cotton. As the over-wintered adults died, the infestation on cotton declined and approximately one-half bale per acre was set before serious damage occurred. However, dusting was necessary at frequent intervals between July 8 and August 17. A total of nine applications of dust was applied at the rate of approximately 12 pounds per acre to cotton on small plots. Treatments were replicated five times in randomized blocks. Infestation counts were made at approximately 5-day intervals and yield records were taken at the end of the experiment.

Summarized results of experiments at Monroeville Experiment Field are presented in Table 1. Bollworm, **Heliothis armigera** (Hbn.), cotton aphid, and red spider mites were minor factors in this experiment, except where aphids became numerous on plots dusted with calcium arsenate containing no aphicide. Satisfactory control of boll weevil was obtained with all insecticides. However, it was found necessary to increase the rate of application of organics above 10 pounds per acre in order to effect control. Gains from dusting ranged from 414 pounds per acre on the calcium arsenate plots to 1,000 pounds per acre on the areas dusted with 20 per cent toxaphene. Toxaphene, BHC-DDT, and calcium arsenate with nicotine appeared about equally effective.

It will be noted that four applications of 20 per cent toxaphene applied June 6 to 18 at the time cotton plants were just beginning to square did not increase yield of cotton.

Dusting at Headland

The season at Wiregrass Substation, Headland, was somewhat similar to that at Monroeville, except that the weevil infestation was much higher and rainfall

TABLE 1. SUMMARIZED RESULTS of COTTON-DUSTING EXPERIMENTS, FIVE REPLICATIONS, MONROEVILLE EXPERIMENT FIELD, 1949

Treatment 1/	Av. Infestation		Insects Per Sq. In		Yield Seed Cotton Per Acre	
	B. Weevil	Bollworm	Aphids	R. Spiders	Av. Yield	Gain Over Check
	Pct.	Pct.	No.	No.	Lb.	Lb.
Check	73.7	2.0	2.44	2.42	1,742	--------
20% toxaphene, early and late 2/	46.5	2.2	0.27	0.34	2,640	898
20% toxaphene, late	47.4	1.1	0.33	0.34	2,742	1,000
BHC-DDT, 3-5	49.4	1.3	0.32	1.79	2,548	806
Calcium arsenate alternated BHC-DDT	50.6	0.9	1.30	2.51	2,508	766
Calcium arsenate alternated calcium arsenate + 2% nicotine	49.0	0.7	0.95	0.66	2,631	889
Calcium arsenate	52.4	1.0	6.80	1.18	2,156	414
L. S. D., 5 per cent level					217	

1/Dusts all inert, applied approximately 12 pounds per acre: July 8, 15 (rain), 18, 23, 28; August 2, 5, 11, 17 (rain).

2/Dusted June 6, 11 (rain), 13, 18 in addition to the dates given in footnote 1.

much more frequent. Also, temperatures were lower.

The experiment was conducted on a field basis and insecticides were applied by Negro labor using mule-drawn, 2-row dusters. No personnel of the Entomology Department was stationed in the vicinity of this experiment, but trips were made at 5- to 7-day intervals to make infestation counts and give instructions on application of insecticides.

Treatments were replicated four times in a linear series to simplify the dusting procedure. Four check plots, located on either side of the experimental area, were used to estimate the theoretical yield for each plot in the area.

Almost daily rainfall made application of insecticides very difficult. A total of 11 applications of dusts was made at the rate of 10 to 15 pounds per acre between July 7 and August 16. Seven of 11 treatments were washed off by rainfall within 24 hours after application.

Summarized results of the experiment at Headland are presented in Table 2. Boll-

TABLE 2. SUMMARIZED RESULTS of COTTON-DUSTING, FOUR REPLICATIONS, NON-RANDOMIZED, WIREGRASS SUBSTATION, 1949

Treatment 1/	Boll Weevil Infestation		Bollworm Infestation		Yield Seed Cotton Per Acre		
	Dusted	Check	Dusted	Check	Dusted	Check	Gain Over Check
	Pct.	Pct.	Pct.	Pct.	Lb.	Lb.	Lb.
Calcium arsenate	74.1	87.4	2.2	2.4	1,125	597	528
BHC-DDT-inert, 3-5	48.1	88.3	0.0	2.9	1,550	448	1,102
20% toxaphene-inert	51.5	87.8	0.1	2.7	1,457	523	934

