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ANIMAL AND PLANT HEALTH INSPECTION SERVICE
PLANT PROTECTION AND QUARANTINE
WHITEVILLE METHODS DEVELOPMENT CENTER
IMPORTED FIRE ANT STATION

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1985 ANNUAL REPORT

Imported Fire Ant Station

Whiteville Methods Development Center

Plant Protection and Quarantine Programs

Animal and Plant Health Inspection Service

U. S. Department of Agriculture

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These reports were prepared for the information of the U. S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine personnel and others that are interested in imported fire ant control. Statements and observations may be based on preliminary or uncompleted experiments; therefore, the data are not ready for publication or public distribution.

Results of insecticide trials are reported here. Mention of trade names or propriety products does not constitute an endorsement or recommendation for use by the U. S. Department of Agriculture.

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SUMMARY

Aerial Application of Bait Toxicants (Page 1):

Large scale field trials involving aerial application of various bait toxicants and formulations were conducted in the Fall of 1984, Spring 1985, and to a very limited extent in the Fall of 1985. Delayed activity of Fall treatments clearly demonstrated the desirability of Spring treatments.

Evaluation of Bait Combinations (Page 10):

All possible combinations of Amdro, Affirm, and Logic were tank mixed (50:50 w/w) and applied at a bulk rate of 1.5 lbs bait/acre. No combination of baits was more effective than Amdro alone at 4 and 8 weeks after application.

Effect of Increased Rates of Application on IFA Control with Logic and Affirm (Page 13):

Increased rates of application (1.5 and 2.0 lbs bulk bait/acre) did not increase the rate or the degree of morbidity with either Logic or Affirm.

Evaluation of Potting Soil Toxicants (Page 16):

Six candidate toxicants were evaluated in 1985. Results are incomplete, but Triumph 1G demonstrated good potential for this use pattern.

Sequential Applications of Amdro and Dursban for Control of IFA in Field Grown Ornamentals (Page 21):

Results of several field trials indicated that a combination treatment of Amdro followed by Dursban 10G reduced the IFA population to an acceptable level of risk, and could be used as a quarantine treatment for field grown nursery stock.

Evaluation of Vapona-impregnated No-Pest Strips for Quarantine Treatment of Containerized Plants (Page 27):

Vapona strips were not effective in eliminating simulated IFA infestations from containerized plants.

Evaluation of CO_2 as an In-Transit Fumigant for Certification of Nursery Stock (Page 29):

CO_2 showed no potential for this use in a preliminary test.

Sweep Shank Injection of Dursban for Certification of Field Grown Nursery Stock (Page 31):

Dursban injected beneath the soil surface at 10 and 20 lbs AI/acre was investigated as a possible preplant quarantine treatment for field grown nursery stock. Both rates of application were ineffective in eliminating IFA colonies from treated aras.

Evaluation of Insecticides for Grass Sod Quarantine Treatment (Page 34):

No candidate insecticide provided a longer residual activity than the 10G Dursban standard. However, Dursban 50WP gave good control and was almost as effective as the 10G formulation.

Influence of Method of Application on Efficacy of Bait Toxicants (Page 39):

Superior control was achieved when either Amdro or Logic was applied aerial broadcast rather than as single mound treatments.

Evaluation of Pyemotes tritici for Control of IFA (Page 45):

The straw itch mite (*P. tritici*), was totally ineffective in several trials conducted in 1985.

Evaluation of GLC-684 (Page 53):

GLC-684, like other liquid mound fumigants, did not provide a high degree of colony mortality, but was effective in killing worker ants and causing colony relocation.

Evaluation of Several Non-Pesticidal Means of IFA Control (Page 61):

Several non-pesticides and unconventional treatments were evaluated. Satisfactory control was not achieved with any treatment or procedure.

Relative Toxicities of Several Insecticides to Red IFA Queens (Page 65):

The relative toxicities of several contact insecticides to RIFA queens were determined by in vitro bioassays. Triumph was the most toxic of the 5 products tested (LD50 of 1.02 ng/cm2).

PROJECT NO.: FA01G015

PROJECT TITLE: Aerial Application of Bait Toxicants

PROJECT LEADERS: Homer Collins, Dudley Adams, C. J. Mauffray, Avel Ladner and P. M. Bishop

A. Fall 1984 Tests

I. Introduction:

Six treatments (two formulations of Affirm, two formulations of Logic, Amdro and an untreated check) were evaluated at three sites in the fall 1984 series of trials (Table 1). All treatments were applied in September by the PPQ Cessna Ag-Truck equipped with the bait dispersal system developed by the PPQ Equipment Development Center in Mission, Texas.

II. Aircraft Specifications:

1. 1977 Cessna Ag-Truck
2. Delivery system--MDEC Model 01 Auger System
3. 120 mph operating speed
4. 50' altitude
5. 75' working swath (90' overall swath)
6. Operated by Tim Roland, PPQ Aircraft Operations

III. Guidance:

Aircraft guidance and swath spacings were provided by flagmen who were in radio cantact with the aircraft.

TABLE 1. Summary of Fall 1984 Field Trials with IFA Bait Toxicants.

Imported Fire Ant Station, USDA, APHIS, PPQ, Gulfport, Mississippi.

TEST SITE LOCATION	PLOT NO.	BAIT FORMULATION APPLIED	DATE APPLIED	DESIRED RATE OF APPL. (LBS./ACRE)	ACTUAL RATE OF APPL./ACRE BULK(LBS.)	AI(GMS.)	ACREAGE TREATED
	I	Amdro	09/18/84	1.0	1.0	4.0	70
Orange,	II	Logic (ECG)	09/18/84	1.0	1.2	5.5	80
	III	Logic (PGD)	09/18/84	1.0	1.0	4.5	77
Texas	IV	Affirm (A003)	09/18/84	1.0	1.0	.050	101
	V	Affirm (W0001)	09/18/84	1.0	1.0	.050	90
	VI	Untreated Chk.	-	-	-	-	-
	I	Logic (PGD)	09/20/84	1.0	1.0	4.5	137
Gulfport,	II	Amdro	09/20/84	1.0	1.0	4.0	163
	III	Affirm (W0001)	09/20/84	1.0	1.0	.050	83
Missis-	IV	Affirm (A003)	09/20/84	1.0	1.0	.050	90
sippi	V	Logic (ECG)	09/20/84	1.0	1.0	4.5	92
	VI	Untreated Chk.	-	-	-	-	-
	I	Logic (PGD)	09/25/84	1.0	1.0	4.5	162
Marianna,	II	Logic (ECG)	09/25/84	1.0	1.0	4.5	120
	III	Affirm (W0001)	09/25/84	1.0	1.0	.050	94
Florida	IV	Affirm (A003)	09/25/84	1.0	1.0	.050	97
	V	Amdro	09/25/84	1.0	1.0	4.0	50
	VI	Untreated Chk.	-	-	-	-	-

IV. Treatments Applied:

As previously mentioned, 6 treatments were evaluated in this set of trials. Some characteristics of each bait formulation are as follows:

Toxicant	Manufacturer	Inert Carrier 1/	% SBO	Bulk Density (lbs/ft3)	% AI
Amdro	Am. Cyanamid	PGD	30	20.8	.88
Affirm(A003)	Merck and Co.	PGD	30	19.4	.011
Affirm(W0001)	Merck and Co.	PGD	30	20.8	.011
Logic(ECG)	Maag	ECG	25	32.3	1.0
Logic(PGD)	Maag	PGD	30	22.2	1.0

1/ PGD = Pregelled defatted corn; ECG= Expanded Cob Grit.

V. Description of Test Sites:

Both Affirm and Logic were applied under Experimental Use Permits (618-EUP-10 and 35977-EUP-2, respectively) which restricted bait application to non-cropland. Test sites were chosen on the basis of relative fire ant populations, height of vegetation, absence of domestic animals and crops. After on-site inspections of several possible locations, the following airport properties were selected as test sites:

(1) Orange County Airport, Orange, Tx.

(2) Gulfport/Biloxi Regional Airport, Gulfport, Ms.

(3) Marianna Municipal Airport, Marianna, Fl.

Five treatment blocks approximately 100 acres in size (plus

an untreated check) were established at each airport.

VI: Procedures used to Determine Efficacy:

Efficacy was determined by procedures described elsewhere. The colony classification system described by Lofgren and Williams (1982) was used to categorize all IFA colonies and to compute population indices before and after treatment.

VII. Results and Discussion:

Good to excellent control was achieved with each treatment evaluated, but approximately 10 months was required to achieve the maximum benefit from most treatments (Table 2). The activity of Amdro appeared to be somewhat faster than other treatments (colony mortality averaged 65% six weeks after application). The long delay assiciated with this and other Fall trials clearly demonstrate the desirability of a Spring bait application.

