# Summary of Imported Fire Ant Activities for 1978

Gulfport Methods Development Center
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These reports were assembled for the information of USDA, APHIS, PPQ 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.

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## I. Personnel Structure

1978 yas a year of transition for the Gulfport Methods Development Center. Several changes in employee structure and program responsibilities were made. Direction of the Citrus Blackfly (CBF) program was shifted from this laboratory to the Brownsville Methods Development Center at Brownsville, Texas.. The West Indian Sugar-cane Root Borer Methods Development Station in Mayaguez, Puerto Rico was closed down and reopened in Plymouth, Florida. More significantly, greater emphasis and subsequent personnel requirements were placed on the Mediterranean Fruit Fly (Medfly) program. As shown in Table 1, several employees previously assigned primarily to Imported Fire Ant (IFA) projects were reassigned to Medfly projects in Guatemala, Mexico and Hawaii. A total of 8.5 man years or 50% of the available man years were expended on IFA projects in 1978.

Table 1. Personnel Structure for Gulfport Methods Development Center
Fiscal Year 1978:

| Employee's Name | Grade | Title | Location | Man yrs. expended on indicated PPQ Program | | | |
|---|---|---|---|---|---|---|---|
| | | | | IFA | Medfly | CBF | WISRB |
| D. Adams | GS-7/8 | Bio.Technician | Gulfport, Ms. | 9/12 | 3/12 | | |
| A. Agostini | GS-11/5 | Agriculturist | Mayaguez, P.R. | | | | 1/12 |
| K. Barber | GS-4/6 | Accnt.Tech. | Gulfport, Ms. | 3/12 | 2/12 | | 1/12 |
| B. Clark | GS-5/6 | Bio. Technician | Gulfport,Ms. | 6/12 | 6/12 | | |
| H. Collins | GS-12/2 | Entomologist | Gulfport, Ms. | 11/12 | | | 1/12 |
| M. Cuevas | GS-7/7 | Bio. Technician | Gulfport, Ms. | 11/12 | 1/12 | | |
| E. Fairley | WG-5 | Maint.Worker | Gulfport, Ms. | 12/12 | | | |
| M. Gilbert | GS-5/9 | Secretary | Gulfport,Ms. | 5/12 | 6/12 | 1/12 | |
| A. Guenthner | GS-11/7 | Entomologist | Gulfport,Ms. | 2/12 | 10/12 | | |
| L. Herbaugh | GS-11/5 | Agriculturist | Plymouth, Fl. | | | | 2/12 |
| A. Ladner | GS-5/6 | Bio. Technician | Gulfport, Ms. | 9/12 | 3/12 | | |
| C. Mangum | GS-13/5 | Lab. Director | Gulfport, Ms. | 4/12 | 5/12 | 2/12 | 1/12 |
| C. Mauffray | GS-7/7 | Bio. Technician | Gulfport, Ms. | 10/12 | 2/12 | | |
| J. Medley | GS-12/10 | Entomologist | Gulfport, Ms. | 12/12 | | | |
| M. Miles | GS-9/3 | Bio. Technician | Gulfport,Ms. | 3/12 | 9/12 | | |
| J. O'Neal | GS-12/2 | Entomologist | Ft.Lauderdale,Fl. | | | 6/12 | |
| E. Ozaki | GS-12/5 | Agriculturist | Honolulu, Hawaii | | 6/12 | | |
| J. Spence | GS-11/9 | Chemist | Gulfport, Ms. | 3/12 | | 9/12 | |
| J. Stewart | GS-12/6 | Ag. Engineer | Gulfport, Ms. | 2/12 | 10/12 | | |
| Total Man Years | | | | 8.5 | 5.25 | 1.5 | .5 |

GRAND TOTAL --------15.75 Man Years

## 2. Ferriamicide Shelf life Studies

In January 1978, this laboratory initiated a series of tests to obtain information on the shelf life of ferriamicide bait. Originally, we had intended to test a single formulation of ferriamicide. However, during the course of our investigations, the formulation was changed several times due to various reasons. Over 20 different formulations of ferriamicide have been evaluated to date. Test procedures utilized were as follows:

Samples (usually 5 lb. bags) of each formulation received were stored in constant temperature cabinets at 4°C, 21°C, 36°C, 50°C, and room temperature. Periodically, subsamples were removed for bioassay of feeding acceptance and GLC Analysis. The GLC Analyses were conducted by the APHIS Environmental Monitoring Laboratory at Gulfport, Miss., and the results of those tests reported elsewhere. The bioassay for feeding acceptance was essentially the same as that employed by Lofgren et. al. (1961), i.e., the feeding activity of captive imported fire ant colonies on each ferriamicide sample was compared with that on a freshly prepared bait standard consisting of 15% soybean oil and 85% (w/w) ground corn cob. Each bait sample was tested on eight ant colonies (replicates). The acceptance ratio was computed in the following manner:

$$\text{Acceptance ratio} = \frac{\text{No. ants feeding on Ferriamicide Sample}}{\text{No. ants feeding on soybean oil Standard}}$$

An acceptance ratio with a value of less than 1.00 indicates that a given sample was less attractive than the standard. Values equal to or greater than 1.00 indicates that a sample was equally or more attractive than the standard.

Pertinent information such as ingredients, date prepared, etc. for each formulation tested appears in Table 2. Acceptance ratios for each formulation, holding temperature, and aging interval are shown in Table 3.

Table 2. Ferriamicide Formulations Tested by GMDC in 1978

| Test Series | Date Formulated | Formulation Number | Ingredients and other information |
|---|---|---|---|
| I. | 12/15/77 | None | Cold mix. Grit temp. 58°f.;Formula temp. 150° f. |
| II. | 3/2/78 | None | |
| III. | 3/23/78 | None | |
| IV. | 3/30/78 | None | Batch 1 = 10-5: Liquid temp. 212°f.<br>Batch 2 = 5-10; Liquid temp. 201°f. |
| V. | 4/6/78 | 10-41-Cont | Ferriamicide with no Fe $Cl_2$ |
| " | 4/6/78 | 10-42-P | Ferriamicide plus 1% Propylene Glycol.. No $FeCl_2$ |
| " | " | 10-41-PGCA | Ferriamicide plus .8% Propylene Glycol plus .2% citric acid. No $FeCl_2$ |
| " | " | 10-41-AM | Ferriamicide with Amine-Mirex Soln added to last layer. No Fe $Cl_2$ |
| " | " | 10-41-3PGCA | Ferriamicide plus 2.5% propylene Glycol plus .6% citric acid No Fe $Cl_2$ |
| VI. | 4/13/78 | 10-42-PCFI | Citric Acid, Fe $Cl_2$ propylene Glycol in pretreat layer. |
| " | " | 10-42-PG21 | Same as 10-42- PCFl, but P. Glycol (1%) added to Mirex layer. |
| " | " | 10-42-PG2.1 | Same as 10-42-PCFl but .1% P. Glycol on Mirex layer. |
| " | " | 10-42-PTG | Pretreated Grit, SBO, P. Glycol, citric acid, Fe $Cl_2$. |
| VII. | 4/20/78 | 10-47-2P6CA | 1st layer: 85% Grit, 5% Oil,<br>2nd layer: 7.23% Oil, 1.7% T- 1902, .05% Mirex, .09% P. Glycol, .024% Citric acid |
| " | 4/27/78 | 10-47-2P6CA | 1st layer: 85% Grit, 5% Oil<br>2nd layer: 7.23% Oil T-1902 1.7%, .05% Mirex, .09% P. Glycol, .024% citric acid |

