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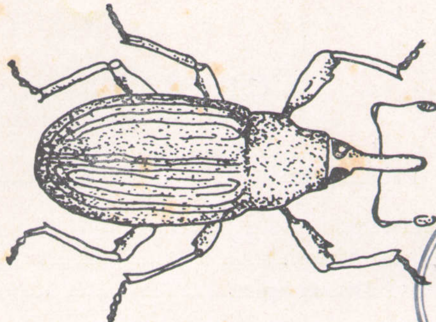
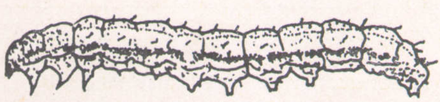


Cotton Insect Control with ULV-Applied Insecticides



AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY
E. V. Smith, *Director* Auburn, Alabama

CONTENTS

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Cotton Insect Control with ULV-Applied Insecticides

F. R. GILLILAND, JR., W. T. DUMAS,
F. S. ARANT, and H. W. IVEY[1]

ULTRA-LOW VOLUME application of chemical pesticides for insect control has received considerable attention in recent years. This technique, usually referred to as ULV, consists of applying concentrated liquid pesticides in a total spray volume of ½ gallon or less per acre. This contrasts with the more conventional low-volume application of water-diluted pesticide sprays at volumes exceeding ½ gallon per acre.

Messenger *(7)* and Skoog et al. *(11)* conducted the earliest work with ULV application of pesticides. These workers achieved control of several species of grasshoppers on western grasslands with aerial sprays of a chlorinated hydrocarbon insecticide applied at 1 pint per acre. Messenger *(8)* reported good control of the cereal leaf beetle (*Oulema melanopus* (L.)) by aerial application of undiluted technical malathion at volumes of 8 and 5.3 liquid ounces per acre. In Texas, Burgess *(3)* achieved effective control of the boll weevil (*Anthonomus grandis* Boheman) using undiluted technical malathion at rates of 9, 13.5, and 18 fluid ounces per acre. Cleveland et al. *(4)* reported that aerial applications of undiluted technical malathion at 8, 12, and 16 fluid ounces per acre were as effective against the boll weevil as methyl parathion applied at 0.4 pound per acre in 2 gallons of water. In Texas, ULV malathion was used effectively in large scale boll weevil diapause control programs in 1964, 1965, 1966, and 1967 *(1,2,10)*. Nemec and Adkisson *(9)* found that ULV sprays of certain insecticides were as effective as conventional water emulsion sprays in

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[1] Respectively, Associate Professor, Department of Zoology-Entomology; Associate Professor, Department of Agricultural Engineering; Professor and Head, Department of Zoology-Entomology; and Assistant Superintendent, Wiregrass Substation.

laboratory tests for controlling the bollworm (*Heliothis zea* (Boddie)) and the tobacco budworm (*H. virescens* (F.)). They concluded that any insecticide that was effective for boll weevil when applied as a water emulsion spray could also be used as a ULV spray without a loss of efficiency.

Prompted by these reports of the successful use of ULV sprays, tests were conducted in Alabama during 1966, 1967, 1968, and 1969 to determine the effectiveness of ULV-applied chemicals in controlling cotton insect pests. Both ground and aerial ULV applications were tested.

GENERAL PROCEDURES

Tests to evaluate the ULV application technique and the effectiveness of various ULV-applied insecticides were conducted at three locations in Alabama during 1966-1969. Tests with ULV sprays applied by ground-operated equipment were conducted at the Agricultural Engineering Research Unit near Marvyn, Alabama, in 1966, 1967, 1968, and 1969, and on the Baxter Farm near Headland, Alabama, in 1967. Also in 1967, a test to evaluate aerially applied ULV sprays was conducted on the Knouff and Suggs farms near Town Creek, Alabama.

Criteria used for assessing the results of each experiment included boll weevil and bollworm control and the yield of cotton from each test plot. Boll weevil control in the various treatment plots was determined by collecting samples of cotton squares (flower buds) from each plot and calculating the percentage with oviposition punctures. Bollworm infestations were determined by several methods: (1) percentage of plant terminals containing live bollworms; (2) percentage bollworm-damaged squares; (3) percentage bollworm-damaged bolls; and (4) number of bollworm eggs per 100 plant terminals. All or some of these sampling techniques were used to determine bollworm infestations in each experiment. Yield data were collected from each treatment plot by mechanically harvesting the center four or eight rows. These samples were weighed and the data converted to pounds of seed cotton per acre. Data were analyzed using Duncan's Multiple Range Test, and only those differences showing significance at the 5 per cent level are reported as true differences.

Rainfall records were maintained at each test location. These data are presented in Appendix Tables 1-5.