1/Dusts applied at rate of 10 to 15 pounds per acre with mule-drawn equipment as follows: July 7 (rain), 14 (rain), 18, 22 (rain), 26 (rain), 29 (rain); August 2 (rain), 5, 8 (rain), 11, 16.

worm, cotton aphid, and red spider mites were of little importance in this experiment. Where calcium arsenate was used without an aphicide, the aphid population was too low to warrant taking infestation counts. The most effective control under the condition of this experiment resulted from use of BHC-DDT mixture, with 20 per cent toxaphene second, and calcium arsenate third. This is the second consecutive year that BHC-DDT and toxaphene have been more effective against boll weevil than calcium arsenate at Headland. During both years the temperatures were mild. Insect migration was extremely heavy and frequent rainfall made it difficult to keep insecticides on the plants. These conditions were quite different from those encountered at Monroeville where temperatures were higher, and very few applications of dusts were washed off by rain.

Tractor Spraying and Dusting at Prattville

Field-scale experiments were carried on at the Murfee and Dismukes farms near Prattville to determine effectiveness of toxaphene sprays and dusts for control of cotton insects. Insecticides were applied with tractor equipment 1/ to plots approximately 1 to 3 acres in size, depending upon the length of the rows. All treatments were replicated four times. Each replicate was in a separate field.

1/Department of Agricultural Engineering cooperated in this work.

The cotton was planted following a heavy crop of winter legumes in two of the fields. Cotton in these two fields was very rank, reaching a height of 6 to 7 feet on undusted areas. The other two fields had grown no legumes and the plants were considerably smaller.

Frequent rainfall together with the heavy, sticky nature of the soil made the application of insecticides with ground machinery difficult. A total of 16 applications was made between July 1 and August 30. Seven of these applications were washed off within 24 hours by heavy rainfall. The insect population was extremely heavy, and it was necessary to shorten the interval between applications of insecticides in order to reduce infestation. Sprays were applied at the rate of 6 gallons per acre, while dusts were applied at approximately 12 pounds per acre.

Results of the tractor dusting and spraying at Murfee and Dismukes farms are presented in Table 3. The toxaphene emulsion spray and the toxaphene-DDT emulsion spray appeared to be slightly more effective than the dust in controlling boll weevil. However, the differences in yield from the three treatments were not significant. The average gains resulting from application of insecticides ranged from 1,043 pounds per acre of seed cotton on the areas dusted with toxaphene to 1,230 pounds on the plots receiving toxaphene-DDT spray.

The tractors used for applying sprays

TABLE 3. SUMMARIZED RESULTS of TRACTOR SPRAYING and DUSTING of COTTON at MURFEE and DISMUKES FARMS, 1949

Treatment 1/	Amt. Technical Per Acre	Average Infestation		Insects Per Square Inch		Yield Seed Cotton Per Acre 2/	
		Boll Weevil	Boll-worm	Aphids	Red Spiders	Av. Yield	Gain Over Check
	Lb.	Pct.	Pct.	No.	No,	Lb.	Lb.
Check	0	71.6	7.7	1.0	0.2	620	-------
Toxaphene dust	2.5 3/	42.7	0.9	0.4	0.1	1,663	1,043
Toxaphene spray	2	40.7	1.3	0.2	0.1	1,744	1,124
Toxaphene-DDT spray	2 Tox. 1 DDT	35.8	0.2	0.1	0.0	1,850	1,230
L. S. D., 5 per cent level						308	

1/Insecticides applied: July 1, 6, 11 (rain), 20 (rain), 25, 28; August 2 (rain), 3, 6, 10 (rain), 12 (rain), 13, 17 (rain), 22, 26, 30 (rain).

2/Based on undamaged rows.

3/Approximate rate; varied from 1.6 in first applications to 3 in last.

and dusts were equipped with guards developed at the Stoneville Laboratory of the U.S.D.A. Bureau of Plant Industry, Soils, and Agricultural Engineering. These guards were manufactured, installed, and adjusted by the U.S.D.A. Farm Tillage Machinery Laboratory and the Experiment Station's Department of Agricultural Engineering. However, some difficulty was encountered in the use of these guards, particularly in crossing terraces with the equipment.