Table 2 (continued)

| Test Series | Date Formulated | Formulation Number | Ingredients and other information |
|---|---|---|---|
| VII. | 4/27/78 | 10-48-A | 1st layer: 85% Grit, 5% Oil, P. Glycol .0096%, citric acid .0016%, $FeCl_2$ .0008%<br>2nd layer: 5.14% Oil, 1.7% T-1902, .05% Mirex .08% P. Glycol, .012% citric acid, .006% $Fe\ Cl_2$. |
| " | " | " | 1st layer: 85% Grit, 5% Oil<br>2nd layer: Oil 6.35%, Amine 1.7%, Mirex .05% P. Glycol. .8%, citric acid .2%. |
| VIII. | 5/24/78 | 10-52-A | 1st layer: 85% Grit, 8% Oil, 1.01% Antioxidant.<br>2nd layer: Oil 4.24%, Amoine 1.7%, mirex .05% |
| IX. | " | 10-54-A | 1st layer: 85% grit, 8% Oil, 1% Antioxidant<br>2nd layer: Oil. 3.25%, Amine 1.7%, mirex .05%, P. Glycol 1%. |
| X. | 6/12/78 | 10-56-A | 1st layer: 85% grit, 8% Oil, .91% Antioxidant<br>2nd layer: 4.14% oil, 1.7% Amine, .05% Mirex, 9.2% Propylene Glycol. |

Table 3 IFA Feeding Acceptance of Various Ferriamicide Formulations aged for the indicated intervals at the indicated temperatures.

| Bait Series and Other Designations | Age of Bait (Days) | Holding Temperature (Degrees Centigrade) | Acceptance Ratio 1/ |
|---|---|---|---|
| Series I, cold mix | 30 | Room | .41 |
| " " | 46 | Warehouse | .21 |
| " " | " | Room | .70 |
| " " | " | 21 | .39 |
| " " | " | 36 | .36 |
| " " | " | 50 | .10 |
| " " | 68 | Warehouse | .54 |
| " " | " | Room | .57 |
| " " | " | 21 | .41 |
| " " | " | 36 | .15 |
| " " | " | 50 | .03 |
| " " | 90 | Warehouse | 1.5 |
| " " | " | Room | .97 |
| " " | " | 21 | 1.0 |
| " " | " | 36 | .04 |
| " " | " | 50 | .01 |
| " " | 105 | Warehouse | .21 |
| " " | " | Room | .21 |
| " " | " | 21 | .16 |
| " " | " | 36 | 0 |
| " " | " | 50 | 0 |
| " " | 124 | Warehouse | .52 |
| " " | " | Room | .26 |
| " " | " | 21 | 1.30 |
| " " | " | 36 | .06 |
| " " | " | 50 | .02 |
| " " | 161 | Warehouse | .58 |
| " " | " | Room | .09 |
| " " | " | 21 | .37 |
| " " | " | 36 | .01 |
| " " | " | 50 | .01 |
| Series II | 5 | Room | .68 |
| " | 21 | 4 | .41 |
| " | " | Room | .24 |
| " | " | 21 | .14 |
| " | " | 36 | .23 |
| " | " | 50 | .01 |
| " | 46 | 4 | .46 |

Table 3 (continued)

| Bait Series and Other Designations | Age of Bait (Days) | Holding Temperature (Degrees Centigrade) | Acceptance Ratio 1/ |
|---|---|---|---|
| Series II | 46 | 4 | .46 |
| " | " | Room | .13 |
| " | " | 21 | .80 |
| " | " | 36 | .05 |
| " | " | 50 | .06 |
| " | 84 | 4 | .27 |
| " | " | Room | .44 |
| " | " | 21 | .71 |
| " | " | 36 | .01 |
| " | " | 50 | .01 |
| Series III | 4 | Room | .12 |
| " | 7 | Room | .27 |
| " | 14 | 4°C | .66 |
| " | " | Room | .34 |
| " | " | 21°C | .62 |
| " | " | 36°C | .42 |
| " | " | 50°C | .24 |
| " | 25 | 4 | .77 |
| " | " | Room | .54 |
| " | " | 21 | .54 |
| " | " | 36 | .68 |
| " | " | 50 | .22 |
| " | 63 | 4 | .75 |
| " | " | Room | .30 |
| " | " | 21 | .71 |
| " | " | 36 | .11 |
| " | " | 50 | .02 |
| Series IV, Batch 1 | 3 | Room | .92 |
| " Batch 2 | " | " | .64 |
| " Batch 2 | 19 | 4°C | 1.78 |
| " Batch 2 | " | " | .93 |
| " Batch 1 | " | Room | .24 |
| " Batch 2 | " | " | .34 |
| " Batch 1 | " | 21°C | 1.05 |
| " Batch 2 | " | " | .90 |
| " Batch 1 | " | 36°C | .38 |
| " Batch 2 | " | " | .15 |
| " Batch 1 | " | 50°C | .02 |
| " Batch 2 | " | " | .02 |

Table 3 (continued)

| Bait Series and Other Designations | Age of Bait (Days) | Holding Temperature (Degrees Centegrade) | Acceptance Ratio 1/ |
|---|---|---|---|
| Series IV, Batch 1 | 56 | 4 | 1.50 |
| " Batch 2 | " | " | .59 |
| " Batch 1 | " | Room | .34 |
| " Batch 2 | " | " | .21 |
| " Batch 1 | " | 21 | .69 |
| " Batch 2 | " | " | .34 |
| " Batch 1 | " | 36 | .01 |
| " Batch 2 | " | " | .01 |
| " Batch 1 | " | 50 | .01 |
| " Batch 2 | " | " | .01 |
| Series V, 10-31-CONT | 11 | Room | .66 |
| " 10-42-PG | " | " | .82 |
| " 10-41-PGCA | " | " | 1.20 |
| " 10-41-AM | " | " | 1.50 |
| " 10-41-3PGCA | " | " | 1.20 |
| Series VI 10-42-PGF1 | 4 | Room | .60 |
| " 10-42-PG21 | " | " | .59 |
| " 10-42-PG2.1 | " | " | .82 |
| " 10-42-PTG | " | " | .74 |
| Series VII, 10-48-A | 7 | Room | .09 |
| " " | 33 | " | .73 |
| " " | 53 | " | .61 |
| " " | " | 4 | .29 |
| " " | " | 50 | .23 |
| " 10-48-B | 7 | Room | .13 |
| " " | 33 | " | .40 |
| " " | 53 | " | .09 |
| " " | " | 4 | .29 |
| " " | " | 50 | .18 |
| " 10-47-2P6CA | 14 | Room | .23 |
| " " | 40 | " | 1.52 |
| " " | 60 | " | .46 |
| " " | " | 4 | .51 |
| " " | " | 50 | .29 |
| Series VIII 10-52-A | 2 | Room | .22 |
| " " | 6 | " | .73 |
| Series IX 10-54-A | 13 | Room | .84 |
| Series X 10-56-A | 14 | Room | 1.08 |
| " | 30 | 4 | 1.07 |
| " | 30 | Room | 1.05 |
| " | 30 | 50 | .54 |
| " | 44 | 4 | 1.17 |
| " | 44 | Room | .90 |
| " | 44 | 50 | .78 |
| " | 76 | 4 | 1.04 |
| " | 76 | Room | .40 |
| " | 76 | 50 | .10 |

1/ Average based upon observation of the feeding activity of IFA colonies (replicates)

3. Field Tests with Ferriamicide

Ferriamicide, a degradable formulation of mirex produced by the Mississippi Authority for the Control of Fire Ants, was evaluated for control of imported fire ants on non-agricultural land in late summer of 1978. The granular bait formulation (10-56-A) was applied broadcast at a rate of 1 lb. bait per acre (227 mg AI/acre) by MACFA owned helicopter equipped with a specially designed bait distribution system. A total of 18 different test plots ranging in size from 10 to 100 acres were treated between Aug. 25 and Aug. 31, 1978. All test plots were located in Central and South Mississippi. The degree of control was determined by counting all live ant colonies within three to eight subplots randomly located within each test plot. Counts were made prior to treatment and at 4, 8, and 12 weeks following treatment.