1966 EXPERIMENT

Methods and Materials

This test, conducted at the Agricultural Engineering Research Unit, consisted of insecticidal treatments and an untreated check, Table 1. Five different insecticidal formulations were applied as ULV sprays with a John Blue Low Volume Sprayer mounted on a high clearance spray machine. The ULV sprayer was adjusted to spray an 8-row swath. For comparative purposes, one duplicate ULV treatment (malathion) was applied with a Hahn ULV Kit that also sprayed an 8-row swath. A water emulsion spray treatment, applied by a high clearance sprayer at the conventional rate of 5 gallons per acre, was included in the test as a standard. Each test material was applied on a 4- to 6-day schedule between July 20 and September 2.

The test plots were on solid planted Auburn 56 cotton. Individual plots were 16 rows wide and 164 feet long. Tiers of plots were separated by 20-foot alleys. Each treatment was replicated four times in randomized complete blocks.

Results and Discussion

All insecticidal treatments decreased boll weevil infestations below that in the untreated check. Emergence of the second generation during early August resulted in considerable increases in boll weevil damage in most plots. However, applications of Guthion + TDE and methyl trithion + TDE resulted in good boll weevil control throughout the second generation emergence period and achieved the lowest seasonal average boll weevil infestations.

Bollworm populations achieved only moderately important infestation levels during the test. Seasonal average infestation counts in all treatments were below the economic threshold for bollworm infestations; however, slightly damaging infestations did occur in the malathion treatments and the untreated check during mid-August. Methyl trithion + TDE and Guthion + TDE treatments resulted in the best level of bollworm control; plots treated with malathion throughout the test (Treatment No. 3) had a seasonal average infestation only slightly less than the untreated check.

Malathion + Thiodan-treated plots yielded the greatest amount of seed cotton. However, all except two of the other insecticide-treated plots yielded equal amounts. Two treatments, malathion

TABLE 1. DESCRIPTION OF TREATMENTS, LEVELS OF BOLL WEEVIL AND BOLLWORM INFESTATIONS, AND YIELD OF SEED COTTON, ULV TEST, MARVYN, ALA., 1966

Treatment	Rates[1]	Vol. applied	Boll weevil[2] ovip. punc. sq.	Live bollworms[2] 100 terminals	Yield[3]
	Lb./A.	*Oz./A.*	*Pct.*	*No.*	*Lb./A.*
Malathion + Thiodan[4]	0.5 + 0.5	16	18.1	1.8	1,840a
Guthion + TDE	0.38 + 1.13	48	6.7	0.9	1,748ab
Malathion[4]	1.2	16	23.8	3.9	1,726ab
Guthion + DDT (standard EC)	0.25 + 0.5	640	15.2	2.4	1,647ab
Malathion (Blue ULV machine)[5]	1.2	16	15.2	2.3	1,634ab
Malathion (Hahn ULV machine)[5]	1.2	16	17.0	2.4	1,552bc
Methyl trithion + TDE	0.5 + 1.0	128	7.8	0.9	1,550bc
Check	------	------	27.8	5.7	1,432c

[1] Application dates: 7/20, 7/25, 7/29, 8/3, 8/12, 8/17, 8/23, 8/29, 9/2.
[2] Seasonal averages.
[3] Means followed by same letter are not significantly different at 0.05 level.
[4] Doubled rate 8/23.
[5] Changed treatment and rate on 8/12 to Malathion + TDE @ 1.0 + 1.0 lb./A.

(Hahn machine) and methyl trithion + TDE, did not yield significantly more cotton than the check.

1967 EXPERIMENTS—HEADLAND

Methods and Materials

This test, consisting of 12 treatments, was conducted on the Baxter Farm near Headland, Alabama. Ten insecticidal materials were tested as ULV sprays and compared to a standard water emulsion spray and an untreated check, Table 2. All ULV applications were made with a John Blue Low Volume Sprayer mounted on a high clearance spray machine and adjusted to spray an 8-row swath. The standard emulsifiable concentrate formulation was applied with a high clearance sprayer at a volume of 5 gallons per acre. All applications were made on a 4- to 6-day schedule.

Treatments were replicated four times in randomized complete blocks. Twenty-foot alleys separated tiers of plots. Individual plots of solid planted cotton were 16 rows wide and 150 feet long.

Results and Discussion

Boll weevil infestations were relatively high prior to the first insecticide application, and several applications were required in most treatments to effectively decrease the infestation. Compared to the untreated check, however, all insecticidal treatments resulted in effective boll weevil control. Boll weevil infestation in the malathion treatment was lower than the infestation in the malathion + TDE treatment but not lower than the infestations on the other treatments.

