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PLANT PROTECTION AND QUARANTINE

IMPORTED FIRE ANT STATION

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1983 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 assembled for the information of the U. S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine personnel and key personnel in other agencies engaged in imported fire ant programs. Statements in some instances are based on preliminary uncompleted, or unconfirmed experiments or observations; therefore, the data are not ready for publication or public distribution.

Results of insecticide tests 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.

Introduction

In keeping with Agency policy relative to fire ant control (see Appendix I), the major effort expended by the Imported Fire Ant Station in 1983 was directed towards development of bait toxicants compatible with aerial application. Our primary role in this endeavor was to conduct efficacy studies on bait toxicants applied under Experimental Use Permits (EUPs) to large scale field test plots. Considerable time, efforts and resources were expended in traveling to test sites to collect efficacy data and apply treatments. The interest, support and encouragement received from the public, State cooperators, and the pesticide industry is gratefully acknowledged by the Fire Ant Station personnel.

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SUMMARY

Aerial Application of Bait Toxicants

Large scale field trials with bait toxicants applied by aircraft were conducted in 3 states during the 1983 season. Results obtained in the Spring series of trials indicated that the pregelled defatted corn formulation of RO 13-5223 (Logic(R)) provided 87% colony mortality 12 weeks after application. Amdro (R) provided 86% colony mortality versus 75% with the .011% pregelled defatted corn formulation of MK-936 (Affirm (R)). Other formulations of both Logic (R) and Affirm (R) were somewhat less effective in producing colony mortality; however, all treatments drastically reduced brood production and pretreatment population indices.

Preliminary results of a series of trials initiated in the Fall with these same products indicated that applications made in October may not be as effective as Spring applications.

Efficacy of two Prodrone treatments in Kendall and Kerr County, Texas are being monitored. Two preliminary post treatment population surveys have been completed to date. 10 weeks after the second application, a 62% reduction in the pretreatment population index was noted. Additional surveys will be conducted throughout the 1984 season (Page 1).

Evaluation of a Dursban Injection System for Certification of Balled Burlapped Nursery Plants.

The Whitemore (R) PT 270 Residual Crack and Crevice Injection System was investigated for treatment of balled and burlapped nursery plants. Utilization of the system was found to be easy, simple, fast and effective. Cost of the system was estimated to be approximately $.43 per plant, which is considered too expensive for use on an operation basis (Page 27).

Evaluation of Potting Soil Toxicants

A limited number of granular formulations of insecticides were evaluated as a preplant incorporated treatment for nursery potting soils. None of the candidates under evaluation provided activity equivalent to chlorpyrifos or chlordane (Page 31).

Shelf Life Studies with Bait Studies

Shelf life of various formulations of Affirm (R) was determined by bioassaying bait stored at different temperatures and conditions. Bait stored at room temperature remained acceptable for longer than did bait stored at elevated temperatures (Page 34).

Evaluation of Bait Toxicants for Treatment of Individual IFA Colonies

Three bait toxicants were evaluated for single mound treatment to determine the effectiveness of simulated "homeowner treatments" with these products. Affirm provided 88% colony mortality after 24 weeks; Logic and Amdro provided 86% and 0% respectively (Page 43).

Impact of IFA Bait Toxicants on Non-Target Ant Species

A study to determine the effects of Amdro, Logic, and Affirm on non-target ants was initiated in October, 1983. No results are available at this time (Page 46).

PROJECT NUMBER: IFA 83-1

PROJECT TITLE: Aerial Application of Bait Toxicants

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

A. Fall 1982 Tests.

I. Introduction.

Aerial application of palatable bait formulations containing a feeding attractant, an inert carrier, and a slow-acting toxicant is the most cost-effective method of controlling fire ants over large areas. Field evaluation of products under development for this purpose has long been a primary function of this laboratory. Several products were evaluated in the fall of 1982, and the results of these trials are reported here.

Formulations applied, rates and dates of application, acreage treated, etc., are summarized in Table 1. All treatments were applied in mid October by a USDA Cessna spray plane equipped with a modified bait delivery system.

II. Procedures Used to [illegible]

Efficacy of each treatment was determined by procedures described elsewhere (Harlan et al 1981, Collins 1982, Banks et al 1983). However, the colony classification system devised by Lofgren and Williams (1982) was used to categorize all colonies and to compute population indices,

III. Results and Discussion.

Colony mortality (% kill), population index changes, and percentage of surviving colonies with brood at each test site and evaluation interval are shown in Table 2. Results from all sites are combined and averaged in Table 3. Performance of each product is summarized as follows:

1. Ferriamicide was the most effective treatment evaluated. Ninety-five percent colony mortality with a corresponding 99% decline in population index was observed at both 26 and 38 weeks after evaluation (April and July, 1983). In January, 1983 the Mississippi Authority for the Control of Fire Ants refiled a request to the U.S. EPA for a Specific Exemption (Section 18, FIFRA) to use Ferriamicide. This request was denied in June, 1983.
2. Amdro averaged 79% colony mortality and 92% reduction in population index 38 weeks after treatment (Table 3).
3. Four formulations of MK-936 were evaluated. Superior control (67% colony mortality, 83% reduction in population index 38 weeks after treatment) was obtained with the .011% pregelled corn formulation. The .011% corn cob grit formulation provided 38% colony mortality and 38% reduction in population index. Performance of the other two formulations was slightly better than the cob formulation.

Thirty-eight weeks following the mid October application, a very pronounced increase in brood production was noted in most plots treated with MK-936. This increase in brood production (% surviving colonies with brood) could be attributed to either: (1) Reinfestation/adoption of newly mated queens or (2) Queen recovery. Glancey et al (1982) reported that very low concentrations of MK-936 caused a decline in brood production by laboratory queens with a return to normalcy after 16 weeks. Diminished foraging by workers and lower rate of colony metabolism (both of which are seasonally influenced phenomenon) could possibly result in sub-lethal dosages from late season (fall) applications.

TABLE 1. Treatment Evaluated in Fall 1982 Field Trials

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

TEST SITE LOCATION	PLOT NO.	BAIT FORMULATION 1/ APPLIED	DATE APPLIED	DESIRED RATE OF APPLICATION (Lbs./Acre)	ACTUAL RATE OF APPLICATION Bulk (Lbs.)	AI (Grams)	TOTAL ACRES TREATED
Victoria, Texas	I	AMDRO (.88% PGDC)	10/13/82	1.0	1.0	4.0	105
	II	Bant (.75% PGDC)	10/14/82	1.25	1.4	4.8	108
	III	MK-936 (.011% ECG)	10/14/82	1.0	1.2	.060	111
	IV	MK-936 (.011% CCG)	10/14/82	1.0	1.3	.065	111
	V	MK-936 (.0055% PGDC)	10/14/82	1.0	1.2	.030	146
	VI	MK-936 (.011% PGDC)	10/14/82	1.0	.9	.045	278
	VII	Ferriamicide (.05% CCG)	10/14/82	1.0	.8	.181	96
Dothan, Alabama	I	MK-936 (.011% PGDC)	10/19/82	1.0	1.1	.055	68
	II	MK-936 (.0055% PGDC)	10/19/82	1.0	1.2	.030	67
	III	Bant (.75% PGDC)	10/19/82	1.25	1.2	4.0	113
	IV	AMDRO (.88% PGDC)	10/19/82	1.0	1.0	4.0	98
Cordelle, Georgia	I	Bant (.75% PGDC)	10/20/82	1.25	1.5	5.1	106
	II	MK-936 (.0055% PGDC)	10/20/82	1.0	1.1	.027	118
	III	MK-936 (.011% PGDC)	10/20/82	1.0	1.2	.060	103
	IV	AMDRO (.88% PGDC)	10/20/82	1.0	1.0	4.0	84
Bay St. Louis, Mississippi	I	Bant (.75% PGDC)	10/26/82	1.25	1.3	4.4	200

1/ PGDC = Pregelled defatted corn; ECG = Expanded cob grits; CCG = Corn cob grits.