Pretreatment mound populations averaged 28 mounds per acre.Ferriamicide provided 69, 81 and 84% control at 4, 8, and 12 weeks respectively following treatment. Winter weather has prevented subsequent plot evaluations. However, they will be made when weather permits.

| Bait Formulation | Rate of Application/Acre | | Mean % reduction in active ant colonies at indicated Post-treatment interval 1/ | | |
|---|---|---|---|---|---|
| | AI | Bulk Bait | 4 wks. | 8 wks. | 12 wks |
| Ferriamicide | 227 mg | 1.0 lb | 69 | 81 | 84 |
| Untreated check | - | - | 0 | 10 | 0 |

1/ Mean based on a total of 18 test plots.

4. Nursery Potting Soil Tests

The Federal IFA Quarantine (#81) explains the conditions governing the issuance of certificates and permits to authorize the movement of regulated articles into non-regulated areas. One of the provisions for certification is treatment of articles in accordance with administratively-approved procedures. One procedure outlined therein is the insecticidal treatment of potting and bench soil. This currently involves the incorporation of chlordane dust into potting soil at a rate of 5 lb. actual pesticide per acre (4 oz. of the 5% dust per cu. yd.). This application provides three years of certification for the treated soil.

In anticipation of an eventual ban on the use of chlordane(now scheduled for December 1979), this laboratory initiated a screening program to evaluate registered "soil" insecticides in April 1976. This program has been conducted on a continuing basis, and results to date are reported here. Test procedures used to evaluate all Experimental insecticides were as follows: A potting soil mixture in a 1:1:1 ration of sand, peat moss, and pine bark was prepared by mixing in a portable cement mixer. Added to this were granular formulations of various toxicants at rates of 5 and 10 lbs. AI per 3-inch acre (equivalent to 5.6 and 11.2 grams AI per cubic yard). The cement mixer was operated for one hour after the addition of the experimental insecticides.

The insecticidal mixes were then poured into one-gallon plastic pots and weathered outdoors under natural conditions for one month prior to the first bioassay and GLC Analysis. Bioassays were conducted by placing 40 cc of

fragmented IFA colonies containing all life stages on treated soil. The test "colonies" were observed for two weeks or until mortality of all life forms occurred. The results of this type of test are qualitative in nature and, therefore, not suitable for statistical analysis. However, the use of simulated or fragmented colonies more closely duplicates natural infestations than would a quantitative test wherein a given number of worker ants are introduced onto treated soil and the results expressed as percent mortality. Since regulatory treatments must provide 100% control of the target pests, insecticides or rates which allowed survival of any life form from a test colony were considered ineffective and, therefore, not included in subsequent bioassays.

Results are shown in Table 4. Although most compounds showed very little effectiveness after the initial one month posttreatment bioassay, several compounds have shown some potential as a chlordane replacement. Counter (American Cyanamid) and Dyfonate (Stauffer) at 11.2 grams AI/cu.yd. were effective for six months, but became ineffective after that interval. CGA 4-803 and CGA 4-811 (Geigy) were effective at the last bioassay which was conducted 18 months posttreatment. However, the compound which has shown the most potential is Dursban (Dow). At 11.2 grams AI/cu. yd, this compound continued to be effective after weathering for 30 months, while 2.2 gram AI/cu. yd. was effective for 12 months. Various formulations of Dursban as well as replication in time of previously tested rates, are being tested on a continuing basis.

Table 4. Summary of Nursery Potting Soil Tests

| Insecticide & Formulation Used | Type Potting Soil | Grams AI/ Cu. Yd. | Date Mixed | BIOASSAY | | GLC | |
|---|---|---|---|---|---|---|---|
| | | | | Date of Last Bioassay | Months Effective as indicated by last Bioassay | Date of Last GLC Analysis | Results of GLC Analysis in parts per million |
| Chlordane 10G | Standard Lab Mix | 11.2 | 4/10/76 | 12/5/78 | 32 | 12/28/78 | 17.9 |
| Chlordane 10G | " | 5.6 | 4/10/76 | 12/5/78 | 32 | 12/28/78 | 7.3 |
| Chlordane 10G | " | 2.2 | 4/10/76 | 8/23/78 | 29 | 9/2/78 | 5.4 |
| Dursban 10G | " | 11.2 | 6/1/76 | 12/3/78 | 30 | 12/28/78 | 2.7 |
| Dursban 10G | " | 5.6 | 8/25/76 | 9/7/78 | 21 | 9/26/78 | 2.2 |
| Dursban 10G | " | 2.2 | 9/15/76 | 11/11/77 | 12 | 11/11/78 | 1.4 |
| Dursban 10G | " | 112.0 | 10/1/76 | 12/12/78 | 26 | 12/28/78 | 127.0 |
| Dursban 10G | " | 33.6 | 10/1/76 | 12/12/78 | 26 | 12/28/78 | 23.9 |
| Dursban 10G | " | 22.4 | 10/1/76 | 12/12/78 | 26 | 12/28/78 | 12.9 |

Table 4 (continued)

| Insecticide & Formulation Used | Type Potting Soil | Grams AI/ Cu. Yd. | Date Mixed | BIOASSAY Date of Last Bioassay | BIOASSAY Months Effective as indicated by last Bioassay | GLC Date of Last GLC Analysis | GLC Results of GLC Analysis in parts per million |
|---|---|---|---|---|---|---|---|
| Dyfonate 15G | Std.Lab Mix | 11.2 | 9/3/76 | 6/1/77 | 8 | 6/1/77 | 16.8 |
| Dyfonate 15G | " | 5.6 | 9/3/76 | 11/30/76 | 1 | 11/9/77 | 4.8 |
| Diazinon 2G | " | 11.2 | 9/14/76 | 11/10/76 | 1 | - | - |
| Diazinon 2G | " | 5.6 | 9/14/76 | 10/12/76 | None | - | - |
| Baygon 2G | " | 11.2 | 10/1/76 | 10/29/76 | None | - | - |
| Baygon 2G | " | 5.6 | 10/4/76 | 10/29/76 | None | - | - |
| Furadan 10G | " | 11.2 | 10/29/76 | 11/10/76 | None | - | - |
| Furadan 10G | " | 5.6 | 10/27/76 | 11/10/76 | None | - | - |

Table 4. (continued)

| Insecticide & Formulation Used | Type Potting Soil | Gram AI/ Cu. Yd | Date Mixed | BIOASSAY Date of Last Bioassay | BIOASSAY Months Effective as indicated by last Bioassay | GLC Date of Last GLC Analysis | GLC Results of GLC Analysis in parts per million |
|---|---|---|---|---|---|---|---|
| Thiodan 3D | Std.Lab Mix | 11.2 | 10/8/76 | 10/29/76 | None | - | - |
| Thiodan 3D | " | 5.6 | 10/4/76 | 10/29/76 | None | - | - |
| Counter 15G | " | 11.2 | 10/12/76 | 6/10/77 | 7 | 6/18/77 | 0.12 |
| Counter 15G | " | 5.6 | 10/19/76 | 4/22/77 | 4 | 3/15/77 | 0.1 |
| Cythion 5D | " | 11.2 | 10/28/76 | 12/1/76 | None | - | - |
| Cythion 5D | " | 5.6 | 10/28/76 | 12/1/77 | None | - | - |
| Bendiocard 2.5G | " | 11.2 | 11/10/76 | 12/1/76 | None | - | - |
| Bendiocard 2 5G | " | 5.6 | 11/10/76 | 12/1/77 | None | - | - |
| Bux 10G | " | 11.2 | 12/1/76 | 1/9/77 | None | - | - |
| Bux 10G | " | 5.6 | 10/1/76 | 2/9/77 | None | - | - |