B. Spring 1985 Test

Treatments applied, rates and dates of application, acreage treated, etc. in the Spring 1985 program are summarized in Table 3. Aircraft and dispersal equipment was the same as used in the

TABLE 2. Results of Fall 1984 Field Tests with IFA Bait Toxicants.
USDA, APHIS, PPQ Imported Fire Ant Station, Gulfport, Mississippi.

TEST SITE.	Treatments Applied: Bait Formulation: Toxicant	Carrier _1/	% AI	Rate/Acre: Bulk (Lbs)	AI (Gms)	Pretreat Population Avgs. _2/: Colonies/ Subplot	Pop. Index/ Subplot _3/	Status of IFA Population at Indicated Post-Treat Interval (Weeks) _2/: Avg % Colony Mortality (6)	(33)	(42)	Avg % Change in Pop. Index _3/ (6)	(33)	(42)	Avg % Surviving Col. with Worker Brood (6)	(33)	(42)	
Orange, Texas.	Amdro	PGD	.88	1.0	4.0	9.2	174	52	64	79	-61	-91	-91	73	8	23	
	Affirm, (W0001)	PGD	.011	1.0	.050	9.4	82	40	17	75	-82	-67	-75	0	4	85	_4/
	Affirm, (A003)	PGD	.011	1.0	.050	11.6	180	10	24	83	-79	-85	-91	0	2	53	_4/
	Logic	PGD	1.0	1.0	4.5	9.0	144	0	14	99	-60	-80	-100	0	0	0	
	Logic	ECG	1.0	1.2	5.4	7.5	145	0	10	97	-59	-76	-100	2	0	0	
	Check	-	-	-	-	8.8	128	0	0	51	+114	+101	-52	96	97	88	
Gulfport, Mississippi.	Amdro	PGD	.88	1.0	4.0	6.2	123	73	86	97	-95	-95	-96	6	17	20	
	Affirm, (A003)	PGD	.011	1.1	.055	6.2	105	29	34	65	-85	-86	-74	0	13	100	_5/
	Affirm, (W0001)	PGD	.011	1.0	.050	5.4	91	20	36	45	-82	-87	-66	0	2	73	_5/
	Logic	ECG	1.0	1.0	4.5	6.8	112	3	24	92	-73	-86	-94	0	0	30	
	Logic	PGD	1.0	1.0	4.5	5.6	100	0	54	95	-68	-93	-97	0	0	20	
	Check	-	-	-	-	4.4	82	4	4	21	+51	+35	-22	96	85	100	
Marianna, Florida.	Amdro	PGD	.88	1.0	4.0	4.4	72	71	90	80	-89	-99	-93	30	0	15	
	Affirm, (A003)	PGD	.011	1.0	.050	4.1	66	49	85	83	-91	-98	-85	0	0	50	
	Affirm (W0001)	PGD	.011	1.0	.050	4.5	80	31	74	63	-88	-96	-83	0	0	20	_5/
	Logic	ECG	1.0	1.0	4.5	6.8	148	20	25	80	-84	-85	-57	0	2	10	
	Logic	PGD	1.0	1.0	4.5	5.1	86	16	30	72	-83	-88	-82	0	0	35	_5/
	Check	-	-	-	-	5.2	-93	5	15	30	+44	+9	-32	95	100	99	

_1/ PGD = Pregelled defatted corn. ECG = Expanded cob grit.
_2/ Population parameters based on evaluations conducted in (10) 1/4-acre subplots within each treatment block.
_3/ Population index based on Lofgren scale (Lofgren and Williams, 1982. Jour. Econ. Ent. 75: 798-803.
_4/ Caste composition of surviving colonies suggests queen recovery rather than reinfestation.
_5/ Incipient colonies suggest reinfestation rather than recovery or survival of treated colonies.

(Revised July 26, 1985.)

TABLE 3 . Summary of Spring 1985 Field Trials with IFA Bait Toxicants.
Imported Fire Ant Station, USDA, APHIS, PPQ Gulfport, Mississippi.

Test Site Location	Plot No.	Bait Formulation Applied	Date Applied	Rate of Application/Acre Bulk (Lbs)	Rate of Application/Acre AI (Gms)	Acres Treated
Longview, Texas	II	Logic (85-2)	04/30/85	1.0	4.5	138
	IV	Logic (85-1)	05/01/85	1.2	5.4	173
	VII	Amdro	05/01/85	1.0	4.0	109
	VI	Untreated Chk.	-	-	-	-
Shreveport, Louisiana	I	Logic (85-1)	05/01/85	1.0	4.5	158
	II	Logic 85-2)	05/01/85	1.0	4.5	125
	III	Amdro	05/01/85	1.0	4.0	161
	IV	Affirm (S-85)	05/02/85	1.0	.050	165
	V	Affirm (S-84)	05/02/85	1.1	.055	194
	VI	Untreated Chk.	-	-	-	-
Lafayette, Louisiana	I	Logic (85-1)	05/03/85	1.0	4.5	110
	IV	Amdro	05/03/85	1.0	4.0	112
	V	Logic (85-2)	05/03/85	1.0	4.5	105
	VI	Untreated Chk.	-	-	-	-

Fall 1984 trials. Test sites were airport properties at Longview, Texas, Shreveport, Louisiana, and Lafayette, Louisiana. Plots were rated at 8 and 16 weeks posttreatment by procedures described elsewhere.

Results and Discussion

Good control was obtained with all treatments (Table 4), and confirm the results of previous findings that much more rapid effects are observed following a Spring application.

C. Fall 1985 Test

Only a very limited program was conducted in the Fall of 1985. These trials consisted of a comparison of Logic formulated on pregelled defatted corn (the standard inert carrier) versus an "oil-cake" formulation. Test plots near Monticello, Ms. and Bay City, Tx. were aeraially treated on October 3-8, 1985. A third set of plots near Franklington, La. was treated with ground equipment on October 23 (Table 5).

Evaluations of these trials will be conducted in the Spring and Summer of 1986.

Table 4. Results of the Spring 1985 Field Trials with IFA Bait Toxicants. USDA, APHIS, PPQ Imported Fire Ant Station, Gulfport, Mississippi.

Test Site Location	Toxicant	Treatments Applied 1/ Formulation	Rate/Acre Bulk (Lbs)	Rate/Acre AI (Gms)	Pretreat Population X No. Col. Per Subplot	Pretreat Population X Pop. Index	Colony Mortality (8)	Colony Mortality (16)	Results - Wks. Post-Treat 2/ % Chg. in Pretreat Pop. Index (8)	% Chg. in Pretreat Pop. Index (16)	% Surviving Col. with Worker (8)	% Surviving Col. with Brood (16)
Shreve-	Logic	85-1	1.0	4.5	6.3	111	36	99	-92	-99.7	3	0
port,	Amdro	Std.	1.0	4.0	6.4	108	97	98	-99	-99.7	0	0
	Affirm	S-84	1.1	.055	6.8	112	78	93	-97	-99.3	0	0
Louis-	Logic	85-2	1.0	4.5	8.0	149	50	88	-92	-99.0	0	0
iana	Affirm	S-85	1.0	.050	7.8	125	35	80	-87	-87.0	0	0
	Untreated	Ck	-	-	4.4	82	26	39	- 9	-26.0	97	100
Long-	Logic	85-1	1.2	5.4	6.0	100	48	95	-91	-97	2	7
view,	Logic	85-2	1.0	4.5	5.4	93	34	90	-86	-99	3	0
	Amdro	Std.	1.0	4.0	6.0	105	78	89	-91	-98	10	0
Texas	Untreated	Ck	-	-	6.2	107	40	25	-41	+ 9	73	75
Lafay-	Logic	85-1	1.0	4.5	6.6	101	85	99	-98	-99	0	10
ette,	Amdro	Std.	1.0	4.0	7.8	130	96	93	-99	-93	0	40
	Logic	85-2	1.0	4.5	12.9	167	81	67	-96	-68	3	89
Louis-	Untreated	Ck	-	-	23.7	300	18	32	+15	+28	98	100
ana												

1/ Aerial application April 30 - May 03, 1985.

2/ Population counts based on evaluations conducted in (10) 1/4-acre subplots within each treatment block. Population index based on Lofgren scale (Lofgren and Williams, 1982. Jour. Econ. Ent. 75: 798-803).

Table 5. Summary of Fall 1985 Field Trials with IFA bait toxicants.