TABLE 2. Fall 1982 Field Tests with IFA Bait Toxicants - USDA, APHIS, PPQ, Gulfport, Mississippi

TEST SITE LOCATION	TREATMENTS APPLIED 1/ Bait Formulation Toxicant	Carrier 2/	%AI	Rate/Acre Bulk (Lbs.)	AI (Mg.)	Pre-Treatment Population 3/ $\bar{X}$ No. Colonies Subplot	$\bar{X}$ Pop. Index 4/ Subplot	Status of Population at Indicated Post-Treatment Interval (Weeks) 3/ $\bar{X}$% Colony Mortality (6)	(26)	(38)	$\bar{X}$% Change in Pop. Index 4/ (6)	(26)	(38)	% Surviving Colonies with Brood (6)	(26)	(38)
Victoria, Texas	Ferriamicide	CCG	.05	.8	181	7.0	113	74	95	95	-84	-99	-99	55	0	0
	MK-936	PGD	.011	.9	45	6.9	125	21	17	74	-78	-87	-87	2	0	69
	AMDRO	PGD	.88	1.0	4000	8.1	144	36	56	66	-65	-76	-83	23	22	45
	MK-936	PGD	.0055	1.2	30	6.9	125	16	15	65	-76	-66	-79	9	16	61
	MK-936	ECG	.011	1.2	60	5.5	115	14	26	53	-75	-83	-83	12	5	81
	BANT	PGD	.75	1.4	4800	6.9	113	27	63	34 5/	-78	-66	- 9 5/	14	87	92
	MK-936	CCG	.011	1.3	65	6.7	124	18	4	38	-70	-51	-38	19	19	89
	Untreated Chk	-	-	-	-	5.4	94	9	0	6	+10	+306	+95	57	92	93
Dothan, Alabama	AMDRO	PGD	.88	1.0	4000	4.3	83	50	78	90	-81	-95	-98	32	7	0
	MK-936	PGD	.011	1.1	55	8.2	133	9	23	48	-75	-84	-64	0.5	0	95
	MK-936	PGD	.0055	1.2	30	13.5	209	18	13	42	-67	-39	-52	5	8	94
	BANT	PGD	.75	1.2	4000	6.6	117	13	32	0 5/	+34	-35	+120 5/	92	66	100
	Untreated Chk	-	-	-	-	4.3	82	5	7	19	+29	+56	-16	92	78	100
Cordelle, Georgia	AMDRO	PGD	.88	1.0	4000	7.7	164	39	69	80	-79	-95	-95	36	6	25
	MK-936	PGD	.011	1.2	60	6.6	136	16	9	78	-83	-81	-97	0	0	4
	MK-936	PGD	.0055	1.1	27	5.2	91	28	9	52	-83	-78	-88	3.6	5	27
	BANT	PGD	.75	1.5	5100	7.3	125	13	12	42 5/	+2.4	-13	-37 5/	80	63	88
	Untreated Chk	-	-	-	-	9.4	194	0	11	15	+13	+59	-20	90	99	99

1/ Treatments applied 10/13-20/1982.
2/ PGD = Pregelled defatted corn; ECG = Expanded cob grit; CCG = Corn cob grit.
3/ Population parameters based on evaluations conducted in (15) 1/4-acre subplots within each treatment block except as noted.
4/ Population index based on Lofgren scale (Lofgren and Williams. 1982. Jour. Econ. Ent. 75: 798-803.)
5/ Based on evaluations conducted in (5) 1/4-acre subplots.

TABLE 3. Summary of Results of Fall 1982 Field Tests - USDA, APHIS, PPQ

Imported Fire Ant Station, Gulfport, Mississippi

TREATMENT			X% Colony Mortality at Indicated Post-Treat Interval (Weeks) 1/			X% Change in Population Index at Indicated Post-Treat Interval (Weeks) 1/		
Bait Formulation		Bulk Rate/Acre 1/ (Lbs.)	(6)	(26)	(38)	(6)	(26)	(38)
Ferriamicide 2/	.05% CCG	.8	74	95	95	-84	-99	-99
Amdro	.88% PGD	1.0	42	68	79	-75	-89	-92
MK-936	.011% PGD	1.0	15	16	67	-79	-84	-83
MK-936	.0055% PGD	1.2	21	12	53	-75	-61	-73
MK-936 2/	.011% ECG	1.2	14	26	53	-75	-83	-63
MK-936 2/	.011% CCG	1.3	18	4	38	-70	-51	-38
Bant	.75% PGD	1.4	18	36	25	-14	-38	+25
Untreated Chk.		-	5	6	13	+17	+140	+20

1/ Averages based on results obtained at Victoria, Texas; Dothan, Alabama; and Cordelle, Georgia.

2/ This treatment applied at Victoria, Texas only.

The lack of reinfestation in the Amdro and Ferriamicide plots is indicative of queen recovery rather than reinfestation by new queens. Also, the caste composition of surviving colonies was not characteristic of incipient colonies, since both major and minor workers were usually present.

To date, three separate series of field trials with MK-936 have been conducted by PPQ. Results have varied but have generally shown that MK-936 formulated as a .011% pregelled corn bait will provide acceptable control of the imported fire ant.

Trials conducted in the spring of 1982 (results reported elsewhere), as well as those conducted in the spring of 1983 (Table 5) indicated slightly better control from spring applications than those achieved from the fall applications reported here. Although a firm conclusion cannot be drawn from the limited amount of data available at the current time, there is some evidence for a seasonal variation in the effectiveness of this and other "second generation" bait toxicants.

4. Minimal control with Bant was achieved in this series of trials. Development of this product was discontinued by the manufacturer in December, 1982.

B. Spring 1983 Tests

I. Introduction:

Aerial application of palatable bait formulations containing a feeding attractant, an inert carrier, and a slow-acting toxicant remains the most cost-effective approach to control of imported fire ants. Recent advance in the testing and development of two relatively new products justified large-scale field trials in the Spring of 1983. All treatments were applied by a USDA-owned and operated Cessna spray plane equipped with a modified bait delivery system. Details of the application phase of these field trials are described here.

II. Aircraft Specifications:

1. 1977 Cessna Ag-Truck
2. Delivery System
   A. Transland slim-line spreader (Model 20241)
   B. Ram-air system installed in hopper to prevent bridging.
3. 120 mph operating speed.
4. 50' Altitude
5. 50' working swath
6. Operated by Tim Roland, USDA Pilot

III. Guidance:

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

IV. Treatments Applied and bait formulation specifications:

Avermectin fire ant bait (MK-936) is an experimental product under development by Merck, Sharp and Dohme. Two formulations of MK-936 were applied at each test site.

RO 13-5223 (fenoxycarb) is an IGR under development by Maag Agro-chemicals. This product has been tested extensively in laboratory and small plot field trials but has not been evaluated in large-scale field tests. Two formulations of RO 13-5223 were applied at each test site. Physical characteristics of each formulation applied were as follows:

Toxicant	Manufacturer	Inert Carrier 1/	% Oil	Aug. Bulk Density (lbs/ft^3)	% AI
MK-936	Merck & Co.	PGDC	30	16.9	0.011
"	" "	"	30	16.8	0.0055
RO 13-5223	MAAG Agrochemicals	PGDC	30	15.5	1.0
"	" "	ECG	25	31.1	1.0
AMDRO	American Cyanamid	PGDC	30	19.6	0.88

1/ PGDC = pregelled defatted corn; ECG = Expanded cob grits.