Table 4 (continued)

| Insecticide & Formulation Used | Type Potting Soil | Grams AI/ Cu. Yd. | Date Mixed | BIOASSAY Date of Last Bioassay | BIOASSAY Months effective as indicated by last Bioassay | GLC Date of Last GLC Analysis | GLC Results of GLC Analysis in parts per million |
|---|---|---|---|---|---|---|---|
| Geigy Ga 4-803(4E) | Std.Lab Mix | 11.2 | 1/5/77 | 6/1/78 | 18 | - | - |
| Geigy Ga 4-811(4E) | " | 11.2 | 1/10/77 | 6/1/78 | 18 | - | - |
| Temik 10G | " | 11.2 | 2/15/77 | 3/15/77 | None | - | - |
| Temik 10G | " | 5.6 | 2/15/77 | 3/15/77 | None | - | - |
| Orthene 5G | " | 11.2 | 4/22/77 | 5/17/77 | None | - | - |
| Orthene 5G | " | 5.6 | 4/22/77 | 5/17/77 | None | - | - |
| Disyston 15G | " | 11.2 | 5/14/77 | 7/20/77 | None | - | - |
| Dasanit 10G | " | 11.2 | 7/20/77 | 8/16/77 | None | - | - |
| Disyston 10G | " | 11.2 | 10/18/77 | 11/30/77 | None | - | - |

Table 4 (continued)

| Insecticide & Formulation Used | Type Potting Soil | Grams AI/ Cu. Yd. | Date Mixed | BIOASSAY Date of Last Bioassay | BIOASSAY Months Effective as indicated by last Bioassay | GLC Date of Last GLC Analysis | GLC Results of GLC Analysis in parts per million |
|---|---|---|---|---|---|---|---|
| Dursban 0.5G | Std.Lab Mix | 11.2 | 3/17/78 | 10/24/78 | 7 | 11/8/78 | 6.6 |
| Dursban 0.5G | " | 5.6 | 3/17/78 | 10/24/78 | 7 | 11/8/78 | 2.1 |
| Chlordane 10G | " | 11.2 | 3/17/78 | 10/24/78 | 7 | 11/8/78 | 8.7 |
| Chlordane 10G | " | 5.6 | 3/17/78 | 10/24/78 | 7 | 11/8/78 | 5.0 |
| Dursban 0.5G | " | 2.2 | 3/17/78 | 10/24/78 | 7 | 11/8/78 | 0.5 |
| Dursban 0.5G | Winter Garden Florida | 11.2 | 5/12/78 | 9/14/78 | 4 | 9/29/78 | 26.7 |
| Dursban 0.5G | Pure sand | 11.2 | 5/16/78 | 9/14/78 | 4 | 9/29/78 | 4.8 |

Table 4 (continued)

| Insecticide & Formulation Used | Type Potting Soil | Grams AI/ Cu. Yd. | Date Mixed | BIOASSAY Date of Last Bioassay | BIOASSAY Months Effective as indicated by last Bioassay | GLC Date of Last GLC Analysis | GLC Results of GLC Analysis in parts per million |
|---|---|---|---|---|---|---|---|
| Dursban 0.5G | Pure Sand | 5.6 | 5/18/78 | 9/29/78 | 4 | 9/29/78 | 4.5 |
| Dursban 0.5G | Zellwood, Fl. | 11.2 | 5/22/78 | " | 4 | " | 58.4 |
| Oftanol 15G | Std.Lab Mix | 11.2 | " | " | 4 | 10/3/78 | 25.1 |
| Oftanol 15G | " | 5.6 | " | " | 4 | " | 9.6 |
| Oftanol 15G | " | 2.2 | 7/18/78 | 8/23/78 | None | 8/23/78 | 5.0 |
| Oftanol 15G | " | 5.6 | 7/19/78 | 11/28/78 | 3 | 12/23/78 | 10.9 |
| Oftanol 15G | " | 11.2 | 7/20/78 | " | 3 | 12/23/78 | 17.8 |
| Dursban 0.5G | " | 5.6 | 8/2/78 | 9/12/78 | 1 | 9/29/78 | 9.7 |
| Dursban 0.5G | " | 11.2 | 8/4/78 | 9/12/78 | 1 | 9/29/78 | 17.6 |
| Akton 15G | " | 2.2 | 11/15/78 | 12/12/78 | None | - | - |

Table 4 (continued)

| Insecticide & Formulation Used | Type Potting Soil | Grams AI/ Cu. Yd. | Date Mixed | BIOASSAY Date of Last Bioassay | BIOASSAY Months Effective as indicated by last Bioassay | GLC Date of Last GLC Analysis | GLC Results of GLC Analysis in parts per million |
|---|---|---|---|---|---|---|---|
| Akton 15G | Std.Lab Mix | 5.6 | 11/16/78 | 12/12/78 | 1 | - | - |
| Akton 15G | " | 11.2 | 11/17/78 | 12/12/78 | 1 | - | - |

## 5. Evaluation of Dursban as a Regulatory Treatment for use in Grass Sod and Ornamental Plant Nurseries

Prevention of spread of imported fire ants from infested areas into non-infested areas has been the goal and responsibility of state and federal regulatory agencies for many years. Quarantines which prohibit or restrict the movement of articles which might harbor incipient infestations were invoked to prevent spread of ants.

In order to comply with quarantine regulations, articles capable of harboring ants such as nursery stock, grass sod, earth-moving equipment, etc. must be certified as being pest-free by local regulatory officials. Certification is usually based upon a treatment that provides 100% assurance that ants will not be transported by or on the regulated article.

Chlorinated hydrocarbon insecticides such as heptachlor and chlordane were used for many years to certify movement of nursery stock, both potted and balled and burlap, grass sod, etc. This treatment is effective, practical and economical. However, registration of chlordane for this purpose will be discontinued after December 1979. Since the risks associated with movement of nursery stock and grass sod are far greater than those associated with any other article or product, the need for an alternate insecticide treatment is readily apparent.

Preliminary studies by this laboratory have shown that Dursban may be effective for control of imported fire ants in certain situations; specifically when mixed into nursery potting soil. Information was needed on the efficacy of Dursban when applied to field-grown

ornamental plant nurseries and to sod farm operations where grass sod and nursery stock are grown, harvested, and shipped to distant markets.

A. Ornamental Plant Nursery Test; Crossville, Ala.

On April 7, 1978, a test to evaluate Dursban under actual nursery conditions (field grown ornamentals) was initiated. All experimental treatments were applied to one acre (approximately) test plots at Crossville Nurseries, Crossville, Alabama. Treatments were as follows:

1. Chlordane 20G, Surface application at 10.0 lbs. AI/acre
2. Chlordane 20G, Surface application at 4.8 lbs. AI/acre
3. Chlordane 20G, Incorporated to 3" depth at 10.0 lbs. AI/acre
4. Chlordane 20G, Incorporated to 3" depth at 5.0 lbs. AI/acre
5. Dursban 15G, Incorporated to 3" depth at 5.3 lbs. AI/acre
6. Dursban 15G, Incorporated to 3" depth at 10.0 lbs.AI/acre
7. Dursban 15G, Incorporated to 3" depth at 2.3 lbs. AI/acre
8. Dursban 4EC, Incorporated to 3" depth at 3.4 lbs. AI/acre
9. Dursban 4EC, Incorporated to 3" depth at 6.0 lbs. AI/acre
10. Dursban 4EC, Incorporated to 3" depth at 8.4 lbs. AI/acre

Granular materials were applied by a tractor-mounted Skibbee® applicator. EC formulations were applied by a John Deer Hiboy® utilizing Tee-Jet® nozzles (8004), 20 lbs. PSI and operated on a 30 ft. swath. A standard soil sampler was used to remove fifty 3" soil cores from each test plot 1, 3, and 6 months after treatment. The fifty cores were then composited, sifted and uniformly mixed prior to the bioassay and GLC Analysis.