Test site Location	Plot Number	Bait Formulation Applied	Date Applied	Rate/Acre Bulk (lbs)	Rate/Acre AI (GMS)	Acres Treated
Monticello, MS	I	Logic (PGD)	10/03/85	1.0	4.5	150
	II	Logic (oil cake)	10/03/85	1.0	4.5	150
Bay City, TX	I	Logic (oil cake)	10/08/85	1.0	4.5	150
	II	Logic (PGD)	10/08/85	1.0	4.5	150
Franklington, LA	I	Amdro	10/23/85	1.5	6.0	10
	II	Logic (oil cake)	10/23/85	1.5	6.8	10

PROJECT NO.: FA01G025

PROJECT TITLE: Evaluation of Bait Combinations

PROJECT LEADERS: H. L. Collins, D. J. Adams, P. M. Bishop, Avel Ladner, and C. J. Mauffray

Introduction:

A small field trial to evaluate various combinations of baits (i.e. "tank-mixes") was initiated.bn May 24, 1985. Since each product evaluated manifests an entirely different mode of action upon treated IFA colonies, it was not known if simultaneous application of two different baits would be more effective than each product applied separately.

Methods and Materials:

All possible combinations of Amdro, Affirm, and Logic were tank mixed (50:50 w/w) and applied at a total bulk rate of 1.5 lbs bait/acre with a tractor mounted granular applicator. Test plots (5 acres each) were located at Stennis Airport near Bay St. Louis, Mississippi. Standard evaluation procedures were conducted in three 1/4 acre subplots within each treatment plot at 4 and 8 weeks after treatment.

Results:

Excellent control was achieved with all treatments (Table 6), but no combination was more effective than Amdro alone at 4 and 8 weeks after application.

Table 6. Results with various bait combinations.

Treatment	Pretreatment Population		Status of Population at indicated post-treat interval (wks)			
	$\bar{X}$ no. colonies/ Subplot	$\bar{X}$ pop. index/ Subplot	$\bar{X}$ % Colony Mortality (4)	(8)	$\bar{X}$ % change in pretreat Pop. index (4)	(8)
Amdro	8.6	138	100	100	-100	-100
Amdro + Affirm	4.0	73	67	100	-96	-100
Amdro + Logic	7.0	106	95	100	-99	-100
Affirm	7.0	115	37	76	-90	-97
Affirm + Logic	6.0	97	34	66	-90	-95
Logic	7.0	105	16	64	-78	-93
Untreated Ck	4.6	72	7	23	+4	-11

PROJECT NO: FA01G035

PROJECT TITLE: Effect of increased rates of application on IFA Control with Logic and Affirm

PROJECT LEADERS: H. L. Collins, D. J. Adams, P. M. Bishop, Avel Ladner and C. J. Mauffray

Introduction:

Although all fire ant baits exhibit delayed activity by design, certain conditions occassionally occur in which more rapid effects would be highly desirable. An unreplicated small plot field test was conducted in order to determine if increased rates of application of Logic or Affirm would result in faster colony elernination.

Methods and Materials:

A series of 1 acre test plots located at Stennis Airport near Bay St. Louis, Mississippi was treated on June 17, 1985 with various rates of Logic and Affirm. A tractor mounted granular applicator was used to apply all treatments. Efficacy of each treatment was determined by establishing one 1/4-acre subplot within each test plot and monitoring treatment effects according to procedures described elsewhere (Harlan et al 1981, Collins 1982, Lofgren and Williams 1982). Plots were rated prior to treatment and at 2, 5, and 10 weeks after treatment.

Results:

Insufficient data (replication) and adverse weather (drouth) makes it difficult to draw firm conclusions from the results of this trial. However, indications are that increased rates of application did not increase either the rate or the degree of morbidity with either product (Table 7).

TABLE 7. Effect of increased rates of application on IFA Control with Logic and Affirm.

Bait	Rate/Acre (lbs)	Pretreatment Population		Results at indicated weeks posttreatment					
		No. Colonies	Population Index	Colony Mortality (2)	(5)	(10)	% Change in Pretreat Pop. Index (2)	(5)	(10)
Affirm (S-85)	1	7	95	43	57	100	-93	-94	-100
	1.5	4	55	25	50	100	-84	-69	-100
	2	3	50	0	66	66	-82	-96	-94
Logic (85-1)	1	5	70	0	40	100	-66	-90	-100
	1.5	6	100	66	33	83	-95	-90	-97
	2	7	115	0	100	86	-69	-100	-97
Amdro (Std)	1	4	40	100	_	_	-100	_	_
Untreated check	_	7	110	0	43	57	-33	-72	-72

PROJECT NO. FAØ2GØ15

PROJECT TITLE: Evaluation of potting soil toxicants

PROJECT LEADER: Tad Dobbs

INTRODUCTION:

Chlordane applied at a rate of 4 ozs. of 5% dust per cubic yard of potting soil was used as a quarantine treatment for containerized nursery stock until cancellation of registration in December 1979. An on-going screening program to evaluate insecticides applied as a pre-plant incorporated treatment for nursery potting soils has been conducted by this laboratory since 1974. The most efficacious treatment disclosed thus far is chlorpyrifos (Collins et al 1980). In January 1980 Dow Chemical Company obtained registration of a 5% chlorpyrifos granule which was marketed under the trade name FA-5. This product was applied at a rate of 0.5 lbs FA-5 per cubic yard of potting media. Several cases of possible FA-5 related phytotoxicity to greenhouse grown succulent plants in Central Florida prompted the registrant to withdraw this product from the market in the Fall of 1981. Registration of a second chlorpyrifos formulation (a 2.58 granule) for treatment of potting soil was obtained in July 1984 by Ford's Chemical and Service, Inc. Pasadena, Texas.

A limited number of candidate potting soil toxicants were evaluated in 1985 in an effort to expand the number of options

available to growers who ship containerized plants outside the IFA regulated area. As in previous years our efforts were impeded by the small number of candidates suitable for this use pattern.

METHODS AND MATERIALS:

Test procedures used to evaluate all candidate toxicants were as follows: Granular or dust formulations of each product tested were blended into nursery potting soil, (Baccto(R), 818 lbs per cu. yd.) at an initial rate of 10 lbs AI per three-inch acre (equivalent to 11.2 grams AI per cu. yd. of media). A portable cement mixer (2 cu. ft. capacity) was used to blend the toxicants into the potting media, and was operated for one hour per batch to insure thorough blending. Treated media was then poured into one-gallon plastic pots and weathered outdoors under natural conditions for one month prior to the first bioassay.

Bioassays were conducted in the laboratory by confining alate queens to treated soil placed in 2" x 2" plastic flower pots equipped with a Labstone(R) bottom. The labstone absorbed moisture from an underlying bed of damp peat moss. There were four replicates per treatment in each bioassay. Each pot (replicate) contained 20 cc. of treated soil and five alate queens. Queen mortality was assessed after seven days of continuous confinement to the treated soil. Treatments which

were effective at the first bioassay interval were aged and retested periodically to measure and compare residual activity with chlorpyrifos. Several granular formulations of chlorpyrifos have provided over 24 months residual activity when applied at a rate of 11.2 gms AI/cu yd of potting soil.

RESULTS AND DISCUSSION:

Only two of the products tested during 1985 gave effective control past 90 days, those being Dursban 50WP and Triumph 1G (Table 8). Results are incomplete at the present because both of these products are still being bioassayed to determine their residual activity.

Table 8. Residual Activity of Candidate Potting Soil Toxicants.

Toxicant	Mean % mortality to alate queens after 7 day exposure				
	Posttreatment interval (Months)				
	1	2	3	6	9
Triumph 1G	100	100	100	100	100
Dursban 50WP	50	66.7	100	100	100
Marshal 5G	15	15	5		
Mocap 10G	50	60	75		
Broot 15G	5	5	0		
Ficam 10G	85				
Check	15	10	5	0	

REFERENCES CITED:

Collins, H. L.,C. L. Mangum, J. G. Medley and A. W. Guenther. 1980. Evaluation of soil insecticides for quarantine treatments against imported fire ants, 1976-1979. Insecticide and Acaracide Tests. 5:209.

PROJECT NO.: FA02G025

PROJECT TITLE: Sequential Applications of Amdro and Dursban for the Control of Fire Ants in Field Grown Ornamentals

PROJECT LEADERS: Tad Dobbs and Homer L. Collins

Introduction:

One of the most pressing problems facing the federal imported fire ant quarantine program is the lack of an acceptable procedure for certification of field-grown nursery stock. Current regulations (PPQ Manual M301.81) state that balled and burlapped plants must be treated with a chlorpyrifos solution either as a dip or a pour-on or injected with EDR with a syringe. These procedures are highly incompatible with normal nursery practices due to the cost and labor involved.

The most effective treatment would he one that could be applied to plants in the field, one that is compatible with most nursery operations, relatively inexpensive and effective. Any treatment that falls short in any of the above criteria would result in reduced compliance, thereby reducing the effectiveness of the program.

The purpose of this research was to test under actual field conditions a certification procedure we felt would be acceptable to everyone involved. This procedure is based on a sequential application of Arndro followed by Dursban. It

is based on the hypothesis that Amdro would drastically reduce the population while Dursban, applied approximately 7 days later, would destroy any remaining weakened colonies and leave a residual barrier against reinfestation.