Considerable damage occurred to the cotton as a result of the frequent applications of insecticides. Data showing results of this damage are presented in Table 4. It will be noted that the sprayer caused much more severe damage than the duster. The sprayer used was new equipment, which rested low on the back of the tractor. Damage was severe in cotton having very rank growth, particularly in fields East I and East II. The large number of applications was another factor in the amount of damage that occurred. However, these data emphasize the need for more suitable machinery for applying insecticides in Alabama. In many sections, well fertilized land produces a rank growth of cotton. Hilly land and terraces add to the difficulty of effective application of insecticides with ground machinery.

Dusting and Spraying at Tallassee

Failure to get a stand necessitated abandoning the field of cotton originally planted for insect-control experiments. A second planting on a smaller area was made the last week in May. This date is considered by farmers as too late to plant cotton in Alabama and expect a crop. However, the cotton grew rapidly and was not seriously infested with the boll weevil until migration began in early August. Infestation after that time was extremely heavy and the interval of application of insecticides had to be shortened to 3 days in order to control the insects. A total of 12 applications was made between August 9 and September 9.

One spray and four dust mixtures were used in the experiments. The spray was a BHC-DDT emulsifiable concentrate containing 10 per cent gamma BHC and 16.7 per cent DDT. The concentrate was diluted with water and applied with a hand-sprayer at the rate of approximately 0.36 pounds gamma and 0.6 pounds DDT per acre in 30 gallons of spray. The emulsion tended to settle out in the spray tank unless agitated continuously. Dusts were applied with hand-dusters at the rate of 10 to 15 pounds per acre per application.

Bollworm was a minor factor in this experiment and practically no red spiders

TABLE 4. EFFECT of TRACTOR DAMAGE on YIELD of SPRAYED and DUSTED COTTON, MURFEE and DISMUKES FARMS, 1949

Treatment		Yield Of Seed Cotton Per Acre					
		Dismukes	East I	East II	Church	Average	Gain Over Check
		Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Check		640	508	340	993	620	--------
Toxaphene dust	(tractor (rows	920	1,556	1,332	1,008	1,204	584
	(no tractor (damage	1,226	1,836	2,136	1,456	1,663	1,043
Toxaphene spray	(tractor (rows	737	1,088	584	844	813	193
	(no tractor (damage	1,136	2,228	1,996	1,618	1,744	1,124
Toxaphene-DDT spray	(tractor (rows	831	1,212	1,160	750	988	368
	(no tractor (damage	1,490	2,088	2,308	1,515	1,850	1,230
L. S. D., 5 per cent level						308	

were found. Near the end of the experiment, the aphid population on the calcium-arsenate plots was high and the plants lost most of the leaves early enough to reduce the yield of cotton.

Summarized results of the dusting and spraying experiment at the Station's Plant Breeding Unit, Tallassee, are presented in Table 5. These results are based on records made from the four inner rows from each plot. All insecticidal treatments reduced boll weevil infestation and increased the yield of seed cotton above that on the undusted checks. Twenty per cent toxaphene dust and BHC-DDT 3-5 dusts were the most effective treatments. Calcium arsenate dust was the least effective treatment in terms of seed cotton yield. An aphid population of over 16 insects per square inch of leaf surface developed on plants dusted with calcium arsenate (Table 5), as compared with 3 insects on the undusted checks. The leaves dropped from the aphid-infested plants and prevented many of the bolls from maturing properly, thereby reducing yield on the calcium-arsenate plots. A new material, aldrin, showed promise in the control of the boll weevil in this experiment. The infestation was lower than on the calcium-arsenate plot and no build-up in apids occurred. A gain of 1,066 pounds of seed cotton per acre resulted from the use of 2 per cent aldrin and 5 per cent DDT in an inert carrier. It is believed from this experiment that 2 per cent concentration is not quite sufficient for best results from use of aldrin.

While the BHC-DDT spray showed promise, it was not as effective as the dust. The high gallonage used in applying the material may have been a factor in the results obtained with the spray.