Effectiveness of each treatment was determined by the following procedures:

A. Bioassay: Fragmented IFA colonies composed of ca. 100 cc of ants (immature forms, workers, and alates), were placed onto composited soil samples (3 replicates for each treatment) taken from the different test plots. Mortality observations were recorded at 1, 2, 3, 5, 7, 10 and 14 days after introducing the test colonies onto the treated soil.

B. GLC Analysis: Hexane extracts of composited soil samples were injected into a Tracor® MT-220 gas chromatograph fitted with electron capture detectors. The 6' glass columns used were 3% OV-1 on gas chrom Q, 100/120 mesh, and a mixture of 1.5% OV-17, 1.95% QF-1 on gas chrom Q, 100/120 mesh operating parameters were: oven temperature 195°C.; detector temperature 215°C; inlet temperature 235°C. Carrier gas was nitrogen at ca. 100 ml/minute.

Results:

Results of the 1, 3 and 6 month posttreatment bioassay and GLC analyses are shown in Tables 1, 5, 6 and 7. These data are subjective and, therefore, not suitable for statistical analysis. However, as previously mentioned, when considering regulatory treatments, less than 100% kill is totally unacceptable.

Table 5. Thirty-day Posttreatment Evaluation of treated soils from Crossville Nursery.

| Plot Treatment and Rate/Acre AI | Summary of Bioassay Results 1/ | GLC Analysis (residues in PPM) |
|---|---|---|
| Chlordane 10# Surface | Test colonies killed in 3 days | 10.4 |
| Chlordane 4.8# Surface | Test colonies killed by 10th day | 3.5 |
| Chlordane 10# Incorp. | Test colonies killed by 7th day | 10.2 |
| Chlordane 5# Incorp. | Test colonies killed by 10th day | 5.5 |
| Dursban G. 5# Incorp. | Test colonies killed by 3rd day | 2.9 |
| Dursban G. 10# Incorp. | Test colonies killed by 3rd day | 6.1 |
| Dursban G. 2.3# Incorp. | Only few major workers survived 14 days | .9 |
| Dursban EC. 3.4# Incorp. | Test colonies killed by 3rd day | 2.1 |
| Dursban EC. 6.0# Incorp. | Test colonies killed by 3rd day | 3.0 |
| Dursban EC. 8.4# Incorp. | Test colonies killed by 3rd day | 5.5 |
| Untreated Check | Complete survival of all colonies | |

1/ 3 replicates (colonies) per treatment.

Table 6. 90-day Posttreatment Evaluation of treated soil from Crossville Nursery.

| Plot Treatment and Rate/Acre AI | Summary of Bioassay results 1/ | GLC Analysis (Residues in PPM) |
|---|---|---|
| Chlordane 10# Surface | Test colonies killed in 5 days | 11.0 |
| Chlordane 4.8# Surface | Test colonies killed in 5 days | 3.2 |
| Chlordane 10# Incorp. | Test colonies killed in 7 days | 7.3 |
| Chlordane 5# Incorp. | Test colonies killed in 7 to 14 days | 3.1 |
| Dursban G. 5# Incorp. | Test colonies killed in 5 days | .98 |
| Dursban G. 10# Incorp. | Test colonies killed in 3 days | 4.2 |
| Dursban G. 2.3# Incorp. | Test colonies killed in 10 days | .81 |
| Dursban EC, 3.4# Incorp. | Test colonies killed in 3 days | .90 |
| Dursban EC, 6.0# Incorp. | Test colonies killed in 3 to 10 days | 1.4 |
| Dursban EC, 8.4# Incorp. | Test colonies killed in 7 to 14 days | 1.3 |
| Untreated Check | All colonies survived 14 day exposure period | - |

1/ 3 replicates (colonies) per treatment.

Table 7. Six-Month Posttreatment Evaluation of treated soils from Crossville Nursery.

| Plot Treatment and Rate/Acre AI | Summary of Bioassay Results 1/ | GLC Analysis (REsidues in PPM) |
|---|---|---|
| Chlordane 10# Surface | Test colonies killed in 10 days | 7.4 |
| Chlordane 4.8# Surface | Few alates survived; all affected; expected to die | 3.1 |
| Chlordane 10# Incorp. | Few alates survived; all affected; expected to die | 5.6 |
| Chlordane 5# Incorp. | Test colonies kllled in 14 days | 7.0 |
| Dursban G. 5# Incorp. | Small number of majors survived 14 day exposure | .29 |
| Dursban G. 10# Incorp. | A few alates survived 14 day exposure | .74 |
| Dursban G. 2.3# Incorp | All colonies live, healthy, not affected | .23 |
| Dursban EC 3.4# Incorp | Test colonies killed by 14th day | .31 |
| Dursban EC 6.0# Incorp. | Test colonies killed in 10 to 14 days | .37 |
| Dursban EC 8.4# Incorp. | Test colonies killed in 7 to 14 days | .71 |
| Untreated Check | All colonies survived 14 day exposure | - |

1/ 3 replicates (colonies) per treatment.

B. Sod Farm Test; Auburn, Ala.

On May 24, 1978, a test to evaluate Dursban under grass sod farm conditions was initiated. All experimental treatments were applied to 1-acre test plots at Beck's Turf Nursery, Auburn, Alabama. Treatments were as follows:

1. Dursban 4EC, Incorporated at 2.5 lbs. AI/acre
2. Dursban 4EC, Incorporated at 5.0 lbs. AI/acre
3. Dursban 4EC, Incorporated at 10.0 lbs. AI/acre
4. Chlordane 20G, Incorporated at 4.9 lbs. AI/acre
5. Chlordane 20G, Incorporated at 10.9 lbs. AI/acre
6. Dursban 15G, Incorporated at 2.4 lbs. AI/acre
7. Dursban 15G, Incorporated at 5.5 lbs. AI/acre
8. Dursban 15G, Incorporated at 9.7 lbs. AI/acre

Granular materials were applied by a tractor-mounted Skibbee® applicator. EC formulations were applied by a tractor-mounted spray rig utilizing Tee-Jet® nozzles (8004), 30 PSI, and operated on a 30-ft. swath. Effectiveness of each treatment was determined by the procedures described previously in Sections 5A and 5B.

Results

Results of the 1, 3 and 6 month posttreatment bioassays and GLC analyses are presented in Tables 8, 9 and 10.

Table 8. Thirty-day Posttreatment Evaluation of Treated soil from Beck's Sod-farm.

| Plot Treatment and Rate/Acre AI 1/ | Summary of Bioassay Results 2/ | GLC Analysis (Residues in PPM) |
|---|---|---|
| Dursban 4E, 2.5 # | Major workers (<100) survived 14 day exposure period | .79 |
| Dursban 4E, 5.0 # | Major workers (<100) survived 14 day exposure period | .71 |
| Dursban 4E, 10.0 # | Test colonies killed in 2 days | 2.9 |
| Chlordane 20G, 4.9 # | Test colonies killed in 5 days | 9.5 |
| Chlordane 20G, 10.0 # | Test colonies killed in 5 days | 24.0 |
| Dursban 15G, 2.4 # | Test colonies killed in 7 days | 1.1 |
| Dursban 15G, 5.2 # | Test colonies killed in 2 days | 1.9 |
| Dursban 15G, 9.7 # | Test colonies killed in 3 days | 3.4 |
| Untreated check | All colonies survived 14 day exposure period | - |

1/ All treatments incorporated to 3" depth with a Roto-tiller ®

2/ Three replicates (colonies) per treatment.