Table 2 also shows average seasonal counts of live bollworms per 100 terminals in the various treatments. Bollworm populations remained relatively low throughout the test. All chemical treatments resulted in average seasonal infestations lower than that in the check. All treatments except malathion gave equally effective control with malathion slightly less effective than Monsanto CP 47114.

Seed cotton yields from all treatments except Monsanto CP 47114 were greater than yields from the check. Only EPN + methyl parathion and malathion plots yielded a greater amount of cotton than the CP 47114 plot, however.

TABLE 2. DESCRIPTION OF TREATMENTS, LEVELS OF BOLL WEEVIL AND BOLLWORM INFESTATIONS, AND YIELD OF SEED COTTON, ULV TEST, HEADLAND, ALA., 1967

Treatment	Rates[1]	Vol. applied	Boll weevil[2 3] ovip. punc. sq.	Live bollworms[2 3] 100 terminals	Yield[3]
	Lb./A.	*Oz./A.*	*Pct.*	*No.*	*Lb./A.*
Malathion	1.2	16	12.2a	4.5b	1,489a
Methyl parathion	1.0	16	13.4ab	3.5ab	1,354ab
Guthion + DDT	0.125 + 1.0	51	15.0ab	3.9ab	1,327ab
Toxaphene + DDT	2.5 + 1.25	64	16.1ab	2.0ab	1,381ab
Guthion + DDT (standard EC)	0.25 + 1.0	640	16.2ab	3.6ab	1,354ab
EPN + methyl parathion	0.5 + 0.25	16	16.6ab	2.3ab	1,543a
Monsanto CP 47114	1.0	16	16.7ab	1.2a	1,191bc
Azodrin	0.6	16	17.0ab	2.5ab	1,408ab
Methyl trithion + TDE	0.75 + 1.0	64	17.4ab	3.3ab	1,435ab
Malathion + DDT	0.5 + 1.0	32	18.2ab	3.2ab	1,327ab
Malathion + TDE	0.5 + 1.0	32	20.3b	3.1ab	1,327ab
Check	----------	----	42.0c	7.4c	1,026c

[1] Application dates: 6/20, 6/28, 6/30, 7/7, 7/12, 7/17, 7/21, 7/26, 7/31, 8/4, 8/12, 8/16, 8/25, 8/30, 9/5.
[2] Seasonal averages.
[3] Means followed by the same letter are not significantly different at the 0.05 level.

1967 EXPERIMENTS—MARVYN

Methods and Materials

Six different insecticidal materials were tested as ULV sprays in this experiment conducted at the Agricultural Engineering Research Unit near Marvyn, Alabama, Table 3. Other treatments in the test included a standard water emulsion spray and an untreated check. All ULV materials were applied with a John Blue Low Volume Sprayer; for comparison, one material, malathion, also was applied with a Hahn ULV Kit. The water emulsion spray was applied at a rate of 5 gallons of total spray per acre with a high clearance sprayer. Both ULV and EC applications were applied on 8-row swaths at 4- to 6-day intervals.

Sixteen-row by 100-foot plots of solid planted Auburn 56 cotton were used for each test treatment. Treatments were replicated four times in randomized complete blocks. Tiers of plots were separated by 20-foot alleys.

Results and Discussion

Infestation counts made in the check plots indicate the heavy boll weevil pressure encountered during this test. However, all insecticide treatments gave effective weevil control; no differences in seasonal mean infestations of the different insecticide treatments were indicated by statistical analysis. However, infestation counts in the plots treated with ULV toxaphene + DDT + methyl parathion tended to be lower than the means for most other treatments. These differences were not so noticeable during July when the first generation was most prevalent. However, emergence of the second boll weevil generation during early August magnified the slight population differences present during July.

Bollworms were of much less consequence than boll weevils in this test. Counts of live bollworms and bollworm-damaged squares indicate the low infestations. Infestations increased during mid- to late August. Compared to the check, all insecticide-treated plots had lower infestations. Although several other insecticide treatments gave equal bollworm control, ULV toxaphene + DDT + methyl parathion appeared to achieve the best level of control.