Materials and Methods:

Four separate tests were conducted in the spring, summer and fall of 1985 to evaluate this procedure. In all tests, Amdro was applied at 1.5 lb. per acre with a modified Gandy (R) applicator. Dursban 10 G was applied at 6.0 lb. AI per acre with a Skibbee spreader. In both cases, the spreaders were mounted to a Ford 1700 tractor travelling at 4 mph.

At each evaluation period, each plot was rated according to the population index system (Lofgren and Williams, 1982). In addition, 20 bait stations (peanut butter on tongue depressors) were randomly placed in each plot. Bait stations were evaluated as being either positive or negative for foraging IFA workers 1 hour after being placed on the soil surface.

Results:

Test 1: Stennis Airport, Bay St. Louis, Mississippi.
May 23, May 30, 1985.

Population Index at Indicated No. of Weeks Post-Treatment					
Treatment	Pretreat	4	8	15	19
Amdro + Dursban 10G	135	0	0	0	0
Check	71.5	76.6	43.3	48	61.6

	% of Bait Stations with Ants				
Treatment	Pretreat	4 Wks	8 Wks	15 Wks	19 Wks
Amdro + Dursban 10G	100	45	0	0	15
Check	100	45	100	95	75

Test 2: V. E. Howell Nursery, Lucedale, Mississippi.
April 11, April 17, 1985

Population Index at Indicated No. of Weeks Post-Treatment							
Treatment	Pretreat	1	8	12	16	20	24
Amdro + Dursban 10G	1802	670	10	0	4	98	350
Amdro	926	684	275	130	181	360	625
Check	807	446	305	287	349	180	593

Treatment	% of Bait Stations with Ants						
	Pretreat	1 Wk	8 Wks	12 Wks	16 Wks	20 Wks	24 Wks
Amdro + Dursban 10G	95	0	15	25	5	45	95
Amdro	95	5	100	85	95	70	100
Check	95	95	100	100	100	60	100

Test 3: Pascagoula Airport, Pascagoula, Mississippi.
August 29, September 10, 1985

Treatment	Population Index at Indicated No. of Weeks Post-Treatment		
	Pretreat	4	8
Amdro	135	43	22
Amdro + Dursban 10G	185	0	0
Dursban 10G	80	3	0
Check	115	132	110

Treatment	% of Bait Stations with Ants		
	Pretreat	4 Wks	8 Wks
Amdro	100	5	40
Amdro + Dursban 10G	100	0	0
Dursban 10G	100	0	0
Check	100	100	100

Test 4: Windmill Nursery, Folsom, Louisiana.
October 22, October 29, 1985.

Treatment	Population Index at Indicated No. of Weeks Post-Treatment	
	Pretreat	4 Wks
Amdro	250	90
Amdro + Dursban 10G	185	2
Dursban 10G	270	68
Check	385	372

Treatment	% of Bait Stations with Ants Pretreat	4 Wks
Amdro	60	30
Amdro + Dursban 10G	90	0
Dursban 10G	90	0
Check	95	70

Discussion:

Results of all tests conducted in this study indicate that the combination treatment of Amdro followed by Dursban 10G gave effective control of imported fire ants. Essentially 100% control was achieved in all trials during the period from 4 to 16 weeks post-treatment.

While it does appear that the control period will vary from site to site (possibly dependent upon local climatic conditions, time of mating flights and numerous other factors), we feel that a 4 to 16-week certification period can be achieved with this procedure.

REFERENCES CITED.

Lofgren, C. S. and D. F. Williams. 1982. Avermectin B1a, a highly potent inhibitor of reproduction by queens of the red imported fire ant. Jour. Econ Ent. 75: 798-803.

PROJECT NO.: FAØ2GØ35

PROJECT TITLE: Evaluation of Vapona-Impregnated No-Pest Strips for quarantine treatment of Containerized Plant Material

PROJECT LEADER: Tad Dobbs

Introduction:

Accidental spread of imported fire ants by means of transport in containerized plants has long been of prime concern to PPQ and State regulatory agencies. Any simple, effective treatment for the control of IFA that could be made available to nurserymen would undoubtedly reduce this risk of introduction into non-infested areas. For this purpose, we tested the feasibility of using Vapona-impregnated no-pest strips for fire ant control in containerized plants.

Materials and Methods:

Various numbers (0-5 per pot) of Vapona-impregnated strips measuring ca. 1" x 1" x 1" were placed into plastic pots containing potting media and 25 IFA workers (simulated infested containerized plant). The workers were exposed to the Vapona for 24 hours and then removed and examined for any possible effects.

Results and Discussion:

No mortality or other adverse effects were noted in any of the pots after 24 hours. As a result, no further testing of this procedure was indicated.

PROJECT NO.: FA02G045

PROJECT LEADER: Tad Dobbs

PROJECT TITLE: Evaluation of Carbon Dioxide as an In-Transit Fumigant for Certification of Nursery Stock

Introduction

Fumigation of commercial shipments of ornamental nursery plants, grass sod, etc. for the control of fire ants while in transit is a potentially effective quarantine tool. The development of an effective, nonphytotoxic fumigant would allow shipments destined for noninfested areas to be easily treated and certified. For this reason, we investigated the effectiveness of carbon dioxide as a soil fumigant for fire ants.

Materials and Methods

A mature colony of fire ants along with approximately 2 gallons of soil was placed in a 3-gallon plastic bucket. This bucket was, in turn, placed into a 20-gallon plastic trash can with a tight fitting lid. A small hole was cut in the top of the trash can lid to allow for the introduction of a hose from a carbon dioxide containing cylinder. Ants were continuously exposed to the carbon dioxide in this manner from 1 to 5 hours.

Results:

Immediately after the ants were removed from the CO_2 exposure, they appeared to be dead or moribund. In all cases, however, the ants returned to normal after 15 to 30 minutes' exposure to fresh air. Therefore, it was concluded that additional tests with CO_2 were not warranted.

Exposure Time (Hrs)	Results
1	No effect.
3	No effect.
5	No effect.

PROJECT NO.: FA02G055

PROJECT TITLE: Sweep Shank Injection of Dursban for Certification of Field Grown Nursery Stock

PROJECT LEADERS: Tad Dobbs, Dudley Adams and H. L. Collins

Introduction:

The only approved procedure for certification of field grown ornamental plants (balled and burlapped plants) is a chlorpyrifos root-dip treatment (PPQ Manual **805-25.2230**). This procedure is labor intensive, costly, and disruptive to the root system of plants grown in light sandy soils. A simple, inexpensive in-field treatment for this type of plant material is the most needed IFA quarantine treatment at the current time. Treatments for most other regulated items (i.e., grass sod and potting soil) are based on chlorpyrifos (Dursban) due to its high toxicity as a contact myrmicide as will as its residual activity compared to other available insecticides. However, chlorpyrifos photodegrades rather rapidly when surface applied. Therefore, a means of subsurface application through the use of a sweep-shank injector system was investigated as a possible means of extending the residual activity of chlorpyrifos. By extending the residual activity it would be possible to apply chlorpyrifos as an in-furror preplant treatment for field grown stock. To be successful, a minimum of 24 months of protection would he required.

Methods and Materials:

A sweep shank injector was fabricated at the Whiteville Methods Center and transported to the IFA Station for a series of trials in the spring of 1985. A sweep shank injector basically consists of 5 twelve-inch "sweep" plows modified to include a flat fan spray nozzle mounted behind each sweep, giving a total coverage of 60 inches (i.e, a 60" band) which is injected at various depths below the soil surface. In our trials the sweep shank injector was adjusted with the draft control of a farm tractor to deliver the Dursban solution at a depth of 2-4 inches.

Three 1-acre plots were disked to loosen the soil on May 1, 1985. After allowing 7 days for the ants to reacclimate and rebuild the mound structure, all colonies within a 1/4 acre subplot in each 1 acre treatment plot were enumerated and categorized according to the population index system devised by Lofgren and Williams (1982). On May 15, 1985 Dursban 4EC was injected into an entire 1-acre plot at a rate of 10 lbs AI/acre in 50 gallons of water. A second 1-acre plot was "double treated" in order to deliver 20 lbs AI/acre in 100 gallons of water. A third plot served as an untreated check. Evaluations were conducted 5, 10, and 20 weeks after treatment.

Results and Discussion:

As shown in Table 9 neither the 10 nor the 20 lb rate provided any control. GLC analyses of soil core samples 1/ collected 10 weeks after application indicated that the Dursban was concentrated at the 2-4" depth. The amount found at that depth (1.46 ppm) is approximately 5 times the LD99 for IFA workers. Apparently the ants are able to tunnel through the relatively thin Dursban layer and/or perhaps line their tunnels with soil particles from above or below the "lethal zone". No additional trials with this procedure are anticipated.