Table 9. 90-day Posttreatment Evaluation of Treated soil from Beck's Sod Farm.

| Plot Treatment and Rate/ACRE AI | Summary of Bioassay Results 2/ | GLC Analysis (Residues in PPM) |
|---|---|---|
| Dursban 4E, 2.5 # | Large proportion of colonies survived 14 day exposure period | .12 |
| Dursban 4E, 5.0# | Large proportion of colonies survived 14 day exposure period | .21 |
| Dursban 4E, 10.0 # | Major workers survived 14 day exposure period | 1.00 |
| Chlordane 20G, 4.9 # | Test colonies killed in 7 days | 6.40 |
| Chlordane 20G, 10.0 # | Test colonies killed in 5 days | 12.90 |
| Dursban 15G, 2.4 # | Large number of major workers survived 14 day exposure period | .46 |
| Dursban 15G, 5.2# | Large number of major workers survived 14 day exposure period | .77 |
| Dursban 15G, 9.7 # | Test colonies killed in 5 days | 1.40 |
| Untreated check | All colonies survived 14 day exposure period | - |

1/ All treatments incorporated to 3" depth with a Roto-Tiller. (R)

2/ Three replicates (colonies) per treatment.

Table 10. Six month Posttreatment Evaluation of Treated soils from Beck's Sod Farm

| Plot treatment and Rate/Acre AI 1/ | Summary of Bioassay Results 2/ | GLC Analysis (Residues in PPM) |
|---|---|---|
| Dursban 4E, 2.5# | All colonies live, healthy, apparently not affected | .05 |
| Dursban 4E, 5.0# | All colonies live, healthy, apparently not affected | .09 |
| Dursban 4E, 10.0# | All colonies live, healthy, apparently not affected | .34 |
| Chlordane 20G, 4.9# | Complete mortality of all colonies by 10th day of exposure | 5.30 |
| Chlordane 20G, 10.0# | Complete mortality of all colonies by 10th day of exposure | 5.40 |
| Dursban 15G, 2.4# | All colonies live, healthy, apparently not affected | .05 |
| Dursban 15G, 5.2# | All colonies live, healthy, apparently not affected. | .17 |
| Dursban 15G, 9.7# | Large numbers of majors survived; minors killed | .41 |
| Untreated check | All colonies survived 14 day exposure period | - |

1/ All treatments incorporated to 3" depth with a Roto-Tiller (R).

2/ Three replicates (colonies) per treatment.

6. Evaluation of Dursban Drench Treatment for Certification of Grass Sod

The potential value of Dursban for imported fire ant regulatory treatments has been discussed in previous sections of this report. Due to the great diversity of plant nursery operations, many different use patterns are required for a regulatory pesticide.

One such use pattern would be the application of a high volume drench treatment applied immediately before harvest to certify shipment of grass sod. The dense heavy thatch associated with commercial sod production requires a high volume spray to insure adequate coverage of the target area. If effective, high volume sprays also have potential for use in controlling ants in non-agricultural areas such as parks, playgrounds and cemetaries.

On July 12, 1978, a high volume Dursban spray was applied to a 1.5 acre grass sod test plot located near Gulfport, Miss. Rate of application was 11.6 lbs. AI per acre in 234 gallons of water (.05 lbs. AI/gallon).

The spray was applied with a FMC Model FG 1010 high pressure sprayer equipped with two TK 30 flood jet nozzels. Prior to treatment, three 1/4 acre check plots were established within the treated area, and the number of active IFA colonies per check plot was recorded, Subsequent counts of the number of active ant colonies per plot were made at 1, 4, 8 and 16 weeks posttreatment.

Soil samples (collected by the standardized procedure) were taken pretreatment, 0 day (immediately after treatment), 1 week, 2 weeks, 4 weeks and 16 weeks posttreatment. These samples' were then subjected to GLC analysis to determine residue levels remaining in the soil at the various sampling intervals.

Results of this test are shown in Tables 11 and 12. Although good control of active ant colonies was obtained, the value of this treatment for a regulatory treatment is questionable since rapid and total kill would be much more desirable. However, the 90% reduction in ant colonies at 16 weeks posttreatment is encouraging and might be considered satisfactory in the other facets of control mentioned above.

Additional checks will be made to ascertain whether 100% control will eventually be achieved. More testing, utilizing higher rates and volume of spray solutions, seem justified and are planned for next season.

Table 11. Evaluation of Dursban Drench Treatment [1/] for Control of Imported Fire Ants
Gulfport, Ms. - July 12, 1978.

| Treatment | Sub-Plot | Pre-treat mound count | % Reduction in active IFA colonies at indicated post treat intervals | | | |
|---|---|---|---|---|---|---|
| | | | 1 week | 4 weeks | 8 weeks | 16 weeks |
| 11.6 lbs. Active Dursban per acre in 234 gallons water | A | 6 | 66 | 66 | 86 | 100 |
| | B | 7 | 72 | 86 | 100 | 100 |
| | C | 6 | 17 | 84 | 50 | 66 |
| | Total | 19 | 53 | 79 | 79 | 90 |
| Untreated Check | A | 3 | 0 | 0 | 0 | 0 |
| | B | 3 | 33 | 0 | 0 | 33 |
| | C | 7 | 0 | 0 | 14 | 0 |
| | Total | 13 | 8 | 0 | 8 | 0 |

Table 12. Residues of Dursban in Soil from a grass sod plot treated with 11.6 lbs. AI/Acre Gulfport, Ms. - July 12, 1978

| Sampling interval | Residues in PPM as determined by GLC Analysis |
|---|---|
| Pretreatment | Negative |
| 0 day (immediately after treatment) | 9.5 |
| 1 week Post treatment | 6.3 |
| 2 weeks Post treatment | 3.7 |
| 4 weeks Post treatment | 4.4 |
| 8 weeks Post treatment | 1.5 |
| 16 weeks Post treatment | 1.5 |

7. Bioassay of nursery soil samples submitted for GLC Analysis:

The phenomenon of "binding" of organochlorine pesticides to soil particles under certain conditions (primarily high organic matter) is well documented in the scientific literature. While in a "bound" state, the organochlorine molecules are not available as an insecticide. Treatment of nursery potting soil with 4 ounces of 5% chlordane dust/cu. yard is specified in PPQ Manual 805-25.2240. On one or more occasions, PPQ Inspectors have noted live ant colonies in potting soil which had been treated and did contain chlordane as indicated by GLC analysis. Apparently, the chlordane was in a "bound" state, but was released by the hexane extraction process conducted prior to GLC analysis.

In an effort to determine how widespread this problem might be, bioassays of nursery samples which are submitted to this laboratory by PPQ Inspectors from the Southeastern Region for routine GLC analysis were conducted. The bioassay procedure used was as follows: Each soil sample was divided into 3 replicates, then one hundred gram aliquots of moistened soil samples were placed in 473 ml glass jars. Afterwards, 100 worker ants were placed into each jar with the soil. After 7 days of exposure to the soil, the number of surviving ants was recorded. The percent mortality obtained for each of the 44 samples tested to date was then compared to the previously obtained GLC analysis and is shown in Table 13.