V. Description of test sites:

Both MK-936 and RO 13-5223 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 exclusion of entry by humans. After on-site inspections of several possible locations, the following sites were selected:

(1) Gregg County Airport, Longview, Tx.

(2) Shreveport Regional Airport, Shreveport, La.

(3) Albany-Daugherty Co. Airport, Albany, Ga.

Five treatment blocks approximately 150 acres in size (plus an untreated check) were established at each site.

VI. Details of Treatment:

Listed here in chronological order are details concerning the application of each treatment under evaluation in this series of tests.

A. Longview, Texas:

5/3/83 - A series of calibration flights were performed in order to select the appropriate orifice plate for each formulation. Based on these calibration flights, selection of orifice sizes and swath widths were as follows:

Formulation	Orifice Plates (inches)	Working Swath (feet)
AMDRO	31/64	50
MK-936 .011% PGD	33/64	50
MK-936 .0055% PGD	33/64	50
RO 13-5223 PGD	17/32	50
RO 13-5223 ECG	15/32	55

Treatment of Block V with AMDRO was completed at 11:35 A.M. Rate of application was 1.0 lb. of material per acre. Climatic conditions during treatment were as follows:

Air temperature - 69°F
Soil temperature - 81°F
Wind - 0-7 mph

Skies were bright, sunny and clear.

Treatment was suspended throughout the afternoon due to excessive wind. Block I was subsequently treated with RO13-5223, ECG at 1.0 lb. acre. This treatment was completed at 7:45 p.m.

5/4/83 - Treatment delayed until 10:00 a.m. to allow dew to dry, climatic conditions at 10:00 a.m. were as follows:

Air temperature - 68°F.
Soil temperature- 68°F
Wind - 0-3 mph

Skies clear.

MK-936 .0055% PGD was applied to Block II at 1.0 lb/acre. Block IV received MK-936 .011% at 1.2 lbs. per acre. RO13-5223 PGD was applied to Block III at 1.25 lbs/acre.

B. Shreveport, La.:

5/4/83 - Treatment of Block II with MK-936 .0055% was initiated at 4:15 p.m. Air temp. was 79°F, soil 90°F, winds were 3-6 mph and skies were clear. Rate of application was 1.0 lb/acre. Block I was treated with MK-936 .011% at 0.9 lb/acre. RO 13-5223 PGD was applied to Block III at 1.1 lbs/acre.

5/5/83 - Treatment of Block IV with AMDRO was completed at 10:45 a.m. Treatment of this plot was initiated on 5/4, but was not completed due to nightfall. Rate of application was 0.9 lbs/acre. Climatic conditions were as follows:

Air temperature - 78° F.

Soil temperature- 92° F.

Wind 8-10 mph

RO 13-5223 ECG was applied to Block V at 1.7 lbs/acre. Installation of improper size orifice plates may have accounted for the heavier than desired rate of application.

C. Albany, Ga.

5/10/83 - Climatic conditions were as follows:

Air temp - 75°F
Soil temp. - 68°F
Wind 3-5 mph
Cloudy, overcast, highly humid.

Block I was treated with MK-936 .0055% at 0.7 lbs/acre. Since calibration flights in Longview, Tx. had indicated a 33/64" orifice, and subsequent treatments at both Longview and Shreveport were at the desired rate of application, 33/64" plots were installed at Albany. However, as indicated above, the rate of application at Albany was far less than desired. It is possible that differences in relative humidity between Albany and other sites may have affected flow rate of the material. No other apparent differences were evident since changes in bulk density, airspeed, etc. did not occur. Effect of relative humidity on flow rate (or calibration) has not been observed in previous tests or treatments involving pregelled defatted corn bait formulations.

Block II was treated with RO 13-5223. Rate of application was 0.9 lbs. of bait per acre. Block III received AMDRO at 1.2 lbs/acre. Thunderstorms in the area occured within one hour of the completion of treatment of Block III, and operations were ceased for the day.

5/11/83 - Treatments delayed until 10:15 a.m. to allow foliage to dry. Air temp. was 75°F, soil 66°F, winds were calm and skies were cloudy and overcast at time of treatment. Block V was treated with MK-936

.011% PGD at 1.2 lbs/acre. Block IV received RO 13-5223 ECG at 1.2 lbs/acre.

VII. Summary:

Formulations applied, rates and dates of application, acreage treated, etc. is summarized in Table 4. All formulations were of good quality, with excellent flowability and uniformity.

VIII. Results:

Results of these trials are shown in Tables 5 and 6. Six weeks after application, Amdro was the most effective treatment. However, by 12 weeks after application, RO 13-5223 applied as a 1% pregelled defatted corn formulation was slightly more effective than other treatments. All treatments were considered highly effective since a 96% or more reduction in population index was obtained. Only a small percentage of surviving colonies were producing brood at this time. Absence of brood is a strong indication that an IFA colony will eventually succumb due to its inability to repopulate.

Table 4. Summary of Spring 1983 Field Trials with IFA Bait Toxicants.
Imported Fire Ant Station, USDA, APHIS, PPQ, Gulfport, Ms.

Test Site Location	Plot No.	Bait Formulation Applied 1/	Date Applied	Desired Rate of Application (Lbs/Acre)	Actual Rate of Application /Acre		Acreage Treated
					Bulk(lbs)	AI (gms)	
Longview,Tx.	I	RO 13-5223 (1% ECG)	5/3/83	1.0	1.0	4.5	153
	II	MK-936 (.0055% PCD)	5/4/83	1.0	1.0	0.025	138
	III	RO 13-5223 (1% PGD)	5/4/83	1.0	1.0	4.5	151
	IV	MK-936 (.011% PGD)	5/4/83	1.0	1.0	0.050	173
	V	AMDRO (Std.)	5/3/83	1.0	1.0	4.0	48
	VI	Untreated Ck.	-	-	-	-	-
Shreveport,La.	I	MK-936 (.011% PGD)	5/4/83	1.0	0.9	0.045	158
	II	MK-936 (.0055% PGD)	5/4/83	1.0	1.0	.025	125
	III	RO 13-5223 (1% ECG)	5/5/83	1.0	1.1	5.00	161
	IV	AMDRO (Std)	5/5/83	1.0	0.9	3.60	254
	V	RO 13-5223 (1% ECG)	5/5/83	1.0	1.7	7.72	130
	VI	Untreated Ck.	-	-	-	-	-
Albany, Ga.	I	MK-936 (.0055%)	5/10/83	1.0	0.7	0.017	160
	II	RO 13-5223 (1% PGD)	5/10/83	1.0	0.9	4.08	143
	III	AMDRO (Std)	5/10/83	1.0	1.2	4.80	76
	IV	RO 13-5223 (1% ECG)	5/11/83	1.0	1.2	5.45	143
	V	MK-936 (.011% PGD)	5/11/83	1.0	1.2	0.060	107
	VI	Untreated Ck.	-	-	-	-	-

1/ ECG = Expanded cob grit; PGD = Pregelled defatted corn.