1/ GLC analysis by Jim Spence, Chemist, NMRAL, PPQ.

Table 9. Sweep Shank Injection of Dursban.

Treatment	RESULTS AT INDICATED WEEKS POSTTREAT					
	% Colony Mortality			% Change in Pretreat Pop. index		
	(5)	(10)	(20)	(5)	(10)	(20)
Dursban injection--10#AI/acre	17	0	0	-52	49	373
Dursban injection--20#AI/acre	0	0	0	31	50	447
Untreated check	21	21	0	-34	0	22

PROJECT NO.: FA02G065

PROJECT TITLE: Evaluation of Insecticides for Grass Sod Quarantine Treatments

PROJECT LEADERS: Tad Dobbs, Homer Collins, Avel Ladner, P. M. Bishop, Dudley Adams and C. J. Mauffray

INTRODUCTION:

Commercial shipments of ornamental nursery plants and grass sod were associated with accidental introduction of imported fire ants into previously noninfested areas as early as 1953 (Culpepper 1953). Due to their effectiveness and residual activity, chlorinated hydrocarbon insecticides were used as a quarantine treatment to prevent this accidental spread until the U. S. Environmental protection Agency issued a cancellation order for the use of chlordane for this purpose on March 6, 1978. Efforts by this laboratory to develop alternate treatments have indicated that chlorpyrifos applications will eliminate newly mated or alate queens (but not mature colonies) from grass sod. Registration of a 10% chlorpyrifos granule for this use pattern (4.0 to 6.0 lbs AI/acre) was obtained in July 1984 by Ford's Chemical and Service, Inc., Pasadena, Texas.

It is assumed that the greatest pest risk associated with shipment of grass sod is transport of newly mated queens that may be either on the sod surface or slightly below the surface in the initial brood chamber. This assumption is based on the fact that the likelihood of removing and shipping a mature queen is nil, since vibrations from approaching harvest machinery would cause

her to retreat deeply within the mound. Therefore, the intent and purpose of current insecticide treatments is not to eliminate mature fire ant colonies, but instead to provide mortality to newly mated queens.

Two series of field tests to evaluate several insecticide formulations were conducted in 1985.

METHODS AND MATERIALS:

Test I - Test I was initiated on May 28, 1985 on the Alboa Grass Farm near Gulfport, Mississippi. Each treatment was applied to one of seven unreplicated 10'x 50'plots which contained mature centipede sod. Granular formulations were applied with a Gandy(R) Model 605 granular applicator calibrated to deliver 5.0 lbs AI/acre. The Dursban 50W formulation was applied with a tractor mounted PTO-driven sprayer calibrated to deliver 50 gallons of finished spray per acre at 30 PSI. Six whirljet nozzles (BSS-3) spaced 20" apart on a 10'boom were utilized. Due to a breakdown in the irrigation system, the plots recieved no moisture until a substantial rain fall two weeks posttreatment. Due to the difficulty in obtaining large numbers of newly mated queens, the more easily collected unmated queens (female alates) were utilized to bioassay the effectiveness of each insecticide. The following treatments were evaluated:

INSECTICIDE	MANUFACTURER	FORMULATION	RATE/ACRE (LBS. AI)
Amaze	Mobay	5 G	5.0
Broot	Union Carbide	15 G	5.0
Dursban	Dow	50 WP	5.0
Dursban	Ford's	10 G	5.0
Marshall	FMC	5 G	5.0
Triumph	Ciba-Geigy	1 G	5.0
Untreated Ck.	-	-	-

Residual activity of each product was determined in the following manner: A wheel-type soil sampler was used to collect and composite approximately 300 soil cores (.5" x 2.0") from each plot at various intervals following treatment. Samples were passed through a 1/4" mesh sieve to remove grass, rhizomes and other debris from the soil. Each composited soil sample was then bioassayed with alate queens. Bioassays were conducted in the laboratory by confining alate queens to treated soil which was placed in 2" x 2" plastic flower pots equipped with a Labstone(R) bottom. The Labstone absorbed moisture from an underlying bed of damp peat moss, while a Fluon(R) coating and a screen mesh lid prevented the ants from escaping from the top of the open pots. Each pot (replicate) contained 20 cc. of treated soil and 5 alate queens. There were 4 replicates/treatment/sampling date. Queen mortality was assessed after 7 days continuous exposure to treated soils.

Test II - Test II was initiated on July 23, 1985 at the Pearl River Sod Farm near Wiggins, Mississippi. Test plots

were 20' x 50' and were comprised of mature centipede sod. Irrigation water was not applied, but approximately 1.0 cm of rainfall was recieved during the first 24 hrs post-treatment.

RESULTS:

Test I:

As shown in Table 10, Triumph 1G, Dursban 50W, Marshall 5G and Dursban 10G were equally effective in providing control for 30 days after treatment. No control was achieved with any treatment after 30 days.

Test II:

Dursban 10G was the most effective treatment in this series of tests (100% mortality 120 days after application), but Dursban 50WP was also highly effective for 120 days after treatment.

Table 10. Residual effectiveness of various insecticides for control of alate queens in grass sod.

Treatment	Rate/Area (lbs. AI)	X % Mortality at indicated days post-treat (7 days continuous exposure)					
		(1)	(7)	(30)	(60)	(90)	(120)
Test I (May 28, 1985)							
Dursban 10 G	5.0	85	100	100	5	---	5
Triumph 1 G	5.0	100	100	100	0	---	0
Dursban 50 W	5.0	100	90	100	0	---	33
Marshall 5 G	5.0	0	70	100	5	---	0
Broot 15 G	5.0	25	20	60	---	---	---
Amaze 5 G	5.0	45	50	40	---	---	---
Check	---	5	5	0	0	---	0
Test II (July 23, 1985)							
Dursban 10 G	5.0	---	100	100	95	96	100
Dursban 50 W	5.0	---	85	100	93	62	97
Triumph 1 G	5.0	---	100	100	0	3	0
Marshall 5 G	5.0	---	45	92	0	0	0
Amaze 5 G	5.0	---	100	85	10	0	0
Mocap 5 G	5.0	---	45	83	0	20	0
Triumph 1 G	2.0	---	85	9	42	3	3
Check	---	---	0	0	0	3	0

PROJECT NO.: FA03G015

PROJECT TITLE: Influence of Method of Application on Efficacy of Bait Toxicants

PROJECT LEADERS: H. L. Collins, D. J. Adams, Avel Ladner, C. J. Mauffray, and P. M. Bishop

Introduction:

Efficacy of several IFA bait toxicants has been established in various trials conducted by this laboratory as well as numerous other researchers. Casual observatons of several recent trials (all with non-Mirex products) have generally indicated that less control was achieved with individual mound treatments than was obtained with broadcast applications of the same product. A small field study was initiated in May 1985 to compare the results of aerial broadcast treatments with single colony treatments.

Methods and Materials:

This study was conducted in conjunction with the more extensive aerial field trials with bait toxicants detailed in previous sections of this report (see pages 4-8). Briefly, that trial involved aerial application of Logic and Amdro baits to 100-acre test plots at three sites in the spring of 1985.

The study described here involved single mound treatments

with Logic and Amdro adjacent to the aerial test plots. Both sets of plots were treated on the same date (May 1-3, 1985). Plots were located on airport properties at Shreveport, La., Longview, Tx., and Lafayette, La. Each single mound plot was 1 acre in size. All IFA colonies within the 1 acre plots were treated by hand at a rate of 4 Tbs/colony by an application team comprised of 5 individuals. A 1/4-acre efficacy plot was established in the center of each 1 acre plot. One Amdro plot and one Logic plot was located at each airport for a total of 3 replicates. All ant colonies within each efficacy plot were enumerated and categorized prior to and 8 and 16 weeks after treatment according to the population index system described by Lofgren and Williams (1982).

Results and Discussion:

Results of the single mound treatments are shown in Table 11. Colony mortality in Amdro treated plots ranged from 43 to 71% eight weeks after treatment, but had decreased greatly at all sites by 16 weeks. Logic provided 50 to 89% colony mortality at 8 weeks with an increase at 16 weeks except at Lafayette, La. which appeared to become heavily reinfested by that time.

Table 12 compares the averages for all sites and both application procedures. These results clearly indicate that

Table 11. Results with single mound treatments with Amdro and Logic baits, Spring 1985.