Statistical analysis of the data showed that all insecticidal treatments except Malathion + Thiodan had yields equal to the top

TABLE 3. DESCRIPTION OF TREATMENTS, LEVELS OF BOLL WEEVIL AND BOLLWORM INFESTATIONS, AND YIELD OF SEED COTTON, ULV TEST, MARVYN, ALA., 1967

Treatment	Rates[1]	Vol. applied	Boll weevil[2 3] ovip. punc. sq.	Live bollworms[2 3] 100 terminals	Bollworm[2 3] damaged sq.	Yield[3]
	Lb./A.	*Oz./A.*	*Pct.*	*No.*	*Pct.*	*Lb./A.*
Toxaphene + DDT + methyl parathion	2.5 + 1.0 + 0.25	64	12.5a	0.50ab	0.67a	2,045ab
Malathion + Thiodan	1.0 + 0.5	32	18.5a	0.33a	1.67ab	1,907b
ME Guthion + DDT (standard EC)	0.25 + 1.0	640	21.2a	0.58ab	2.75ab	2,322a
Guthion + DDT ULV	0.125 + 1.0	51	22.6a	0.42a	1.58ab	2,274a
Malathion (Blue ULV machine)	1.2	16	22.6a	1.33bc	3.67b	2,118ab
Malathion (Hahn ULV machine)	1.2	16	23.0a	1.67c	3.58b	2,177ab
Methyl trithion + TDE	0.5 + 1.0	64	23.5a	0.83abc	3.25b	2,003ab
Check			66.0b	3.50d	11.00c	1,501c

[1] Application dates: 7/11, 7/17, 7/21, 7/26, 7/31, 8/9, 8/14, 8/18, 8/22, 8/29, 9/1.
[2] Seasonal averages.
[3] Means followed by same letter are not significantly different at 0.05 level.

yielding treatment (Guthion + DDT EC). All insecticidal treatments had yields greater than the untreated check.

1967 EXPERIMENTS—TOWN CREEK

Methods and Materials

This test, designed to evaluate aerial ULV sprays, included seven ULV formulations, an aerially applied water emulsion spray, and an untreated check, Table 4. None of the treatments were replicated. Plot size ranged from 8-9 acres for the insecticide-treated plots to 3 acres for the check. All cotton in the test was contiguous and was planted in a 2-1 skip-row pattern.

A Piper PA-18, fitted with a belly tank, was used for all insecticide applications. Applications were made at an airspeed of approximately 80 m.p.h. and a height of 8 feet, delivering an effective swath of 50 feet. Disc-type nozzles with changeable orifice discs were used for application of the standard water emulsion spray. ULV applications were made with flat fan nozzles. Calibration for the different ULV materials was accomplished by varying the size and number of nozzles. Nozzles were equipped with diaphragm check valves for rapid cutoff, and were directed 30° forward into the airstream. Boom pressure for all applications was maintained at 40 p.s.i. The conventional spraying system was used to apply the water emulsion spray but was modified for ULV applications *(6)*.

The major components of the ULV system consisted of a 7.5-gallon paint pressure tank, a 20-pound CO_2 bottle, and a liquid supply line, Figure 1. The dimensions of the paint pressure tank allowed a 5-gallon can of the test insecticide to be placed inside the pressure tank. Attached to the underside of the tank lid was a length of 3/8-inch ID pipe. The location of the pipe attachment was such that the pipe could be inserted through the pouring spout in the top of the insecticide can. When the pressure tank lid was secured into place, the bottom of the pipe was approximately 1/4-inch from the bottom of the insecticide can. To prevent stoppage of the system from any particles collected at the bottom of the can, the pipe was threaded and a 50-mesh nozzle strainer was inserted into the pipe and secured by a nozzle cap. A brass tee fitting was attached to an opening in the tank lid and fitted with a pressure gauge and relief valve. Pressure was supplied to the system by CO_2. A pressure regulator on the CO_2

TABLE 4. DESCRIPTION OF TREATMENTS AND LEVELS OF BOLL WEEVIL AND BOLLWORM INFESTATIONS, ULV TEST, TOWN CREEK, ALA., 1967

Treatment	Rates[1]	Vol. applied	Boll weevil[2] ovip. punc. sq.	Bollworm eggs[2] 100 terminals	Live bollworms[2] 100 terminals	Bollworm[2] damaged sq.
	Lb./A.	*Oz./A.*	*Pct.*	*No.*	*No.*	*Pct.*
Malathion	1.2	16	4.6	2.3	2.2	6.0
Malathion + DDT[3]	0.5 + 1.0	32	4.6	1.9	0.7	3.0
Toxaphene + DDT	2.5 + 1.25	64	5.1	2.2	0.5	3.1
EPN + methyl parathion[4]	0.5 + 0.25	16	3.5	2.1	1.3	3.6
ME Guthion + DDT (ULV)	0.25 + 1.0	42	6.3	3.0	1.6	4.5
Azodrin	0.6	16	4.2	2.3	1.4	3.3
Malathion + Sevin	0.75 + 1.5	64	5.0	1.8	0.9	5.6
ME Guthion + DDT (EC)	0.25 + 1.0	256	3.6	2.3	0.8	3.9
Check	----	----	6.5	4.6	3.3	11.8

[1] Application dates: 7/20, 7/25, 7/30, 8/4, 8/9, 8/14, 8/20, 8/24, 8/29, 9/5, 9/10, 9/15, 9/20.
[2] Seasonal averages.
[3] First two applications of this material were made with 42 oz. of 1.5 + 3.0 lb./gal. formulation.
[4] Application of this material was not made on 8/9.