TABLE 5. Spring 1983 Field Tests with IFA Bait Toxicants - USDA, APHIS, PPQ - IFA Station, Gulfport MS

Test Site Location	Treatments Applied					Pretreatment Population 2/		Status of Population at Indicated Post-Treatment Interval (Weeks) 2/					
	Bait Formulation			Rate/Acre									
	Toxicant	Carrier 1/	%AI	Bulk (Lbs.)	AI (Gms.)	$\bar{X}$ No. Colonies Per Subplot	$\bar{X}$ Pop. Index 3/ Per Subplot	$\bar{X}$% Colony Mortality (6)	(12)	$\bar{X}$% Change in Pop. Index 3/ (6)	(12)	% Surviving Colonies with Brood (6)	(12)
LONGVIEW, TX	RO 13-5223	PGD	1.0	1.0	4.54	11.5	184	50	95	-92	-99	0	0
	Amdro	PGD	0.88	1.0	4.0	6.8	117	92	85	-98	-98	22	0
	MK-936	PGD	0.011	1.0	0.050	11.4	190	72	84	-95	-98	2	4
	MK-936 4/	PGD	0.0055	1.0	0.025	11.1	183	57	81	-93	-99	0	0
	RO 13-5223	ECG	1.0	1.0	4.54	5.5	112	24	62	-84	-93	0	7
	Untreated Ck.	-	-	-	-	6.2	108	20	15	- 8	-17	94	89
SHREVEPORT, LA	Amdro	PGD	0.88	0.9	3.6	4.3	79	98	94	-99.8	-99	0	0
	RO 13-5223	PGD	1.0	1.1	5.0	5.7	120	44	83	-93	-99	0	0
	RO 13-5223	ECG	1.0	1.7	7.72	6.2	100	44	76	-90	-97	0	0
	MK-936	PGD	0.011	0.9	0.045	5.5	118	45	65	-94	-97	0	0
	MK-936	PGD	0.0055	1.0	0.025	7.4	156	46	53	-92	-96	0	0
	Untreated Ck.	-	-	-	-	8.6	172	33	31	-36	-38	94	95
ALBANY, GA	RO 13-5223	PGD	1.0	0.9	4.08	6.7	119	29	83	-90	-99	0	0
	RO 13-5223	ECG	1.0	1.2	5.45	6.3	134	32	83	-91	-98	0	5
	Amdro	PGD	0.88	1.2	4.80	8.9	160	90	78	-97	-93	36	44
	MK-936	PGD	0.011	1.2	0.060	6.4	115	53	77	-94	-97	0	0
	MK-936	PGD	0.0055	0.7	0.017	7.0	128	26	48	-88	-94	1	2
	Untreated Ck.	-	-	-	-	7.3	150	31	39	-37	-45	91	97

1/ PGD = Pregelled defatted corn; ECG = Expanded cob grit.
2/ Population parameters based on evaluations conducted in (15) 1/4-acre subplots within each treatment block unless otherwise indicated.
3/ Population index based on Lofgren scale (Lofgren and Williams, 1982. Jour. Econ. Ent. 75:798-803).
4/ Based on 6 subplots; others destroyed by airport construction.

TABLE 6. Summary of Results of Spring 1983 Field Tests - USDA, APHIS, PPQ

Imported Fire Ant Station, Gulfport, Mississippi

TREATMENT Bait Formulation	Bulk Rate/Acre [1/] (Lbs.)	$\bar{X}$% Colony Mortality at Indicated Post-Treat Interval (Weeks) [1/] (6)	 (12)	$\bar{X}$% Change in Population Index Indicated Post-Treat Interval (6)
RO 13-5223 1.0% PGD	1.0	41	87	-92
Amdro .88% PGD	1.0	93	86	-98
MK-936 .011% PGD	1.0	57	75	-94
RO 13-5223 1.0% PGD	1.3	33	74	-88
MK-936 .0055% PGD	0.9	44	61	-91
Untreated Ck.	-	28	28	-27

[1/] Averages based on results obtained at Longview, Texas; Shreveport, Louisiana; and Albany, Georgia.

C. Fall 1983 Tests

I. Introduction:

As reported elsewhere, results of our spring 1983 program to evaluate aerially dispersed bait toxicants indicated that several products currently under development continue to show promise for imported fire ant suppression. Additional trials with these products were conducted in October, 1983. Details of the application phase of these field trials are described here.

II. Aircraft Specifications:

1. 1977 Cessna Ag-Truck
2. Delivery System
   A. Transland slim-line spreader (Model 20241)
   B. Ram-air system installed in hopper to prevent bridging
3. 120 mph operating speed
4. 50' altitude
5. 50' working swath
6. Operated by Tim Roland, USDA pilot

III. Guidance:

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

IV. Treatments Applied and Bait Formulation Specifications:

Avermectin fire ant bait (MK-936) is an experimental product under

development by Merck and Company, Inc. Laboratory and field trials have indicated that MK-936 either kills the IFA queen or prevents egg production, resulting in a cessation of brood production.

RO 13-5223 (Logic^{R}) is an IGR under development by Maag Agrochemicals Inc. Ovicidal effects, as well as IGR activity, has been demonstrated previously with this product. Two formulations of both Avermectin and Logic were applied at each test site. Physical characteristics of each formulation were as follows:

TOXICANT	MANUFACTURER	INERT CARRIER 1/	% OIL	AVG BULK DENSITY (LBS/FF^3)	% AI
MK-936 (3C)	Merck & Co.	PGDC	30	17.4	0.011
MK-936 (A-1)	Merck & Co.	PGDC	30	21.5	0.011
RO 13-5223	MAAG	PGDC	30	15.5	1.0
RO 13-5223	MAAG	ECG	25	31.0	1.0
Amdro	American Cyanamid	PGDC	30	17.6	0.88

1/ PGDC = Pregelled Defatted Corn; ECG = Expanded Cob Grits.

V. Description of Test Sites:

Both MK-936 and RO 13-5223 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 exclusion of entry to the treated area by humans. After on-site inspections of several possible locations, the following airport properties were selected as test sites:

(1.) Pounds Field, Tyler, Texas.

(2.) Dannelley Field, Montgomery, Alabama.

(3.) Valdosta Municipal Airport, Valdosta, Georgia.

Five treatment blocks approximately 100 acres in size (plus an untreated check) were established at each airport.

VI. Details of Treatment:

Listed here in chronological order are details concerning the application of each treatment under evaluation in this series of tests.

A. Tyler, Texas. (Pounds Field)

10/18/83 - Based upon calibration flights, in combination with experience gained in previous trials, selection of metering orifices and swath widths was as follows:

FORMULATION	ORIFICE PLATES (INCHES)	WORKING SWATH (FEET)
Amdro	31/64	50
MK-936 (3C)	31/64	50
MK-936 (1A)	33/64	50
RO 13-5223 PGDC	17/32	50
RO 13-5223 ECG	5/16	55

Climatic conditions during treatment were as follows:

Air temperature . . . . . 82° F.

Soil temperature . . . . . 71° F.

Winds . . . . . 4 mph.

Skies were overcast.

Block V was treated with Amdro at a rate of 0.91 lbs per acre. Block I received MK-936 (Formulation 3C) at 1.0 lb per acre. MK-936 (Formulation 1A) was applied to Block II at 1.2 lbs per acre. Block IV received 1.7 lbs of Logic® PGD per acre. Visual inspection of the dispersal system indicated that leakage was occurring around the gate-seal side plates; (this caused the excessive rate of application). New plates were installed to correct the problem.

10/19/83 - Treatment was delayed in a.m. due to wind. Climatic conditions at time of treatment (noon) were as follows:

Air temperature . . . . . 82° F.

Soil temperature (2" depth) . . . 71° F.

Winds . . . . . 5 mph.

Skies were cloudy and overcast.

Block III received Logic® ECG at 1.0 lb/acre.

B. Montgomery, Alabama. (Dannelley Field)

10/25/83 - Treatment of Block III with Logic ECG was initiated at

3:00 p.m. Climatic conditions were as follows:

Air temperature . . . . . 70° F.