Airplane Dusting and Spraying

Experiments were conducted on the control of cotton insects with sprays and dusts applied by airplane at the Murfee and Dismukes farms near Prattville and on the Atmore State Prison Farm.

Prattville. In the experiment near Prattville, 20 per cent toxaphene dust, toxaphene emulsion spray, and toxaphene oil solution were applied with aerial equipment. The insecticide was applied at the rate of 2 pounds of the technical material per acre. A bi-plane was used in applying the spray, with nozzles adjusted to deliver 2 gallons of spray per acre. Dusts were also applied with a bi-plane at the rate of 10 pounds per acre.

Four applications of the insecticides were applied on a field basis between July 1 and 20, and infestation counts of insects were taken at intervals of approximately 5 days. The owner and operator of the plane left the project and went into commercial spraying in Mississippi about July 24. The project was discontinued and no picking records were made.

Average boll weevil infestations during

TABLE 5. SUMMARIZED RESULTS of COTTON DUSTING and SPRAYING, FOUR REPLICATIONS, PLANT BREEDING UNIT, TALLASSEE, 1949

Treatment 1/	Average Infestation		Aphids Per Square Inch	Yield Of Seed Cotton Per Acre	
	Boll Weevil	Bollworm		Average Yield	Gain Over Check
	Pct.	Pct.	No.	Lb.	Lb.
Check	88.6	5.87	3.12	643	--------
20% toxaphene dust	49.6	1.37	0.15	1,886	1,243
BHC-DDT spray	67.9	1.50	0.18	1,482	839
BHC-DDT, 3-5 dust	52.2	1.37	0.09	1,864	1,221
Calcium arsenate	65.4	2.37	16.16	1,120	477
2% aldrin + 5% DDT dust	62.1	1.50	0.78	1,709	1,066
L. S. D., 5 per cent level				282	

1/Insecticides applied: August 9 (rain), 13, 16, 19 (rain), 20, 23, 25, 29, 31 (rain); September 2, 7 (rain), 9.

the period of spraying are presented in Table 6. All dusts and sprays reduced the infestation of boll weevil, and sprays appeared to be equal to the dusts in weevil control.

Atmore. Seven applications of insecticides were applied with aerial equipment on the Atmore Prison Farm between July 29 and August 22. Boll weevil adults were migrating in large numbers throughout most of this period. Rates of application of insecticides and insect infestations are given in Table 7. Infestation in the area sprayed with toxaphene was slightly lower than where 20 per cent toxaphene dust and 1.5 per cent dieldrin were used. All of the insecticides reduced the boll weevil infestation well below that on the checks. Yield records were not obtained in this experiment at Atmore.

THREE-YEAR AVERAGE GAINS from DUSTING

New organic insecticides have been used experimentally in Alabama over a period of 3 years. In one series of experiments, tests were made to determine effectiveness of insecticides applied during the time the crop was being set and matured. In another series, studies were made to determine the relative effectiveness of early and late applications of dusts. Summarized data on both series are herein presented.

Dusting While Crop Was Being Set and Matured

Four insecticidal treatments have been found to be effective in control of boll weevil. Results of all experiments with four leading insecticides, Table 8, show that 20

TABLE 6. AVERAGE BOLL WEEVIL INFESTATIONS in FIELDS DUSTED and SPRAYED with AIRPLANE EQUIPMENT, MURFEE and DISMUKES FARMS, 1949

Treatment 1/	Amount Of Technical Per Acre	Infestation		
		50 A Field	Silo Cut	East Road
	Lb.	Pct.	Pct.	Pct.
Check	0	-------	55.3	57.3
Toxaphene dust	2	47.6	17.2	-------
Toxaphene-oil emulsion	2	-------	21.0	35.8
Toxaphene-oil solution	2	30.6	14.7	39.9

1/Sprays applied at rate of 2 gallons and dusts at 10 pounds per acre per application: July 1, 6, 11 (rain), 20 (rain).