FIG. 1. Major components of the aerial ULV system, including pressure tank, CO_2 bottle, and liquid-supply line.

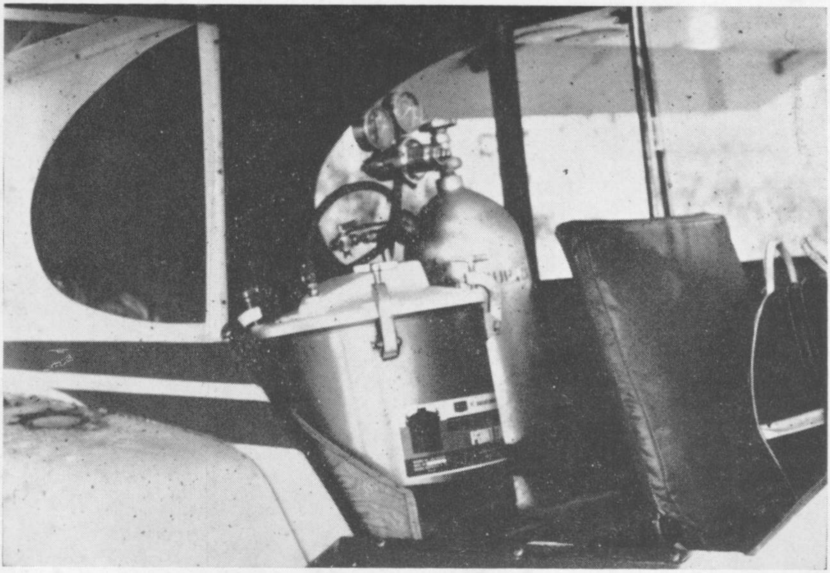

FIG. 2. ULV system in place in rear seat of airplane.

bottle permitted boom pressure to be set as desired. Pressure gauges attached to the regulator indicated boom pressure and residual pressure in the CO_2 bottle. Pressure was delivered to the pressure tank by a 3/8-inch high pressure neoprene hose connected to a fitting on the tank lid.

A liquid supply line, leading from the pressure tank to the regular aircraft spray boom, consisted partially of neoprene hose and partially of copper tubing. The hose section of the line was attached to the pressure tank lid to provide flexibility so that the lid could be easily manipulated during removal. The liquid supply line was routed through the cockpit and out the side window of the aircraft to the boom. A manual on-off valve was inserted in the supply line near the pilot's seat to allow him to control liquid flow to the boom. The CO_2 bottle and paint pressure tank were secured into a wooden frame by heavy web belts. The frame, containing the bottle and tank, was placed in the rear seat of the aircraft and secured by additional belts, Figure 2.

A positive cutoff valve was installed between the spring-loaded on-off or bypass valve and the spray boom. Closing the cutoff valve prevented reverse pressure from the CO_2 charged liquid in the boom from opening the bypass valve and flowing under pressure into the regular spray tank.

The ULV apparatus permitted rapid changes from one test material to another. To change materials, it was only necessary to remove the pressure tank lid, replace insecticide can A with can B, replace the tank lid, and repressurize the system. With this equipment, it was possible to complete all seven ULV applications within 2 hours.

Standard boll weevil and bollworm infestation records were maintained from each plot. Sampling usually was conducted on the day prior to insecticide application. Applications were made on a 4- to 6-day schedule. Yield records could not be collected because freezing temperatures almost completely destroyed the crop before it was mature and ready to harvest.

Results and Discussion

Boll weevil populations remained low throughout the duration of the test. Because of the scarcity of weevils, accurate evaluation of boll weevil control by the various test materials was impossible.

Counts of bollworm eggs in the different treatment plots are shown in Table 4. Seasonal average counts of eggs in all chemically treated plots were below that in the check. All ULV treatment plots except Guthion + DDT had fewer eggs (seasonal average) than the plots treated with the conventionally-applied EC material. The differences among all treated plots were slight, indicating little difference in effectiveness.

Counts of live bollworms also reflect the relatively light bollworm pressure occurring in the test. ULV toxaphene + DDT applications resulted in the lowest bollworm count; however, most of the other test plots had only slightly higher counts.

Records of bollworm-damaged squares probably give the most accurate estimation of material effectiveness. From mid-August until the end of the test these counts showed relatively consistent increases in bollworm damage. All chemicals tested resulted in less damage than that found in the check. Plots treated with ULV malathion + DDT had the least damage; however, once again, several other materials were almost equally effective.