Table 13. Comparison of Bioassay and GLC Analysis of Nursery Soil Samples submitted for Routine Analysis

| Laboratory Sample Acquisition Number | BIOASSAY RESULTS % Mortality after 7 days exposure 1/ to Indicated Sample Number | | | GLC RESULTS Chlordane Residues, PPM |
|---|---|---|---|---|
| | Test I | Test II | Avg. | |
| 2186 | 85 | 90 | 80 | 3.9 |
| 2187 | 100 | 100 | 100 | 114.0 |
| 2188 | 100 | 100 | 100 | 7.7 |
| 2190 | 100 | 100 | 100 | 8.6 |
| 2194 | 97 | 98 | 98 | 11.1 |
| 2195 | 100 | 100 | 100 | 33.1 (+33.3 PPM Heptachlor) |
| 2196 | Escaped | 100 | 100 | 7.8 (+ 5.8 PPM Heptachlor) |
| 2197 | 25 | 42 | 34 | Negative |
| 2199 | 100 | 100 | 100 | 42.7 |
| 2200 | 56 | 69 | 63 | .55 |
| 2201 | 71 | 100 | 86 | .50 |
| 2202 | 100 | 90 | 95 | 12.1 |
| 2203 | 100 | 100 | 100 | 70.3 |
| 2204 | 100 | 100 | 100 | 28.4 (+ 7.6 PPM Heptachlor |
| 2205 | 100 | 100 | 100 | 2.2 |
| 2206 | 99 | 57 | 78 | 2.8 |
| 2207 | 100 | 70 | 85 | 2.02 |
| 2208 | 100 | 100 | 100 | 1.7 |
| 2223 | 61 | 40 | 51 | .23 |
| 2224 | 100 | 93 | 97 | 5.1 |
| 2225 | 100 | 92 | 96 | 1.2 |
| 2226 | 37 | 62 | 50 | Negative |
| 2189 | 100 | 100 | 100 | 18.4 |
| 2210 | 100 | 100 | 100 | |

Table 13 (continued)

| Laboratory Sample Acquisition Number | BIOASSAY RESULTS % Mortality after 7 days exposure 1/ to Indicated Sample Number | | | GLC RESULTS Chlordane Residues, PPM |
|---|---|---|---|---|
| | Test I | Test II | Avg. | |
| 2217 | 100 | 100 | 100 | 1.9 |
| 2218 | 100 | 100 | 100 | 2.5 |
| 2219 | 100 | 100 | 100 | 2.9 |
| 2220 | 100 | 100 | 100 | 1.8 |
| 2221 | 100 | 34 | 67 | .35 |
| 2222 | 100 | 100 | 100 | 2.5 |
| 2285 | 100 | 18 | 59 | 1.7 |
| 2286 | 100 | 100 | 100 | 47.3 |
| 2290 | 100 | 100 | 100 | 11.5 |
| 2300 | 91 | | | 7.1 |
| 2301 | 100 | | | 16.8 |
| 2302 | 100 | | | 67.4 |
| 2305 | 100 | | | 58.6 |
| 2306 | 45 | | | .03 |
| 2307 | 100 | | | 30.6 |
| 2308 | 100 | | | 2.9 (+ 7.6 PPM Dieldrin |
| 2309 | 90 | | | 7.8 |
| 2310 | 100 | | | 15.9 |
| 2285 | 33 | | | 1.7 |
| 2286 | 100 | | | 47.3 |

1/ Average of 3 replicates, 100 worker ants per replicate.

8. Field Tests with AC-217,300 applied as a bait toxicant

Results of several small plot field tests with various rates and formulations of experimental IFA bait toxicants produced by the American Cyanamid Corporation is summarized herein. All test plots were located in IFA infested improved permanent pastures in either Harrison County, Mississippi; Pearl River County, Mississippi Forrest County, Mississippi; or Autauga County, Alabama (near Montgomery). The bait was applied to plots ranging in size from one to ten acres with a tractor-mounted granular applicator. Results of each test are shown in attached tables 14 through 20. All data were corrected for check mortality by Abbott's Formula. Excessive check mortality experienced in several of the tests obscured interpretation of the results.

A total of 4 different toxicants were evaluated, but the most promising appears to be AC-217,300. Due to numerous changes in the formulation of this compound, the results obtained in any one test cannot be directly compared with the results obtained in others. The results of the first two tests (Tables 14 and 15) were not encouraging. However, some improvement in performance was noted in test three (Table 16) and in subsequent tests. This improvement in performance is thought to be related to improvements made in the formulation by the manufacturer. One of the problems with AC-217,300 has been soluability in soybean oil. This problem has apparently been overcome to some degree by the use of a co-colvent system. A new

carrier, puffed corn (produced by Quaker Oats Company) was evaluted in Test five (Table 18) and subsequent tests. The BB size pellets of this carrier absorb 30% oil by weight and are more friable than corn cob grits. Ants are therefore able to harvest more oil-toxicant mixture per unit weight of bait formulation.

The data from these field tests show that AC-217,300 has good potential as a toxicant for fire ant control; however, additional studies are necessary to clarify the variations in results from location to location. Particular attention must be paid to the effects of population levels and colony size, the effects of natural food abundance on acceptance of the bait, and the influence of climatic factors. The fact that the extruded corn pellet formulation was more effective than the corn cob grits undoubtedly reflects the fact that the ants can remove the soybean oil and toxicant from this carrier more easily. Obviously then, more research must be done to develop the most effective formulation. In addition we have not, as yet, determined the proper toxicant concentration level in the bait for maximum effectiveness. We do have some data that indicate increased control can be obtained with a second bait application 5 to 8 weeks after the first. This approach must be evaluated further as well as the effects of yearly applications applied each spring or fall.

Finally, we must evaluate the need for killing the entire colony. We have noted that when a majority of the workers are killed and reproduction stops, the remaining workers do not maintain the mound. Since man's contact with fire ants is primarily through disturbance of the mound partial control may be sufficient.

In conclusion, we can state that AC-217,300 offers promise as a viable substitute for mirex for fire ant control. Extensive studies are planned this year in cooperation with the American Cyanamid Company on all developmental aspects of this new and interesting compound.

Table 14. Results of Field Tests with AC-217, 300 and AC-206,859

Gulfport, Ms, June 8, 1977

| Bait Formulation | Bulk Rate/Acre 1/ (grams) | % Control at indicated post-treat intervals 2/ | | |
|---|---|---|---|---|
| | | 4 wks. | 8 wks. | 12 wks |
| AC-217,300- .15% | 490 | 17 | 0 | 3/ |
| AC-217,300- .3% | 451 | 35 | 67 | 29 |
| AC-217,300- .6% | 477 | 42 | 43 | 38 |
| AC-206,859- .3% | 545 | 55 | 50 | 43 |
| AC-206,859- .6% | 504 | 37 | 42 | 5 |
| AC-206,859- .9% | 522 | 45 | 32 | 2 |
| Mirex 10-5- | 560 | 82 | 95 | 80 |
| Untreated check | - | 0 | 38 | 44 |

1/ Broadcast application to 1 acre test plots, one 1/2 subplot/plot.

2/ Corrected for check mortality by Abbotts' Formula.

3/ Plot flooded by Tropical Storm "Babe". No count made.

Table 15. Results of field tests with AC-217,300 and AC-206,859.
Pearl River County, Miss. - July 27, 1977

| Bait Formulation | Bulk Rate/acre 1/ (lbs.) | % Control at indicated post-treat interval 2/ | | | |
|---|---|---|---|---|---|
| | | 4 wks. | 8 wks. | 12 wks. | 16 wks. |
| AC-217,300- .15% | 2.4 | 0 | 45 | - | 7 |
| AC-217,300- .3% | 2.5 | 0 | 0 | - | 5 |
| AC-217,300- .6% | 2.2 | 33 | 36 | - | 36 |
| AC-206,859- .3% | 1.8 | 0 | 0 | - | 0 |
| AC-206,859- .6% | 2.6 | 0 | 0 | - | 3/ |
| AC-206,859- .9% | 1.7 | 0 | 6 | - | 4 |
| 10-5 Mirex | 1.4 | 100 | 98 | - | 93 |
| Untreated check | - | 57 | 25 | - | 29 |

1/ Applied to 10 acre (approximately) test blocks. Three 1/2 acre check plots/block.

2/ Corrected for check mortality by Abbotts Formula.

3/ Plot plowed and planted to rye grass. No counts made.