Soil temperature (2" depth) . . . 64° F.

Winds . . . . . 10 mph at 330°.

Skies were high overcast and broken.

Rate of application was 1.2 lbs/acre. Logic PGD was applied to Block IV at 1.25 lbs per acre. Block II received MK-936 (A-1) at a rate of 1.1 lbs/acre, and MK-936 (3-C) was applied to Block I at .9 lbs/acre.

10/26/83 - Treatment was delayed until noon due to heavy dew and cool temperatures. Climatic conditions at the time of treatment were as follows:

Air temperature . . . . . 68° F.

Soil temperature . . . . . 76° F.

Wind . . . . . 5 - 10 mph.

Skies were bright, sunny and clear.

Amdro was applied to Block V at a rate of 1.0 lb/acre.

C. Valdosta, Georgia. (Municipal Airport)

10/27/83 - Climatic conditions at the time treatment was initiated (1:30 p.m.) were as follows:

Air temperature . . . . . 69° F.

Soil temperature . . . . . 80° F.

Wind . . . . . 0 - 5 mph.

Skies were bright, sunny and clear.

Andro was applied to Block V at 1.0 lb/acre. Block III was then treated with MK-936 (3-C) at .9 lbs/acre. MK-936 (1-A) was applied at 1.2 lbs/acre.

VII. Summary:

All bait formulations were of very good quality (excellent flowability and uniformity, and no lumps or foreign debris were noted. Formulations applied, rates and dates of application, acreage treated, etc. is summarized in Table 7.

VIII. Results:

Preliminary results obtained 6 weeks after application appear in Table 8. At that time, very little colony mortality had occurred. However, brood production as well as the population index was reduced by most treatments. Since these treatments were applied in mid October, efficacy is expected to improve over winter and should become evident in the final evaluation which will be conducted in May, 1984.

TABLE 7. Summary of Fall 1983 Field Trials with IFA Bait Toxicants.

IFA Station, USDA, APHIS, PPQ

TEST SITE LOCATION	PLOT NO.	BAIT FORMULATION APPLIED 1/	DATE APPLIED	DESIRED RATE OF APPLICATION (Lbs/Acre)	ACTUAL RATE OF APPL./ACRE BULK(Lbs)	AI(Gms)	ACREAGE TREATED
Tyler, Texas	I	MK-936 (3C)	10/18/83	1.0	1.0	.050	139
	II	MK-936 (1A)	10/18/83	1.0	1.2	.060	127
	III	RO 13-5223 (ECG)	10/19/83	1.0	1.0	4.54	110
	IV	RO 13-5223 (PGD)	10/18/83	1.0	1.7	7.72	135
	V	Amdro	10/18/83	1.0	.9	3.60	50
Mont-gomery, Alabama	I	MK-936 (3C)	10/25/83	1.0	.9	.045	69
	II	MK-936 (1A)	10/25/83	1.0	1.1	.056	60
	III	RO 13-5223 (ECG)	10/25/83	1.0	1.2	5.45	58
	IV	RO 13-5223 (PGD)	10/25/83	1.0	1.2	5.45	59
	V	Amdro	10/26/83	1.0	1.0	4.0	500
Valdosta, Georgia	I	RO 13-5223 (ECG)	10/27/83	1.0	1.0	4.54	106
	II	RO 13-5223 (PGD)	10/27/83	1.0	1.0	4.54	106
	III	MK-936 (3C)	10/27/83	1.0	.9	.045	106
	IV	MK-936 (1A)	10/27/83	1.0	1.2	.060	106
	V	Amdro	10/27/83	1.0	1.0	4.0	99

1/ ECG = Expanded cob grit; PGD = Pregelled defatted corn.

TABLE 8. Preliminary Results of Fall 1983 Field Tests with IFA Bait Toxicants.

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

Test Site Location	TREATMENTS APPLIED: Bait Formulation Toxicant	Carrier [1]	% AI	Rate/Acre Bulk (Lbs.)	Rate/Acre AI (Gms.)	PRETREAT POPULATION [2]: $\bar{X}$ No. Colonies Per Subplot	$\bar{X}$ Pop. Index Per Subplot	STATUS OF POPULATION AT INDICATED POST-TREAT INTERVAL (WEEKS) [2]: $\bar{X}$% Colony Mortality (6)	$\bar{X}$% Change in Pop. Index [3] (6)	% Surviving Colonies with Brood (6)
Tyler, [4] Texas	MK-936 (1A)	PGD	.011	1.2	.060	6.6	104	28	-84	4
	MK-936 (C-3)	PGD	.011	1.0	.050	13.1	191	[5]	[5]	[5]
	Logic	PGD	1.0	1.7	7.72	4.3	75	0	-76	0
	Logic	ECG	1.0	1.0	4.54	12.8	178	0	-51	9
	Amdro	PGD	.88	.9	3.60	15.2	224	18	-37	87
	Untreated Ck.	-	-	-	-	4.6	71	0	+23	96
Montgomery, Alabama	MK-936 (1A)	PGD	.011	1.1	.055	10.2	221	28	-84	0
	MK-936 (3C)	PGD	.011	.9	.045	15.7	299	21	-82	0
	Amdro	PGD	.88	1.0	4.0	9.6	207	33	-67	48
	Logic	ECG	1.0	1.2	5.45	7.7	171	12	-59	33
	Logic	PGD	1.0	1.2	5.45	7.1	146	2	-32	60
	Untreated Ck.	-	-	-	-	8.7	185	10	- 1	99
Valdosta, Georgia	MK-936 (1A)	PGD	.011	1.2	.060	9.1	125	31	-86	0
	MK-936 (C-3)	PGD	.011	.9	.045	9.6	153	8	-78	0
	Amdro	PGD	.88	1.0	4.0	9.1	130	54	-68	30
	Logic	ECG	1.0	1.0	4.54	7.6	122	5	-61	19
	Logic	PGD	1.0	1.0	4.54	6.3	113	8	-57	21
	Untreated Ck.	-	-	-	-	11.1	172	0	+29	98

1/ PGD = Pregelled defatted corn; ECG = Expanded cob grit.
2/ Population parameters based on evaluations conducted in (15) 1/4-acre subplots within each treatment block unless otherwise indicated.
3/ Population index based on Lofgren scale (Lofgren and Williams, 1982. Jour. Econ. Ent. 75:798-803).
4/ 6-week evaluation at Tyler, Texas was based on 8 subplots/treatment due to inclement weather.
5/ Evaluation cancelled by rain.

D. Prodrone Program in Kendall and Kerr County, Texas.

I. Introduction :

Prodrone (R) (formerly Stauffer MV-678) was registered as a fire ant bait in March, 1983. Prodrone is not an acute toxicant but is instead an insect growth regulator (IGR) which disrupts caste differentiation and inhibits egg production (Banks and Schwarz 1980, Banks et al 1983). In 1983, the Texas Department of Agriculture, in cooperation with USDA, APHIS, PPQ applied two applications of Prodrone to approximately 500,000 acres in Kendall and Kerr Counties, Texas.

This laboratory's involvement in that program was limited to monitoring the effects of the two Prodrone treatments on the Kendall/ Kerr County fire ant population.

II. Methods :

A pretreatment survey based on visual inspection of 65 efficacy sites within the treated area and 25 sites in an adjacent untreated county (Bexar) was completed in June, 1983. Survey procedures described elsewhere (Harlan et al 1981, Collins 1982, Banks et al 1983), and a colony classification system devised by Lofgren and Williams (1982) was used to categorize all IFA colonies and to compute population indices before and after treatment.