Test site	Treatment	Pretreat Population: No. Colonies/ Subplot	Pretreat Population: Pop. Index	Results - wks post-treat: Colony Mortality (8)	Colony Mortality (16)	% Change in Pretreat Pop. Index (8)	% Change in Pretreat Pop. Index (16)
Shreveport, LA	Amdro	7	115	43	14	-80	-31
	Logic	6	64	50	83	-84	-84
Longview, TX	Amdro	15	265	53	40	-74	-57
	Logic	8	120	50	75	-89	-86
Lafayette, LA	Amdro	7	100	71	0[1]	-75	+80[1]
	Logic	9	115	89	0[1]	-98	+9[1]
Avg.[2]	Amdro	9.6	160	56	27	-76	-44
(all sites)	Logic	7.6	100	63	79	-90	-85

1 = Apparent heavy reinfestation between 8 and 16 wk post treatment evaluation.
2 = Results from Lafayette not included in 16-wk post treatment averages.

Table 12. Influence of application procedure on efficacy of IFA treatments; aerial broadcast vs single mound treatments with Amdro and Logic baits.

	Results (Avg. for all spring '85 sites) at indicated wks post treat							
	AMDRO				LOGIC (85-1)			
	Colony mortality		Pop. index		Colony mortality		Pop. index	
Application Procedure	(8)	(16)	(8)	(16)	(8)	(16)	(8)	(16)
Aerial Broadcast	90	93	-96	-97	56	97.6	-94	-98.5
Single Mound	56	27	-76	-44	63	79	-90	-85

superior control was achieved when either bait was applied aerial broadcast rather than individually to IFA colonies. Some recently published findings of others (Apperson et al 1984), tend to support these results. Broadcast treatments afford much more uniform coverage than do single colony treatments (spot treatments), thereby eliminating the human error associated with detecting and treating all colonies (especially incipient colonies) in a given area. In addition, the extensive foraging territories of fire ants (Wilson et al 1971) may contribute to more efficient bait harvest and recruitment of additional workers when uniform broadcast applications are used rather than single mound treatments in which relatively large amounts of bait are concentrated around the periphy of individual mounds.

REFERENCES CITED

Apperson, C. S., E. E. Powell and M. Browne. 1984. Efficacy of individual mound treatments of MK-936 and Amdro against the RIFA. Jour. Ga. Ent. Soc. 19:508-516.

Lofgren, C. S., and D. F. Williams. 1982. Avermectin B1a: a highly potent inhibitor of reproduction by queens of the RIFA. Jour. Econ. Ent. 75:798-803.

Wilson, N. L., J. R. Dillier, and G. P. Markin. 1971. Foraging territories of imported fire ants. Ann. Ent. Soc. Amer. 64:650-665.

PROJECT NO.: FA07G015

PROJECT TITLE: Evaluation of Pyemotes tritici for Control of Imported Fire Ants

PROJECT LEADERS: H. L. Collins and P. M. Bishop

Introduction

Pyemotes tritici, commonly known as the straw itch mite, is a widely distributed non-specific predator of a number of insect species, especially stored grain pests. Bruce and LeCato (1980) reared mites on cigarette beetle pupae and applied about 100 cc. of pupae to single IFA colonies as the first progeny emerged from the gravid female mites. These researchers found that 3 to 10 applications of mites at 2-week intervals gave 70% control of IFA colonies. Jouvenaz et al (1981) reported that infestations of P. tritici do not spread to nearby IFA colonies, thus their use would require multiple treatments of each individual IFA colony.

P. tritici was commerciallized under the trade name "FIREMITES" in late 1984 by Biofac, Inc., P. O. Box 87, Mathis TX 78368, telephone (512) 547-3259. Mites are sold by the cup (1 fl. oz. plastic medicine cups with a pressure fitted cardboard cap). The cups contain mites in search of a host as well as reproducing females attached to Sitotroya larvae in wheat kernels. Cups are shipped in styrofoam egg cartons which are labeled with a use date and an expiration

date. Use directions indicate that IFA mounds less than 10 inches in diameter are to be treated with 1 cup each. Mounds 10 to 18 inches in diameter should receive 2 cups each. A repeat treatment in 2 weeks is also suggested.

A series of trials was conducted in the Spring of 1985 to evaluate the effectiveness of P. tritici for control of IFA colonies.

Methods and Materials

Field Test 1. - Mites were provided gratis by Biofac, Inc. The first shipment was received on 03/18/85 and the first field tests were conducted at the IFA Station Farm in Harrison County, Mississippi. Viability of the mites was confirmed by examining the transparent cups under 12X magnification. On 03/18/85, 20 colonies were marked with a wooden engineering stake and rated on the population index scale described by Lofgren and Williams (1982). The contents of two cups per colony were then released into a small depression cut into the apex of each mound. 10 of the 20 colonies received a second application of 2 cups/colony on April 03 (3 weeks after the first application). A third application (2 cups/colony) to five colonies was made on April 12 (6 weeks after the first application).

Post-treatment ratings of all treated colonies were conducted 48 hours, 10 days, 3 weeks, 6 weeks and 12 weeks after treatment.

Field Test 2. - A second field test was initiated on April 12, 1985 on the Russell Necaise property in Harrison County, Mississippi. IFA colonies were marked, rated and treated with 2 cups of "FIREMITES" per colony as described above. 5 of the treated colonies received a second application of 2 cups/colony on April 22, 1985 (10 days after the first treatment). Post-treatment ratings were conducted 10 and 21 days after treatment.

Laboratory test. In addition to the field tests described above, a small laboratory test was intiated on March 20, 1985. Three field colonies (queen status not determined) were separated from the nest tumulus (Markin 1968) and confined in Wilson cells in the laboratory. Two colonies were treated with one cup of "FIREMITES" each while the third served as an untreated check. Colonies were maintained in the laboratory for three months and were periodically observed for mortality, decrease in vigor, etc.

Results

Results of both field trials are shown in Table 13, and are summarized in Table 14. Acceptable population suppression was not achieved in either trial. Three applications of mites were no better than a single application. The laboratory test confirmed the results obtained in the field trials since all treated colonies appeared normal throughout the trial and no adverse effects were noted.

Table 13. Field Tests with Pyemotes tritici for Control of Imported Fire Ant Colonies.

Colony No.	Total No. Mite Treatments Applied 1/	Date(s) of Retreatment	Pretreatment Pop. Index Rating	Population Index at Indicated Post-Treat Interval (* Indicates Colony Movement/Relocation) 48 hrs	10 days	3 wks	6 wks	12 wks
Series I. (03/18/85 - IFA Station Farm, Gulfport, Mississippi.)								
1	3	April 03 and 12	9	9	9	9	10	10
2	"	"	8	9	9	9	10	9
3	"	"	9	9	8	9*	9*	9*
4	"	"	8	8	8	8	9	9
5	"	"	10	10	10	10	9	9
6	2	April 03	10	10	10	10	10	8*
7	"	"	9	9	9	9	9*	7*
8	"	"	8	8	9	9	9	8
9	"	"	8	8	8*	8*	9*	9*
10	"	"	8	8	8	9	7*	9*
11	1	-	7	8	8	8	9	9
12	"	-	10	10	10	10	10*	9*
13	"	-	9	9	9	8*	8	8
14	"	-	9	9	9	9	9	9
15	"	-	9	9	10	10	10	10*
16	"	-	8	8	8	8	9*	7*
17	"	-	8	8	8	8	8	8
18	"	-	10	10	10	9	10	10
19	"	-	10	10	10	10	10*	10*
20	"	-	9	9	9	9	10	7
21	0 (Untreated)	-	8	8	8	8	8*	8*
22	"	-	10	10	10	10	10	10
23	"	-	8	8	8	8	9	9*
24	"	-	9	9	9	8	9	9
25	"	-	10	10	10	9	9	9
26	"	-	9	9	9	9	8*	7*

Colony No.	Total No. Mite Treatments Applied 1/	Date(s) of Retreatment	Pretreatment Pop. Index Rating	Population Index at Indicated Post-Treat Interval (* Indicates Colony Movement/Relocation) 48 hrs	10 days	3 wks	6 wks	12 wks
27	"	-	9	9	9	9	9	8
28	"	-	10	10	10	9	8	8
29	"	-	9	9	9	9	10	9*
30	"	-	9	9	9	9	10	10
Test Series II (04/12/85 - Russell Necaise Farm, Gulfport, Mississippi).								
1	2	April 22	10		10	10		
2	"	"	9		9	8*		
3	"	"	9		8*	8*		
4	"	"	8		8*	8*		
5	"	"	8		9	9*		
6	1	-	10		10	0		
7	"	-	9		9	9*		
8	"	-	9		9	9		
9	"	-	10		10	10		
10	"	-	8		8	8*		
11	0 (Untreated Check)	-	9		9	9		
12	"	-	8		8	8		
13	"	-	8		8	8		
14	"	-	10		10	10		
15	"	-	10		10	10		

1/ 2 cups per colony at each treatment.

Table 14. Summary of Field Tests with Peymotes tritici for Control of Imported Fire Ant Colonies.