1968 EXPERIMENT

Methods and Materials

Six insecticides were tested as ULV sprays and compared to a standard water emulsion spray and an untreated check in this test, conducted near Marvyn, Table 5. All ULV sprays were applied with a John Blue Low Volume Sprayer adjusted to cover an 8-row swath. The water emulsion standard was applied at 5 gallons per acre with a high clearance sprayer. All applications were made on a 4- to 6-day schedule.

Each treatment was replicated four times in a randomized complete block design. A block of Auburn 56 cotton was separated into tiers of plots by 20-foot alleys. Individual plots were 16 rows wide and 100 feet long.

Results and Discussion

Boll weevil infestations at the test site were relatively heavy throughout the growing season. ULV applications of toxaphene + DDT + methyl parathion resulted in better boll weevil control than the two treatments containing malathion. Plots treated with all other test materials except the two containing malathion, had seasonal mean infestations equal to the toxaphene + DDT + methyl parathion treatment. All chemical treatment means were lower than that for the untreated check.

TABLE 5. DESCRIPTION OF TREATMENTS, LEVELS OF BOLL WEEVIL AND BOLLWORM INFESTATIONS, AND YIELD OF SEED COTTON, ULV TEST, MARVYN, ALA., 1968

Treatment	Rates[1]	Vol. applied	Boll weevil[2,3] ovip. punc. sq.	Live bollworms[2,3] 100 terminals	Bollworm[2,3] damaged sq.	Bollworm[2,3] damaged bolls	Yield[3]
	Lb./A.	*Oz./A.*	*Pct.*	*No.*	*Pct.*	*Pct.*	*Lb./A.*
Toxaphene + DDT + methyl parathion	2.5 + 1.0 + 0.25	64	13.4a	0.57a	0.6a	0.8a	1,459a
Monsanto CP 47114	1.0	24	20.4ab	0.43a	0.2a	0.8a	1,468a
Toxaphene + DDT (ULV)	0.25 + 1.0	43	21.0ab	0.29a	0.8a	0.6a	1,509a
ME Guthion + DDT (ULV)	0.25 + 1.0	43	23.0abc	0.57a	0.2a	1.2a	1,479a
ME Guthion + DDT (standard EC)	0.25 + 1.0	640	23.2abc	0.29a	0.4a	1.0a	1,480a
Malathion + methyl parathion	1.1 + 0.6	24	30.0bc	0.29a	0.2a	1.2a	1,476a
Malathion + DDT	0.5 + 1.0	32	32.7c	0.14a	0.6a	0.8a	1,459a
Check	----------------	----	59.4d	3.86b	7.2b	9.2b	1,036b

[1] Application dates: 7/12, 7/17, 7/22, 7/26, 7/31, 8/5, 8/9, 8/14, 8/16.
[2] Seasonal averages.
[3] Means followed by the same letter are not significantly different at the 0.05 level.

Bollworms were not a problem at any time during the test. Populations were too low to evaluate the test materials properly, but all chemical treatments resulted in seasonal mean infestations and damage levels lower than the untreated check.

Yield data indicate the lack of real differences in insect control by any of the chemical treatments. All chemically-treated plots yielded more cotton than the untreated check.

1969 EXPERIMENT

Methods and Materials

This test compared ULV applications of 5 insecticide formulations with a standard water emulsion spray and an untreated check, Table 6. All ULV materials were applied with a John Blue Low Volume Sprayer; for comparative purposes one material, Guthion + DDT, was also applied with a Span Spray Row Crop Sprayer. The standard water emulsion spray was applied with a high clearance sprayer at 5 gallons of total spray per acre. All insecticide applications were made on a 4- to 6-day schedule.

The test plots were planted with Auburn 56 cotton. Individual plots were 16 rows wide and 100 feet long. All treatments were replicated four times in randomized complete blocks separated by 20-foot alleys.

Results and Discussion

All insecticidal materials tested resulted in effective boll weevil control. Only slight differences were present in the seasonal mean infestations in the chemically-treated plots, but all were better than the untreated check. The effectiveness of the different insecticides was especially noticeable during the period of emergence of the second generation early in August. Despite a large increase in the boll weevil population in the check plots, only relatively low populations were observed in the insecticide-treated plots during this time.

Bollworm infestations in the test area were the highest in recent years. Especially heavy infestations occurred during the latter part of August. Data for the three criteria used to evaluate the effectiveness of the test materials for bollworm control indicate little differences among any of the insecticidal treatments. All treatments gave equal control and all were better than the untreated check.