III. Results :

Results of the pretreatment survey and the first and second post treatment evaluation are shown in Table 9 . These results are considered very preliminary since this product is known for its slow and subtle effects upon IFA colonies. During the second evaluation, it was apparent that most colonies within the treated area contained

much less brood than did colonies outside the treated area. However, this decrease in brood production was not quantified. A "shift" in brood production from worker to reproduction caste was not noted at that time. Additional evaluations will be made throughout the Spring and Summer of 1984.

TABLE 9. Preliminary Results of Two Prodrone Applications in Kendall and Kerr County, Texas

Location	Pretreatment IFA Population (June 1983)		Status of IFA Population at the Indicated Post-Treat Interval			
			Mean (±SD)% Reduction in No. of Active Nests		Mean (±SD)% Change in Pretreatment Population Index	
	Mean No. Nests Per Efficacy Site	Mean Population Index/Site	12 Wks. After 1st Appl. (Sep 83)	10 Wks. After 2nd Appl. (Nov 83)	12 Wks. After 1st Appl. (Sep 83)	10 Wks. After 2nd Appl. (Nov 83)
Kendall & Kerr Co. (Within treated area)	8.8	165.0	58(±29)	37(±35)	-72(±25)	-62(±39)
Bexar Co. (Untreated)	16.3	321.8	33(±25)	24(±21)	-41(±25)	-19(±30)

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PROJECT NUMBER: IFA 83-3

PROJECT TITLE: Evaluation of a Dursban Injection System for Certification of Balled and Burlapped Nursery Plants

PROJECT LEADER: Paul M. Bishop

I. Introduction.

Application of long residual insecticides such as dieldrin, heptachlor, and chlordane was used to certify shipment of field grown ornamental plants ("Balled and burlapped" plants) until all use patterns of these products were cancelled on December 31, 1979. A root dip treatment (total immersion of the root ball) in a chloropyrifos solution (8 fl. oz. 2EC/100 gals. H_2O) was published in the March 1980 revision of PPQ Control Manual 805-25.2230.

Less labor intensive and more economical treatments are needed to replace root, dip treatments for balled and burlapped plants. A preliminary evaluation of a pressurized injection system containing .500% Dursban was conducted in order to determine effectiveness, ease of utilization, and cost.

II. Methods and Materials.

The Whitmore(R) PT 270 Residual Crack and Crevice Injection System (Whitmire Research Laboratories, Inc., St. Louis MO 63122) is primarily intended for use by pest control operators for crack and crevice treatments for a variety of pests, including imported fire ants (mound injection). The system consists of a pressurized tank (containing 0.500% Dursban, 15 lbs. net weight), which is connected by a 5' hose to a 4" brass injector (No. 619). On December 28, 1983, 25 simulated "balled and burlapped plants" (burlap bags filled with one gallon of soil) were artificially infested with fragmented IFA colonies (50 cc. of worker ants and brood per colony. Presence of the queen was not determined). After allowing the colonies to acclimate for 10 days, the

system was evaluated. Infested balls were divided into 5 groups (5 balls per group). The first group was injected on 1 side of the root ball only; the second group was injected on diametrically opposed sides and the 3rd and 4th group received 3 and 4 injections respectively. Each 1-second injection delivered approximately 4 mls. of Dursban solution. The fifth group served as an untreated check. Soil balls were observed for 10 days. If a colony appeared to be dead (after disturbing by probing), the burlap liners were removed and the soil was closely searched for the presence of live ants. A colony was considered dead when fewer than 20 worker ants were observed.

III. Results.

As shown in Table 10 , three 1-second injections per root ball (12 mls. 0.500% Dursban) eliminated all ant colonies within 7 days. Four injections per root ball (16 mls.) resulted in total colony mortality in two days. These preliminary results indicate that the injection system is effective in delivering a lethal dose of Dursban to the target area. Efficacy of Dursban (chloropyrifos) against the IFA is well documented (Hillman 1977, Morrill 1977, Collins et al 1980, Bass and Hays 1982, Francke 1983).

Utilization of the system was judged to be easy, simple and fast. Assuming an application rate of 16 mls. Dursban per plant ball (four 1-second injections per plant), a 15 lb. net weight tank would treat approximately 330 plants at an estimated cost of $.43 per plant. Since this amount is probably cost prohibitive, additional tests including determination of phytotoxic effects upon treated plants were not conducted.

Table 10. Survival of Ant Colonies in Root Balls Injected with 0.0500% Dursban by a Whitmire(R) PT 270 Injection System.

Number of Injections Per Root Ball 1/	Number and Condition (Live or dead) of Ant Colonies at the Indicated Time After Injection											
	1 Day		2 Days		3 Days		5 Days		7 Days		10 Days	
	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead
0	5	0	5	0	5	0	5	0	5	0	5	0
1	5	0	5	0	5	0	5	0	5	0	5	0
2	5	0	5	0	5	0	5	0	5	0	5	0
3	5	0	5	0	5	0	0	5	-	-	-	-
4	5	0	0	5	-	-	-	-	-	-	-	-

1/ Each 1-second injection delivered approximately 4 mls. 0.500% Dursban.

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Project Number: IFA 83-4

PROJECT TITLE: Evaluation of Potting Soil Toxicants

PROJECT LEADER: C. J. Mauffray

INTRODUCTION:

An on-going screening program to evaluation insecticides applied as a pre-plant incorporated treatment for nursery potting soil has been conducted since 1974. Until its cancellation of registration in December, 1979, chlordane applied at a rate of 4 ozs. of 5% dust per cubic yard was used for treatment of potting soils. In January, 1980, chlorpyrifos 5% granular (FA-5) was registered for use at a rate of 0.5 lbs. FA-5/yd^3 of potting media. Although FA-5 is highly efficacious, numerous complaints of phytotoxicity in Central Florida prompted the registrant to withdraw this product from the market in the Fall of 1981. Therefore, only two compounds have ever been registered for this use pattern, and neither are currently available.

METHODS AND MATERIALS:

Test procedures used to evaluate all candidate toxicants were as follows: Granular or dust formulations of each candidate tested were blended into nursery potting soil, (BACCTO R, 818 lbs/yd^3) at an initial rate of 10 lbs. AI per three-inch acre (equivalent to 11.2 grams AI per cubic yard 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 by confining 40 cc. of a fragmented fire ant colony (presence of queen not determined) on the soil frcm each of 3 pots from each treatment series.

The test "colonies" were then observed for 14 days or until mortality of 90% or more of all life forms in each of the three colonies occurred. Treatments which allowed survival of more than 10% of a colony were considered ineffective. Treatments which were judged effective at the first bioassay interval were aged and retested periodically to measure and compare residual activity with chlorpyrifos. Granular formulations of chlorpyrifos provide over 24 months residual activity when applied at a rate of 11.2 gms. AI/cubic yard of potting media.

RESULTS:

Results with the limited number of candidate products tested in 1983 are shown in Table 11 . Other than chlorinated hydrocarbon insectcides, chloropyrifos is the only product that demonstrates the residual activity needed for this particular use pattern.

Table 11. Residual Activity of Candidate Potting Soil Toxicants Weathered Outdoors in Plastic Pots Under Natural Conditions.