No. of Mite Treatments Applied (2 cups/mound/ tmt.)	X% Change in Pretreatment Population Index at Indicated Post-Treatment Interval				
	48 hrs.	10 days	3 weeks	6 weeks	12 weeks
SERIES I.					
1	0	+2.5	+0.3	+5.8	-0.7
2	0	+3.0	+4.8	+5.8	-3.8
3	0	0	+3.0	+7.6	+5.0
0 (Untreated)	0	0	-3.2	-1.9	-5.3
SERIES II.					
1		0	-0.8		
2		0	-2.4		
0 (Untreated)		0	0		

References Cited:

Bruce, W. A. and G. L. LeCato. 1980. Pyemotes tritici: A potential new agent for biological control of the red imported fire ant. Int. J. Acarol. 6:271-280.

Jouvenaz, D. P., C. S. Lofgren and W. A. Banks. 1981. Biological control of imported fire ants: a review of current knowledge. Bull. Ent. Soc. Amer. 27:203-208.

Lofgren, C. S. and D. F. Williams. 1982. Avermectin Bla, a highly potent inhibitor of reproduction by queens of the red imported fire ant. Jour. Econ. Ent. 75: 798-803.

Markin, G. P. 1968. Handling techniques for large quantities of ants. Jour. Econ. Ent. 61:1744-1745.

PROJECT NO.: FA07G025

PROJECT TITLE: Evaluation of GLC-684 for Control of Imported Fire Ants

PROJECT LEADERS: Paul M. Bishop and Homer L, Collins.

Introduction

GLC-684 is an experimental product produced by Great Lakes Chemical Corporation, P. O. Box 2200, West Lafayette IN 47906. The material is stored in metal cylinders in a liquid state since it boils at 75 degrees F. At the request of the manufacturer, we investigated GLC-684 as a pour-on fumigant for treatment of individual fire ant colonies.

Methods and Materials.

preliminary laboratory observations indicated that GLC-684 is highly toxic to IFA workers. Both contact and fumigant activity are readily apparent. However, the minimum fumigant concentration required to produce lethal fumigant effects on IFA workers was not determined. Cursory observations of two species of woody ornamental plants (*Rapheoletis* and *Euonymus*) indicated that the material was not highly phytotoxic when applied to the growing media.

A series of field tests was conducted in 1985 to determine the potential for practical use of this product.

Test I. - The first field test was initiated on March 26, 1985 in a closely grazed pasture in Harrison County, Mississippi. Four IFA colonies were marked with a wooden engineering stake and then treated with 2 fluid ounces of GLC-684 per colony. The material was dispensed into a 100 cc. glass beaker from an inverted cylinder prior to being poured into a small hole in the apex of each mound. The hole was then sealed by lightly tamping the surface of the mound. Colonies were rated as active, dead, or relocated at 1 day, 2 weeks, and 4 weeks after treatment. A colony was rated as active if 100 or more worker ants were observed after opening the mound with a spade. If less than 100 workers were observed after closely examining a treated mound, the surrounding area (12' radius around the treated mound) was searched to determine if colony relocation had occurred.

Test II. - Test II was initiated on June 03, 1985 and was conducted in the same location as Test I. However, extremely hot and dry conditions prevailed, and IFA activity was therefore greatly decreased throughout most of this test. A total of 6 treatments including the standard (MC-96) and an untreated check were evaluated. MC-96 (active ingredient 1, 1, 1, tri-chloroethane) is registered (24-C for Mississippi, Louisiana and Texas) as a mound fumigant. MC-96 was applied at a rate of 2 fl. oz/mound as

indicated on the product label. GLC-684 was applied at 1 and 2 fl. oz./colony undiluted as well as mixed with 1 gal. of water. Although the solubility of GLC-684 in water is negligible, it was hoped that the water would aid in dispensing the product throughout the mound structure. Treatment effects were evaluated at 1 day, 3 days, 2 weeks and 6 weeks after application. Mounds treated with the GLC-684/water mixture were drenched over the entire surface of the mound rather than pouring into a hole in the mound apex. The undiluted GLC-684 was poured directly into a hole as in Test I. Each treatment was applied to 5 active IFA colonies.

Test III: Test III consisted of an evaluation of 3 rates of GLC-684 (2, 3, and 4 fl. oz./mound), MC-96, and an untreated check. Treatments were applied on June 19 according to procedures described above (5 colonies per treatment). However, soil moisture was high due to recent rainfall and conditions remained moist throughout the entire test. Post-treatment evaluations were conducted 1 day and 4 weeks after treatment.

Test IV: Test IV was a more definitive test which was designed to compensate for the difficulty in determining whether true colony mortality or colony relocation following treatment had occurred. All colonies within a 1.5 acre fenced pasture were treated at a rate of 2 fl oz GLC-684 per

colony by a 5-person application team on October 22, 1985. Efficacy was determined by establishing a 1/4-acre subplot within the center of the treated area and monitoring treatment effects according to procedures described elsewhere (Harlan et al 1981, Collins 1982, Lofgren and Williams 1982). All colonies within the 1/4-acre subplot were enumerated and categorized on the population index scale prior to treatment and at 1,3, and 6 weeks after treatment.

Results

Results of the 3 preliminary trials are shown in Table 15, and generally indicate that most treated colonies were eliminated. All treated colonies in Test I were rated as apparently dead at 4 weeks after treatment. Test II was conducted under very adverse conditions (drouth) as mentioned above. However, GLC-684 applied undiluted at 2 fl oz/ colony appeared to provide 100% mortality to treated colonies 6 weeks after application. The water/GLC-684 mixture (2 fl oz/gal) appeared equally effective 2 weeks after treatment. However, by 6 weeks after treatment, it appeared that many mounds which were rated as dead at 2 weeks had in fact simply relocated. Results of Test III indicated that dose rates of 3 or 4 fl oz/mound were no better than 2 oz.

Results of Test IV appear in Table 16. Although some reduction in the pretreatment population index was achieved, only minimal colony mortality occurred. Movement of treated colonies was readily apparent, as were large "bone piles" of dead ants. Colony relocation following insecticidal treatment is a well documented phenomenon (Hays et al 1982, Franke 1983, Williams and Lofgren 1983). Results of individual mound treatments are often obscured by colony movement and relocation. Therefore, the most reliable results are obtained from trials which are designed to compensate for colony relocation.

TABLE 15. Results of Preliminary Field Trials with GLC-684 for Control of Imported Fire Ants.

Test Series	Treatment	No. IFA Colonies Treated	Date Treated	% Treated Colonies Rated as Active (A), Dead (D), or Relocated (R) at Indicated Time. 1 Day A	1 Day D	1 Day R	3 Days A	3 Days D	3 Days R	2 Wks A	2 Wks D	2 Wks R	4 Wks A	4 Wks D	4 Wks R	6 Wks A	6 Wks D	6 Wks R
I	2 fl. oz./	4	03/26/85	100						50	50			100				
	Untreated Chk	4	"	100						100			100					
II	1 fl. oz./col.	5	06/03/85	100			60	40		20	60	20				20	20	60
	2 fl. oz./col.	5	"	80	20		20	80		40	20	20					100	
	1 fl. oz. + 1 gal. H20	5	"	100			100			60	20	20				20	40	40
	2 fl. oz. + 1 gal. H20	5	"	100			100			100						20	20	60
	2 fl. oz. MC-96 (Std)	5	"	80	20		60	20	20	20	80						80	20
	Untreated Chk	5	"	100			100			60	20	20				60		40
III	2 fl. oz.	5	06/19/85	60	40									100				
	3 fl. oz.	5	"	100										80	20			
	4 fl. oz.	5	"	40	20	40								80	20			
	2 fl. oz. MC-96 (Std)	5	"	60	20	20									100			
	Untreated Chk	5	"	100									60		40			

TABLE 16. Field Test IV with GLC-684

Treatment_1/	Pretreat Population		Results at indicated Wks Postreatment					
	No. Colonies	Pop. index	Colony Mortality (1)	(3)	(6)	% Change in Pretreat Pop. Index (1)	(3)	(6)
2 fl oz GLC-684/Colony	19	312	21	32	21	-27	-58	-56
Untreated Ck	13	240	0	0	23	8	5	-6

_1/ Treatment applied 10/22/85

References Cited.

Franke, O. F. 1983. Efficacy of tests of single mound treatments for control of red imported fire ants, Solenopsis invicta Buren. Southwestern Ent. 8:42 - 45.

Hays, S. B., P. M. Horton, J. A. Bass and David Stanley. 1982. Colony movement of imported fire ants. Journal Ga. Ent. Soc. 17:266 - 274.

Williams, D. F. and C. S. Lofgren. 1983. Imported fire ant (Hymenoptera: Formicidae) control: Evaluation of several chemicals for individual mound treatments. J. Econ. Ent. 76:1201 - 1205.