The severity of the bollworm infestation is manifested in the

TABLE 6. DESCRIPTION OF TREATMENTS, LEVELS OF BOLL WEEVIL AND BOLLWORM INFESTATIONS, AND YIELD OF SEED COTTON, ULV TEST, MARVYN, ALA., 1969

Treatment	Rates[1]	Vol. applied	Boll weevil[2 3] inf. squares	Live bollworms[2 3] 100 terminals	Bollworm[2 3] damaged sq.	Bollworm[2 3] damaged bolls	Yield[3]
	Lb./A.	*Oz./A.*	*Pct.*	*No.*	*Pct.*	*Pct.*	*Lb./A.*
Malathion + methyl parathion	1.5 + 0.75	32	9.4a	3.8a	5.3a	6.6a	2,300a
Bay 93820	0.75	24	10.2a	2.9a	5.2a	6.0a	2,127a
Azodrin	0.625	16	11.1a	3.6a	5.9a	6.1a	2,019a
ME Guthion + DDT (Span Spray machine)	0.25 + 1.0	59	13.1a	6.2a	6.4a	8.5a	2,103a
ME Guthion + DDT (Blue ULV machine)	0.25 + 1.0	59	12.9a	7.1a	9.3a	9.4a	1,846a
Toxaphene + DDT + methyl parathion	2.0 + 1.0 + 0.5	64	11.1a	4.4a	5.4a	7.6a	2,316a
ME Guthion + DDT (standard EC)	0.25 + 1.0	640	10.1a	5.4a	7.1a	7.0a	2,097a
Check	----	----	45.1b	22.6b	54.5b	29.9b	1,206b

[1] Application dates: 7/9, 7/14, 7/18, 7/23, 7/28, 8/1, 8/6, 8/11, 8/15, 8/20, 8/25, 8/29.
[2] Seasonal averages.
[3] Means followed by the same letter are not significantly different at the 0.05 level.

yield data. Plots of all insecticidal treatments had equal yields, and the check plots yielded less cotton than all chemical treatment plots.

GENERAL DISCUSSION AND CONCLUSIONS

This series of experiments clearly indicates that ULV application of insecticides is an effective method of achieving cotton insect control. In each of these tests, ULV-applied chemicals achieved levels of boll weevil and bollworm control equal to or better than that achieved by the more conventional method of water emulsion sprays. Also, it has been reported *(5)* that ULV sprays offer several advantages over water emulsion sprays. Since the volume of total spray applied is considerably less with ULV-applied sprays, less time is consumed by the applicator in refilling the spray apparatus. This advantage is most evident with aerial ULV sprays. In addition, ULV-applied insecticides have more residual toxicity than water-diluted sprays *(9)* and are more resistant to "wash-off" from rainfall (Gilliland and Dumas – unpublished data). Thus it is evident that the ULV method of insecticide application offers an effective alternative to the more conventional water emulsion application methods.

It should be noted that many of the insecticides included in these tests have not been registered for ULV application. To date, the only chemicals cleared for ULV usage are malathion, malathion + DDT, Guthion, Guthion + DDT, and toxaphene + DDT.

Despite promising results with ULV sprays, many problems are yet to be solved, especially in regard to application of ULV insecticides with ground-operated equipment. Calibration, distribution, flow rate, drift, and safety are some of the more serious problems encountered with most of the ULV ground sprayers.

The physical properties of each insecticide formulation are different and flow rates are not the same; therefore, calibration must be done with the insecticide itself. Flow rates often are so low that the volume of spray caught for measurement in the normally short period of calibration time is so small that inaccurate measurement and improper calibration often result. Low flow rates and the small-orifice spray nozzles usually required often result in frequent interruptions of liquid flow (nozzle stoppage). Because of the low flow rate, the operator frequently has difficulty detecting the stoppage.

Distribution studies have indicated that it is extremely difficult to obtain a uniform distribution pattern across the spray swath. This difficulty is encountered both with multirow, mist-blower type sprayers and those with a single spray orifice for each row in the spray swath.

Special safety precautions must be exercised when applying concentrated ULV insecticides. The potential hazards to the operator during normal operations of calibration, nozzle cleaning, insecticide transfer, and sprayer operation are greater because of the greater concentration of toxic material per unit of volume in ULV formulations as compared to water emulsion sprays.