Toxicant	Formulation	Formulator	Rate (Gm. AI/yd^3 soil)	Months of residual activity (90% or more mortality to test colonies) 1/
Lindane	6WP	Woolfolk	11.2	6
Lindane	5G	Woolfolk	11.2	6
Lindane	5G	The Andersons	11.2	6
Amaze	5G	Mobay	11.2	6
Cypermethrin	2G	ICI Americas	11.2	4
Toxaphene	20D	Woolfolk	11.2	N/A
Permethrin	2G	ICI Americas	11.2	N/A
Endosulfan	5G	Velsicol	11.2	N/A
CN 11-3877	5G	Velsicol	11.2	N/A
Chloropyrifos 2/	2.5G	Ford's	11.2	2+
Chloropyrifos 2/	1%WP	Ford's	11.2	2+

1/ N/A = No activity at the dose rate indicated.

2/ Preparations to register a chloropyrifos formulation for treatment of potting soil have been initiated.

PROJECT NUMBER: IFA 83-5

PROJECT TITLE: Shelf Life Studies with Bait Toxicants

PROJECT LEADER: Dudley J. Adams

INTRODUCTION:

Storage or shelf life of imported fire ant baits has long been a problem with certain types of formulations. Some inert carriers are known to enhance oxidation and rancidity of the soybean oil. Since rancid baits are not actively accepted and fed upon by foraging workers (Lofgren et al 1964), poor control may result from field applications of baits in this condition. In early studies with degradable formulations of Mirex, a copper catalyst was used to enhance the degradation process. However, the copper also promoted oxidation and subsequent rancidity of the oil and was excluded from further testing.

TEST I:

On May 20, 1982, a study to determine the effects of storage under two different temperature regimes was initiated for two formulations of MK-936. Subsamples of each formulation were removed from larger containers (25 lb. fiber drums), and placed into 10" x 12" zip lock plastic bags which were in turn placed inside cardboard boxes.

The boxes were then stored under two different temperature regimes: (1) One group of boxes was stored in the laboratory at ambient conditions of 70 - 74° F. (2) The second group was stored in a non-temperature controlled warehouse which occasionally reached temperatures greater than 100° F. Storage under these conditions would be normal and expected for most

of the area infested by the imported fire ant.

Samples (1 bag per sampling interval) were removed at approximately 1 month intervals from May 1982 to November 1983 and subjected to the following bioassay procedures:

1. General - A laboratory bioassay for feeding acceptance is a standard test used to determine the relative attractancy of various IFA baits or components of baits. Field-collected captive ant colonies are given a free choice to select and feed on either a candidate bait (the bait under evaluation) or a freshly prepared standard bait. It is assumed that the ants will indicate their preference by consuming greater quantities of the bait of their choice.
2. Collection of Ant Colonies - Fragments of colonies containing all life forms (workers, immature, winged sexuals and occasionally the mated queen) are collected from infested fields by shoveling a portion of the nest tumulus into a plastic dish pan. The colonies are then transported into the laboratory and allowed to acclimate and rebuild the next structure for 3 - 4 days prior to testing.
3. Preparation of the Standard Bait - A standard bait known to be attractive to ants is prepared by mixing fresh soybean oil with pregelled defatted corn grits 30%:70% w/w. The standard bait is prepared one day prior to the test.
4. Candidate bait - The candidate bait is any potentially attractive oil, experimental bait formulation, or formulated bait which may have deteriorated due to storage, etc. Each candidate bait is tested on five different colonies, and the results reported as an average response of all colonies.

5. Bioassay - Four grams of a candidate bait contained in a pastic petri dish are placed on the surface of each of the five test colonies. Simultaneously, four grams of the freshly prepared standard bait in an identical container are placed approximately 4 - 5 inches from the candidate bait. Foraging workers are then provided a free choice to feed on the bait of their preference. After a 24-hour feeding period, the dishes are removed and the amount of each bait consumed is determined by weighing.

6. Computation of Acceptance Ratio - An acceptance ratio for each candidate bait is computed in the following manner:

$$\frac{\text{No. grams candidate consumed}}{\text{No. grams standard consumed}} = \text{Acceptance ratio.}$$

An acceptance ratio with a value of less than 1.0 indices that a given candidate is less attractive than the standard. Values equal to or greater than 1.0 indicates that a candidate is equally or more attractive than the standard.

Lofgren et al (1961) reported on the evaluation of 222 different food materials and provided a list of those which gave an acceptance ratio of 0.75 or higher. By convention, this figure has become the minimum ratio recognized as acceptable by most IFA researchers.

RESULTS:

As shown in Table 12, storage of MK-936 for 18 months at room temperature did not adversely affect the acceptability of the pregelled defatted corn formulation. The PGD formulation was initially more attractive than the corn cob grit formulation and remained so throughout the test. Some decrease in acceptance of the CCG formulation was noted after 8 months of storage under warehouse conditions.

Table 12 . Shelf Life of Two MK-936 Bait Formulations Stored at Two Temperature Regimes.

Bait Formulation	Storage Conditions	$\bar{X}$ Acceptance Ratio After Storage for Indicated Time (Months) 1/												
		0	1	2	3	4	5	6	7	8	9	11	15	18
.011% on pregelled defatted corn	Laboratory (70 ° - 74 ° F)	1.1	1.0	1.0	1.0		1.0	.8	1.1	1.0	1.5	1.0	1.0	1.0
.011% on pregelled defatted corn	Warehouse (Uncontrolled temperature)	-	.9	1.2	.9		1.1	1.3	1.0	1.8	.8	1.4	2/	2/
.011% on corn cob grits	Laboratory (70 ° - 74 ° F)	.4	.8	.8	.8		.4	.4	.3	.5	.3	.5	1.0	.5
.011% on corn cob grits	Warehouse (Uncontrolled temperature)	-	.8	.9	.8		1.1	.4	.4	.3	.2	.5	2/	2/

1/ Mean based on laboratory observations of 5 field collected colonies. Acceptance ratios computed after a 24-hour feeding period wherein ants were allowed equal opportunity to feed upon a candidate bait versus a freshly prepared standard bait consisting of 30% SBO and pregelled defatted corn. Test initiated on May 20, 1982.

2/ Not sampled.

TEST II:

A second shelf life study with a .011% pregelled defatted corn formulation of MK-936 was initiated on November 8, 1982. Samples of this formulation were stored in constant temperature cabinets programmed to maintain 38° C and 50° C. A third group of samples were stored at room temperature. Bioassay procedures described in Test I were used to periodically determine feeding acceptance.

RESULTS:

Results of this test appear in Table 13. As expected, bait stored at room temperature for 12 months remained highly acceptable, but storage at both 38° C and 50° C greatly reduced acceptance.

TEST III:

All previous shelf life studies with MK-936 baits were based on storage of subsamples in closed plastic (zip-lock) bags. On April 27, 1983, a study was initiated whereby the effects of storage in the original opened container (15 lb. polyethylene lined bag) were investigated.

RESULTS:

Although this test is still in progress, preliminary results, (Table 14) indicate that bait stored at room temperature for 9 months remained acceptable. Bait stored at 38° C and 50° C became rancid in less than three months.

TEST IV:

Two formulations of MK-936 .011% PGD bait were field tested in the Fall of 1983. Shelf life studies with these two formulations (coded 1-A and C-3) were initiated on October 12, 1983. Preliminary results appear in Table 15 .

Table 13 . Shelf Life of MK-936 .011% Bait Stored at Room Temperature 38° C, and 50° C in Zip-Lock Plastic Bags.

Storage Temperature	$\bar{X}$ Acceptance ration after storage for indicated time (months) [1/]									
	0	1	2	3	4	6	7	8	9	12
Room	1.7	1.2	1.0	.9	2.0	1.2	.9	1.0	.9	1.1
38° C (Constant)	-	1.2	1.0	1.7	.5	.3	.3	0	.8	2/
50° C (Constant)	-	.8	0	0	0	.3	0	0	.3	2/

1/ Mean based on laboratory observations of 5 field collected colonies. Acceptance ratios computed after a 24-hr. feeding period wherein ants were allowed equal opportunity to feed upon a candidated bait versus a freshly prepared standard bait. Test initiated November 8, 1982.