PROJECT NO.: FA07G035

PROJECT TITLE: Evaluation of Several Non-Pesticidal Means of IFA Control

PROJECT LEADERS: Avel Ladner, H. L. Collins, P. M. Bishop, C. J. Mauffray and Dudley Adams

Introduction:

A nonreplicated small plot field test with several non-pesticides and unconventional treatments was conducted to determine the effectiveness of simulated "homeowner treatments" with these procedures. The project was implemented in response to questions posed by organic gardeners and others who prefer not to use conventional insecticides for IFA control.

Methods and Materials:

All treatments (or procedures) were applied to each ant colony in unreplicated 0.6 acre test plots by a treatment team comprised of 5 individuals. The following treatments were applied on November 14, 1985:

(1.) Gasoline (1 pint poured into small hole in apex of mound.
(2.) Diesel fuel " "
(3.) Household bleach " "
(4.) Pine oil " "
(5.) Excavation and physical removal from plot
(Entire nest tumulus and as much of colony as possible)
(6.) Mix colonies together (force combat)
(7.) Chlorpyrifos (.25 oz 4EC/gal water/colony)

(8.) Untreated check

Efficacy of each treatment was determined by establishing one 1/4-acre subplot within each test plot and monitoring treatment effects according to procedures described elsewhere (Harlan et al 1981, Collins 1982, Lofgren and Williams 1982). Plots were rated prior to treatment and at 1 and 8 weeks after treatment.

Results:

The results of this test are shown in Table 17 and indicate that no treatment provided satisfactory control.

Table 17. Results with various non-pesticidal means of IFA control.

Treatment	Pretreatment Population		Results at indicated weeks postreatment			
	No. Colonies	Pop. index	Colony Mortality (1)	Colony Mortality (8)	% Change in Pretreat Pop. index (1)	% Change in Pretreat Pop. index (8)
Gasoline	15	279	7	47	-75	-71
Diesel Fuel	28	553	14	36	-63	-62
Household Bleach	21	389	0	14	-60	-28
Pine Oil Disenfectant	22	405	0	14	-50	-42
Physical Removal	19	340	0	5	-60	-47
Force Combat	23	455	0	0	-31	-43
Dursban Drench	11	195	0	45	-24	-73
Untreated Check	14	320	29	7	-55	-61

References Cited:

Collins, H. L. 1982. Annual Report, USDA,APHIS,PPQ. Imported Fire Ant Station. 79 pages mimeo.

Harlan, D.P., W. A. Banks, H. L. Collins, and C. E. Stringer. 1981. Large area test of AC-217,300 bait for control of Imported Fire Ants in Alabama, Louisiana, and Texas. Southwestern Ent. 6(2):150-157.

Lofgren, C. S. and D. F. Williams. 1982. Avermectin B1a, a highly potent inhibitor of reproduction by queens of the red imported fire ant. Jour. Econ. Ent. 75:798-803.

PROJECT NO: FA07G045

PROJECT TITLE: Relative Toxicities of Several Insecticides to Red Imported Fire Ant Queens

PROJECT LEADER: Tad Dobbs

INTRODUCTION:

A large number of insecticidal products purported to be effective against the red imported fire ant are currently available to both the home owner and the professional entomologist. In recent years, no comparative study has been undertaken to determine the relative direct toxicities of these insecticides specifically to fire ants. For this reason, a project was intitiated to compare the toxicity of several products again IFA queens, the primary target of federal IFA quarantine treatments.

MATERIALS AND METHODS:

Stock solutions (100 ug/ml) of all materials to be tested were prepared by dissolving the appropriate amount of technical grade insecticide in 100 ml of acetone. One ml of several serial dilutions was applied to the bottom of a 100 mm diameter glass petri dish bottom (Hinkle et al, 1985). Following treatment, the dishes were allowed to air dry for ca. 2 hours before testing. We attempted to produce at least 5 levels of mortality between 10 and 90% for each product tested.

When the petri dishes were completely dry, 5 alate queens were placed in each dish (replicate). There were 9

replicates per dilution. Percent mortality of alate queens within each dish was determined after 24 hours. Mean mortality was calculated for each dilution.

Mean IFA mortality vs. insecticide concentrations (ug/ml) were plotted on log-probability graph paper. Probit lines were drawn by hand with LD50 values being converted to nanograms per square centimeter.

RESULTS AND DISCUSSION:

Insecticide	Source	LD50 (ng/cm2)
Triumph	Ciba-Geigy	1.02
Bendiocarb	Nor-Am	5.08
Dursban (Standard)	Dow	5.4
Oftanol	Mobay	29.8
Broot	Union Carbide	63.0

The insecticides tested in this study are listed in order of relative toxicity to IFA queens. Two of the products that were tested were found to be more toxic (in vitro) than the Dursban standard. Triumph was determined to be approximately 5 times more toxic than Dursban while Bendiocarb (Ficam) was only slightly more toxic than the standard.

It is hoped that continued efforts in this project will help to concentrate regulatory research on those products most likely to give positive results.

REFERENCES CITED:

Hinkle, N. C., D. C. Sheppard and M. P. Nolan, Jr. 1985. Comparing residue exposure and topical application techniques for assessing Permethrin resistance in house flies (Diptera: Muscidae).

A Criteria for the participation of
Plant Protection and Quarantine
Animal and Plant Health Inspection Service,
U. S. Department of Agriculture,
in the Control of Imported Fire Ant with
Cooperating States

The imported fire ant (IFA) program goal is to provide control techniques through methods development, continue environmental monitoring of treatment sites, and maintain a limited survey in support of regulatory action to reduce artificial spread outside the regulated area.

The program activities conducted since 1957 consist of the enforcement of quarantine regulations and surveys to support the regulatory program, and these activities provide a basis for insecticide application. Plant Protection and Quarantine (PPQ) with State cooperation applies insecticides to control infestations. Application sites are monitored to determine levels of residues occurring in the environment. The methods development activities are conducted to develop improved or alternate regulatory and control tools.

In recent years, environmental issues and the lack of registration for environmentally acceptable and efficacious insecticides have precluded the large-scale treatment of areas infested with the IFA.

The PPQ program has continued to recognize a responsibility to the public in states infested with IFA. In an effort to meet this responsibility, in an efficient and effective manner, PPQ has developed the following criteria for participating in cooperative control efforts with interested states on a cost-sharing basis. This policy differs from past practices in that PPQ will not participate in pesticide distribution or give-away programs for ground treatment by individuals or for individual mound treatment on lands such as school grounds, picnic or park areas, cemetaries, roadsides, etc.

Application Procedures: The most cost-effective applications providing maximum relief are those which involve the broadcast treatment of all land allowable under the pesticide label on a farm-by-farm basis. The approach should be followed at the community level using aerial applications where possible.

In order to conduct this type of program, all landowners with land eligible for treatment within any 640-acre block must participate in the program before any of the land within that block can be treated or before any of the landowners can receive bait to apply treatments themselves.

It will be the responsibility of the governmental unit charged with pesticide distribution to ensure that these criteria are met.

Animal and Plant Health Inspection Service
February 12, 1985

Appendix II. Current status of registered IFA baits and those with pending registrations as of February, 1986.

Trade name:	Affirm	Amdro	Logic	Prodrone
Common name:	Avermectin	Amdro	Fenoxycarb	Prodrone
Chemical name:	(5-0-demethylavermectin Ala and (5-O-demethyl-25-de-1-methylpropyl)-25 (1-methylethyl) avermectin Ala	Tetrahydro-5, 5-dimethyl-2(1H) pyrimidinone(3-[4-trifluromethyl) phenyl] 1-(2-[4-trifluoromethyl phenyl] ethenyl -2-propenylidene) hydrazone	Ethyl[2-(p-phenoxyphenoxy) ethyl] carbamate	1-(8-methoxy -4,8-dimethy lnonyl)-4-(1-methylethyl benzene
Type formulation:	.011% deffated Corn	.88% defatted Corn	1% defatted corn	1.2% defatted Corn
Application rate:	1 lb/acre (50 mg AI)	1 lb/acre (4 gms AI)	1 to 1.5 lb/acre (4.5 to 6.8 gms AI)	0.88 lbs/acre per application (4.8 gms AI/app.)
Registration Status:	Pending. (Request filed Feb 1984)	Approved Aug. '80 for use on pasture & Non-crop	Approved Oct '85 for use on lawns, turf & non-crop	Approved Mar '83 for use on pasture & Non-crop
Cost:	?	$2.53/lb	?	$.93/lb
Mode of action:	Disruption of queen's reproductive system.	Direct toxicant Affects all life stages.	Primarily IGR	IGR
Manufacturer:	Merck & Co.	American Cyanamid	Maag Agrochemicals	Stauffer