TABLE 7. AVERAGE BOLL WEEVIL and BOLLWORM INFESTATIONS in FIELDS DUSTED and SPRAYED with AIRPLANE EQUIPMENT, ATMORE PRISON FARM, 1949

Treatment 1/	Amount Of Technical Per Acre	Infestation	
		Boll Weevil	Bollworm
	Lb.	Pct.	Pct.
West check	0.0	89.3	1.0
Toxaphene spray	2.0	41.5	0.5
Center check	0.0	76.3	3.0
20% toxaphene dust	2.0	52.7	0.6
1.5% dieldrin 2/	0.15	47.7	4.3
East check	0.0	81.7	1.3

1/Insecticides except dieldrin applied: July 29 (rain); August 2, 6 (rain), 11, 15, 19 (rain), 22.

2/Applied: August 6 (rain), 11, 15, 19 (rain), 22. This area had been dusted with toxaphene July 29 and August 2.

per cent toxaphene dust and BHC 3-5 mixture increased the yield of cotton approximately one-half bale per acre in a large number of experiments. Gains from alternate applications of calcium arsenate and calcium arsenate containing 2 per cent nicotine were considerably less in a smaller number of experiments. Severe damage from bollworm reduced the yield on the calcium-arsenate plots during one season. During another season, very light boll-weevil infestation occurred and the gains were small in all experiments. For these reasons, the average gains from calcium arsenate and calcium arsenate-nicotine are somewhat smaller than might be expected. Where calcium arsenate was used without an aphicide, the average gain from dusting was only 205 pounds of seed cotton per acre.

It is realized that the data in Table 8 are taken from a large number of experiments conducted under different conditions. In any exact evaluation of the results, insects present and conditions under which the experiments were conducted must be taken into account. However, the averages given in the table are indicative of yields and gains that may be expected from control of cotton insects on good land in Alabama.

Tabulated results of experiments, where the four commonly used insecticides occurred together in the same field, are presented in Table 9. With one exception gains from dusting are lower than in Table 8, which includes more tests. However, the yields in Table 9 should represent a fair measure of relative efficiency of treatments against major cotton pests under Alabama conditions during the 3-year period, 1947-1949.

TABLE 8. THREE-YEAR AVERAGE YIELD of SEED COTTON on ALL DUSTED AREAS and CORRESPONDING CHECKS, 1947-1949

Treatment	Replications	Yield Of Seed Cotton Per Acre		
		Dusted	Undusted	Gain From Dusting 1/
	No.	Lb.	Lb.	Lb.
Calcium arsenate	36	1,749	1,536	213
Calcium arsenate alternate with calcium arsenate-2% nicotine	25	2,135	1,821	314
BHC-DDT, 3-5 dust	39	2,085	1,425	660
20% toxaphene dust	73	2,103	1,349	754

1/These gains may not be strictly comparable, since all treatments did not always occur together in the same experiment.

TABLE 9. THREE-YEAR AVERAGE YIELD of SEED COTTON in ALL EXPERIMENTS WHERE FOUR INSECTICIDES OCCURRED TOGETHER in the SAME TEST, 1947-1949

Treatment	Replications	Yield Of Seed Cotton Per Acre	
		Yield	Gain Over Check
	No.	Lb.	Lb.
Check	21	1,946	------
Calcium arsenate	21	2,048	102
Calcium arsenate alternate with calcium arsenate-2% nicotine	21	2,292	346
BHC-DDT, 3-5 dust	21	2,385	439
20% toxaphene dust	21	2,459	513

Timing Applications of Dusts

For many years entomologists and farmers alike have been interested in the possibility of applying insecticides early to kill over-wintered boll weevils. In theory, the elimination of these over-wintered adults should reduce damage later in the year. In practice, profitable control of boll weevil has not resulted from use of calcium arsenate in the form of pre-square mopping and pre-square dusting.

Introduction of new organics again focused attention upon early application of insecticides. Early application on county-wide basis has been recommended in some sections of Texas. Experiments have been conducted in Alabama during the past 3 years in order to determine the effectiveness of early applications with new insecticides. In general, the procedure has been to apply three to four applications of insecticides at 5-day intervals, beginning just before the first squares are large enough for boll weevil egg punctures. This procedure should permit a maximum number

TABLE 10. EFFECT of TIME of APPLICATION of 20 PER CENT TOXAPHENE DUST on INSECT CONTROL and COTTON YIELD, FOUR to FIVE REPLICATIONS, 1947-1949.