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APPENDIX

APPENDIX TABLE 1. RAINFALL NEAR LOCATION OF 1967 ULV TEST, HEADLAND

Date	Amount	Date	Amount
	In.		*In.*
June 2	0.92	July 24	0.02
3	1.25	25	0.40
4	0.23	26	0.63
5	1.04	30	0.67
6	0.61	Aug. 2	0.03
13	0.18	9	0.20
16	0.02	20	0.20
19	0.36	21	0.33
21	0.10	22	0.35
23	0.19	23	2.15
26	0.07	24	0.58
27	1.30	25	0.10
29	0.12	27	0.06
July 1	0.12	28	0.23
2	0.61	29	0.11
3	1.59	Sept. 2	0.60
7	0.02	7	0.33
14	0.03	8	0.10
15	0.10	9	2.33
18	0.22	12	0.30
20	0.88	26	0.02
21	0.11	28	0.07

APPENDIX TABLE 2. RAINFALL NEAR 1967 ULV TEST, MARVYN

Date	Amount	Date	Amount
	In.		*In.*
June 1	0.13	July 8	2.29
2	1.86	14	0.72
4	2.16	24	0.72
20	0.61	25	0.61
22	0.50	30	1.05
23	1.00	Aug. 7	0.14
25	0.88	11	1.16
26	0.38	21	0.10
27	0.07	22	0.30
29	0.30	23	0.54
30	0.45	24	0.41
July 1	0.60	25	1.22
3	1.71	28	0.13
7	1.31	Sept. 4	2.65

APPENDIX TABLE 3. RAINFALL AT SITE OF 1967 ULV TEST, TOWN CREEK

Date	Amount	Date	Amount
	In.		In.
July 28	1.00	Aug. 17	0.11
29	0.12	19	2.20
Aug. 1	1.38	20	0.10
2	0.08	26	0.05
3	0.04	27	2.49
4	0.53	Sept. 4	0.19
8	0.40	9	1.11
9	0.60	11	1.53
10	2.33		

APPENDIX TABLE 4. RAINFALL AT SITE OF 1968 ULV TEST, MARVYN

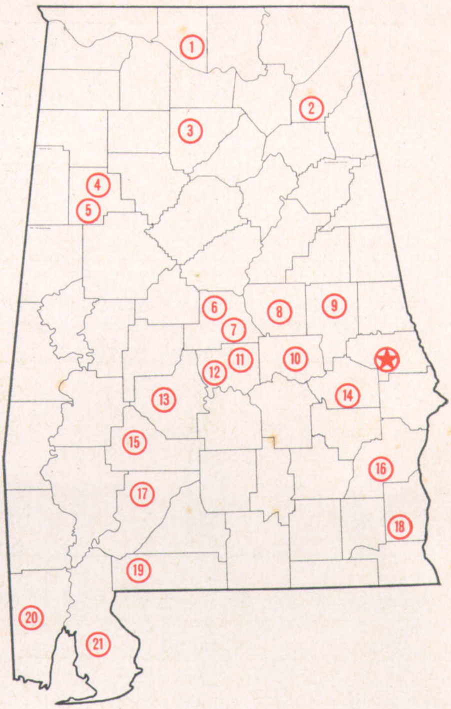
Date	Amount	Date	Amount
	In.		In.
July 3	0.13	July 18	0.20
4	0.05	29	0.75
5	0.21	Aug. 3	0.05
8	0.25	6	0.12
9	0.32	10	0.35
12	0.33	14	0.86
13	0.78	15	0.32

APPENDIX TABLE 5. RAINFALL AT SITE OF 1969 ULV TEST, MARVYN

Date	Amount	Date	Amount
	In.		In.
July 12	0.45	Aug. 15	0.93
13	0.25	17	0.17
16	0.50	18	0.32
17	0.60	19	0.12
19	0.15	21	0.30
24	1.27	22	0.53
26	0.36	23	0.07
27	0.29	Sept. 1	1.06
Aug. 2	1.64	21	5.10
4	0.05	22	0.70
13	0.26	30	0.14

AGRICULTURAL EXPERIMENT STATION SYSTEM OF ALABAMA'S LAND-GRANT UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, livestock, forestry, and horticultural producers in each region in Alabama. Every citizen of the State has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



Research Unit Identification

★ Main Agricultural Experiment Station, Auburn.

1. Tennessee Valley Substation, Belle Mina.
2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Thorsby Foundation Seed Stocks Farm, Thorsby.
7. Chilton Area Horticulture Substation, Clanton.
8. Forestry Unit, Coosa County.
9. Piedmont Substation, Camp Hill.
10. Plant Breeding Unit, Tallassee.
11. Forestry Unit, Autauga County.
12. Prattville Experiment Field, Prattville.
13. Black Belt Substation, Marion Junction.
14. Tuskegee Experiment Field, Tuskegee.
15. Lower Coastal Plain Substation, Camden.
16. Forestry Unit, Barbour County.
17. Monroeville Experiment Field, Monroeville.
18. Wiregrass Substation, Headland.
19. Brewton Experiment Field, Brewton.
20. Ornamental Horticulture Field Station, Spring Hill.
21. Gulf Coast Substation, Fairhope.