Table 14 . Shelf Life of MK-936 (.011% PGD) Stored at Various Temperatures in Opened Bags.

Storage Temperature	$\bar{X}$ Acceptance ratio after storage for indicated time period (Months) 1/							
	0	1	3	4	5	7	8	9
Room	1.0	1.0	.9	.7	1.0	1.1	1.0	.8
38° C (Constant)	-	1.0	.8	.2	.7	.4	0	0
50° C (Constant)	-	1.2	.2	0	.2	0	0	0

1/ Mean based on laboratory observations of 5 field collected colonies. Acceptance ratios computed after a 24 hr. feeding period wherein ants were allowed equal opportunity to feed upon a candidate bait versus a freshly prepared standard bait. Test initiated April 27, 1983.

Table 15 . Shelf Life of MK-936 Bait Formulations Stored in Open Bags at Room Temperature, 38° C, and 50° C.

Formulation code	Storage Temperature	$\bar{X}$ Acceptance ratio after storage for indicated time (months) [1]				
		0	1	2	3 [2]	4
1-A	Room	1.1	1.9	1.4	.3	1.1
	38° C (Constant)	-	.5	.2	0	0
	50° C (Constant)	-	.3	0	0	0
3-C	Room	1.1	1.8	1.4	.5	.99
	38° C (Constant)	-	1.0	1.6	.9	.76
	50° C (Constant)	-	1.0	.3	.3	0

1/ Mean based on laboratory observations of 5 field collected colonies. Acceptance ratios computed after a 24-hour feeding period wherein ants were allowed equal opportunity to feed upon a candidate bait versus a freshly prepared standard bait. Test initiated October 12, 1983.

2/ Decreased consumption of the standard bait was noted at this bioassay interval; possibly related to the time of year (January).

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Lofgren, C. E., F. J. Bartlett, and C. E. Stringer. 1964. The acceptability of some fats and oils as food to imported fire ants. J. Econ. Ent. 75:601-602.

Project No: IFA 83-9

Project Title: Evaluation of Bait Toxicants for Treatment of Individual IFA Colonies

Project Leader: Dudley J. Adams

Small plot tests with three bait toxicants (MK-936, RO 13-5223, and Amdro) were conducted in Hancock County, Mississippi, in July 1983, to determine the effectiveness of simulated "homeowner treatments" with these products. Numerous studies comparing efficacy of these formulations applied broadcast by both aerial and ground equipment have been conducted, but only limited information on their effectiveness as individual colony treatments was available.

All formulations were applied at a rate of 5 Tbs. per ant colony to each colony in three 210' x 210' (1-acre) test plots. Efficacy of each formulation was determined by establishing 1/4-acre subplots within each test plot and monitoring treatment effects according to procedures described elsewhere (Harlan et al 1981, Collins 1982, Lofgren and Williams 1982).

As shown in Table 16, both MK-936 formulated as a .011% pregelled defatted corn bait and RO 13-5223 formulated as a 1% pregelled defatted corn bait provided acceptable control when applied at a rate of 5 Tbs. bait/IFA colony.

TABLE 16 . Evaluation of Bait Toxicants for Individual Mound Treatments.

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

Bait Formulation 1/	Pretreatment Population		Status of Population at Indicated Posttreat Interval (Weeks)								
	$\bar{X}$ No. Colonies Per Subplot	$\bar{X}$ Population Index	$\bar{X}$% Colony Mortality (4)	(11)	(24)	$\bar{X}$% Change in Pop. Index (4)	(11)	(24)	% Surviving Colonies with Brood (4)	(11)	(24)
MK-936 .011% PGD	20.3	366	11	56	88	-86	-82	-94	0	12	43
RO 13-5223 1% PGD	17.0	289	1.6	86	86	-82	-98	-94	0	0	43
Amaro (Standard)	9.0	132	51	0	0	-49	-26	-40	92	52	36
Untreated Check	18.3	331	0	4	0	+20	+32	-41	97	98	23

1/ All formulations were applied at a rate of 5 TBS./colony to all colonies within three 1-acre plots (replicates) in Hancock County, Mississippi, on July 28, 1983.

REFERENCES CITED

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

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

Lofgren, C. S. and D. F. Williams. 1982. Avermectin B_1a, a highly potent inhibitor of reproduction by queens of the red imported fire ant. Jour. Econ. Ent. 75:798-803.

PROJECT NUMBER: IFA 83-10

PROJECT TITLE: Impact of IFA Bait Toxicants on Non-Target Ant Species

PROJECT LEADERS: Dr. Daniel Wojcik [1] and Paul M. Bishop

Introduction.

A cooperative project to gain additional information on the impact of various fire ant toxicants on non-target ant species was initiated in October, 1983. As described in detail elsewhere in this report, a series of large scale field trials with Logic (R), Affirm (R) and Amdro (R) was conducted in the Fall of 1983 (Table 7). Casual observations at one test site, (Pounds Field, Tyler, Texas) indicated that a large and diverse myrmicine fauna was present prior to application of the various bait toxicants under evaluation. A pretreatment survey to determine the types and relative abundance of non-target ant species was conducted at Pounds Field on October 18-19, 1983. Post treatment surveys will be continued throughout 1984.

Methods.

Thirty bait stations were established within each test plot (test plots ranged in size from 50 to 139 acres as shown in Table 7 . Each bait station consisted of two soft drink bottle caps placed about 6" apart on the soil surface. One cap was baited with approximately 1 gram of fresh ground beef while the other was baited with a 2.5% honey-agar block. The location of each bait station was permanently marked with a wooden stake and Pramitol (R) herbicide to facilitate post treatment sampling the exact location sampled prior to treatment.

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Baited stations were left undisturbed for 1 hour and then all ants that were feeding at each bait station were collected by quickly placing the bottle caps in medicine vials with snap-tight lids. Ants were transported on ice to the laboratory where they were preserved in 70% isopropanol until they could be identified and quantified.

Results and Discussion.

Preliminary identifications of ants collected from baits yielded 16 species in 9 genera. Nest samples of an additional 3 species not collected on baits raised the totals to 19 species in 11 genera as follows:

Aphaenogaster sp

Atta texana

Crematogaster sp

Monomorium sp

Pheidole 5 sp

Pogonomyrmex sp

Solenopsis invicta

S. xyloni

S. (Diplorhoptrum) sp

Trachymyrmex septentrionalis

Conomyrma 2 sp

Iridomyrmex pruinosus

Paratrechina 2 sp

S. xyloni was known from this area from old published records but had not been recently collected. The presence of S. xyloni presents a complicating factor in identifying the fire ants collected on these plots. Post treatment collections will be made periodically during 1984.

APPENDIX 1

A Criteria for the Participation of Plant Protection and Quarantine (PPQ), Animal and Plant Health Inspection Service, U.S. Department of Agriculture (USDA), in the Control of Imported Fire Ant (IFA) with Cooperating States

The IFA program goal is to provide control techniques through methods development and environmental monitoring of treatment sites and maintain a limited survey in support of regulatory action 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. 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 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. The policy differs from past practices in that PPQ will not participate in pesticide distribution or a giveaway programs for ground treatment by individuals.

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.

Furthermore, PPQ will cost share in the purchase of pesticides for single mound treatments only when the treatment of public lands which are owed or controlled

by a governmental unit (i.e. State, county, city, or township) is involved. The intention is to assist with the treatment of high public-use area such as school grounds, picnic or park areas, cemeteries, etc.