Year	Treatment	Average Infestation		Insects Per Square Inch		Yield Of Seed Cotton Per A.	
		Boll Weevil	Boll-worm	Aphids	Red Spider	Yield	Gain
		Pct.	Pct.	No.	No.	Lb.	Lb.
1947 1/	Undusted check	48.5	12.8	7.1	3/	762	
	3 dustings, June 17-July 2 2/	45.8	18.6	7.3		629	-133
	5 dustings, July 11-August 21 2/	20.0	4.5	2.2		1,165	403
1948	Undusted check	45.8	3/	2.7	3/	1,616	
	3 dustings, June 2-12	38.8		1.7		1,609	-7
	3 dustings, June 2-12, plus 7 dustings, July 12-August 14	26.7		0.7		2,018	402
	7 dustings, July 12-August 14	24.6		0.7		2,075	459
1948	Undusted check	54.7		5.5	0.3	1,760	
	3 dustings, June 1-15, plus 7 dustings, July 7-August 12	48.9		3.0	2.9	1,892	132
	7 dustings, July 7-August 12	46.8		3.3	1.1	1,898	138
1949 4/	Undusted check	73.7	2.0	2.4	2.4	1,742	
	4 dustings, June 6-18, plus 9 dustings, July 8-August 17	46.5	2.2	0.3	0.3	2,640	898
	9 dustings, July 8-August 17	47.4	1.1	0.3	0.3	2,742	1,000

1/Population of over-wintered weevils June 14 averaged 502 per acre over the experimental areas.

2/Plus one application washed off.

3/Practically no damage.

4/Population of over-wintered weevils averaged 130 per acre over the experimental area June 6 before dusts were applied.

of over-wintered weevils to emerge and then kill the insects with insecticides before they have an opportunity to infest cotton squares.

Results of field-scale and small-plot experiments on timing of applications are presented in Table 10. No gains have resulted from the early applications in Alabama. During one season, the plots receiving three early dustings produced less cotton than undusted checks in each of four fields near Prattville. The reduction in yield resulted from bollworm coming into the area after the dusting operation had ceased. Insect predators had been destroyed by the insecticides and bollworms caused more damage on dusted than on undusted areas. In all other tests, the yields on plots treated early have been slightly but not significantly lower than those on the corresponding plots receiving no early application.

It is concluded from these experiments that insecticides applied to young cotton having a few or no squares were ineffective in increasing the yield. There is evidence that setting of bolls occurred a little earlier where the early applications were made.

SUMMARY

Gains in cotton yields resulting from dusting and spraying for control of boll weevil, **Anthonomus grandis** Boh., and other cotton pests ranged from 766 to 1,243 pounds of seed cotton per acre on well fertilized land in 1949, a season of extremely high insect populations and adverse weather conditions. Materials giving the most effective control and highest yields were: (1) 3 per cent gamma benzene hexachloride-5 per cent DDT dust, (2) 20 per cent toxaphene dust, and (3) sprays prepared from emulsifiable concentrates of toxaphene or toxaphene and DDT.

Dust containing 2 per cent aldrin and 5 per cent DDT was effective, but plots receiving this mixture yielded slightly less cotton than plots treated with toxaphene or BHC-DDT dust. A spray prepared from an emulsifiable concentrate of BHC and DDT was somewhat less effective than toxaphene sprays. Dieldrin applied as a 1.5 per cent dust showed promise against boll weevil.

Over a 3-year period, 73 replications of 20 per cent toxaphene dust resulted in an average gain of 754 pounds of seed cotton per acre over undusted cotton; 39 replications of BHC-DDT mixture resulted in a gain of 660 pounds of seed cotton per acre. Thirty-six replications of calcium arsenate without an aphicide resulted in a gain of 213 pounds of seed cotton per acre.

Three-year average results on timing of applications of insecticides on cotton resulted in yields as follows: Cotton receiving three applications before and just after squaring begins without later treatment averaged 70 pounds of seed cotton per acre less than cotton receiving no insecticide. Where three early applications were followed by an average of seven dustings during the time the crop was being set and matured, the average gain was 483 pounds of seed cotton per acre over undusted areas. Cotton receiving no early treatment, but dusted an average of seven times while the crop was being set and matured, produced 508 more pounds of seed cotton per acre than undusted areas in the same experiments.