Table 16. Small Plot Field Test with American Cyanamid AC-217,300.
Pearl River County, Miss. October 7, 1977

| Formulation | Bulk Rate/Acre 1/ (lbs.) | % Mortality at Indicated Post-Treat Interval 4 wks. | 8 wks. | 12 wks. | 16 wks. |
|---|---|---|---|---|---|
| .45% Active | 5 | 58 | 64 | 60 | 78 |
| .90% Active | 5 | 59 | 73 | 66 | 74 |
| 1.80% Active | 5 | 0 | 3 | 3 | 0 |
| 10-5 Mirex | 1.10 | 69 | 84 | 81 | 97 |
| Check | - | 0 | 0 | 0 | 0 |

1/ Applied to three (3) acre test blocks: Three (3) one-half (1/2) acre check plots/block.

Table 17. Small plot field test with AC-217,300; AC-222,935 and AC-233,382
Pearl River County, Miss. 4/6 to 4/14/1978

| Formulation | | Bulk Rate/acre 1/ (lbs.) | % Mortality at indicated post-treat intervals | | | | |
|---|---|---|---|---|---|---|---|
| | | | 4 wks | 8 wks | 12 wks | 16 wks | 20 wks |
| AC-217,300- | .45% | 5.0 | 63 | 24 | 64 | 20 | 18 |
| AC-217,300- | | 2.5 | 49 | 32 | 72 | 46 | 38 |
| AC-217,300- | | 1.3 | 0 | 8 | 28 | 10 | 57 |
| AC-222,935- | .45% | 5.4 | 47 | 19 | 55 | 0 | 0 |
| AC-222,935 | | 2.4 | 18 | 10 | 54 | 0 | 2 |
| AC-222,935 | | .95 | 11 | 23 | 49 | 51 | 59 |
| AC-233,382 | .63% | 3.5 | 1 | 2 | 22 | 33 | 26 |
| AC-233,382 | | 1.6 | 1 | 18 | 47 | 46 | 26 |
| 10-5 Mirex | | .95 | 55 | 74 | 91 | 87 | 75 |
| Untreated check | | - | 15 | 22 | 41 | 61 | 51 |

1/ Applied to 5-acre test blocks; three one-half acre check plots/block.

2/ Corrected for check mortality by Abbott's Formula.

Table 18. Small plot field test with AC-217,300. Autuaga County, Alabama May 19 - May 22, 1978.

| Formulation | Bulk Rate/acre (lbs) 1/ | % Mortality at indicated post-treat interval 2/ 4 wks | 8 wks | 12 wks | 16 wks |
|---|---|---|---|---|---|
| .375% on cob grits | 4.0 | 1 | 0 | 0 | 0 |
| .375% on cob grits | 7.2 | 0 | 0 | 0 | 0 |
| .75% on cob grits | 3.7 | 2 | 0 | 0 | 0 |
| .75% on cob grits | 8.0 | 3 | 0 | 0 | 0 |
| 1.5% on cob grits | 4.4 | 0 | 0 | 0 | 0 |
| 1.5% on cob grits | 7.5 | 5 | 19 | 0 | 0 |
| .75% on puffed corn | 2.5 | 62 | 68 | 51 | 84 |
| .75% on puffed corn | 3.5 | 43 | 54 | 25 | 47 |
| 1.5% on puffed corn | 2.5 | 53 | 62 | 32 | 36 |
| 1.5% on puffed corn | 3.5 | 36 | 55 | 32 | 35 |
| 3.0% on puffed corn | 2.0 | 53 | 73 | 42 | 49 |
| 3.0% on puffed corn | 3.7 | 39 | 44 | 27 | 42 |
| 10-5 Mirex | 4.9 | 93 | 100 | 100 | 100 |
| Untreated check | - | 14 | 39 | 41 | 43 |

1/ Applied to 3-acre test blocks; three 1/2-acre check plots/block.

2/ Corrected for check mortality by Abbott's Formula.

Table 19. Small plot field test with AC-217,300 and AC-222,935 McManus Farm; Gulfport, Ms.
August 22, 1978

| Formulation | | Bulk Rate/Acre 1/ lbs. | % Mortality at indicated post-treat 2/ 4 wks | 8 wks | 12 wks | 16 wks |
|---|---|---|---|---|---|---|
| 217,300 20-10 on puffed corn | .25% | 4 | 58 | 46 | 39 | 56 |
| 217,300 15-15 on puffed corn | .375% | 4 | 83 | 83 | 81 | 78 |
| 222,935 on puffed corn | .75% | 4 | 77 | 62 | 43 | 43 |
| 217,300 on puffed corn | .75% | 4 | 66 | 62 | 56 | 65 |
| 217,300 on corn cob grits | .37% | 4 | 56 | 28 | 5 | 0 |
| Untreated check | | 4 | 20 | 0 | 0 | 5 |

1/ Applied to 3-acre test blocks, three 1/2-acre check plots/block.

2/ Corrected for check mortality by Abbott's Formula.

Table 20. Small plot field test with AC-217,300; Forrest County, Mississippi
October 19-24, 1978

| Formulation | Bulk Rate/Acre [1] (lbs.) | % Mortaliy at indicated post-treat interval [2] | | |
|---|---|---|---|---|
| | | 4 wks | 8 wks | 12 wks |
| .375% on puffed corn | 1.0 | 54 | 16 | 29 |
| .375% on puffed corn | 2.8 | 68 | 84 | 95 |
| .75% on puffed corn [3] | 1.3 + 1.5 = 2.8 | 72 | 84 | 96 |
| .75% on puffed corn | 1.6 | 59 | 57 | 71 |
| .75% on puffed corn | 3.25 | 76 | 97 | 97 |
| 1.5% on puffed corn | 1.25 | 41 | 41 | 60 |
| 1.5% on puffed corn | 3.2 | 82 | 88 | 91 |
| .1875% on corn cob grits | 2.8 | 37 | 37 | 50 |
| .1875% on corn cob grits | 5.5 | 48 | 69 | 53 |

## 9. Field Tests with Various Chemicals Applied as Individual Mound Treatments

Renewed interest in individual mound treatments for use by homeowners and in other high use areas such as parks, playgrounds, cemetaries, etc. has been generated by the loss of mirex and chlordane. Six series of tests were conducted to evaluate compounds which have been..registered for this use or for which registration is being sought. All test plots were one acre (210' x 210') in size and were located in well grazed permanent pastures located near Gulfport, Ms. The large one acre plots were chosen to minimize the confusion caused by migration of treated ant colonies. Past experience has shown that tagging, staking, or other methods of marking treated mounds cannot be relied upon when a posttreatment evaluation is made. However, when the effects of individual mound treatments are evaluated on the basis of area wide suppression (1 acre) reliable results can be obtained. A summary of these results is shown in table 21.

Table 21. Evaluation of Individual Mound Treatment.

| Treatment 2/ | Date Applied | Plot Size | No. Mounds/Subplot prior to treatment 1/ | % Change in No. Active Mounds at indicated post-treat interval | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2 wks | 4 wks | 8 wks | 12 wks | 16 wks |
| Series I | | | | | | | | |
| Dursban 4E, 1 pint of .02% $H_2O$ solution per 6" mound diameter | 3/10/78 | 1 acre | 27 | + 40 | - 48 | - 23 | | |
| Untreated check | 3/10/78 | 1 acre | 22 | + 8 | - 23 | - 37 | | |
| Series II | | | | | | | | |
| 1,1,1-Trichlorethane, 125 ml per mound | 5/5/78 | 1 acre | 31 | + 9 | - 17 | - 49 | - 84 | - 88 |
| Untreated Check | 5/5/78 | 1 acre | 14 | 0 | + 57 | + 50 | + 14 | + 35 |
| Series III | | | | | | | | |
| Orthene 75S, 1 gallon of .05% $H_2O$ solution per mound 2/ | 6/6/78 | 1 acre | 54 | - 58 | - 70 | - 56 | | |
| Orthene 75S, 1 gallon of .1% $H_2O$ solution per mound | 6/6/78 | 1 acre | 62 | - 68 | - 73 | - 70 | | |
| Dursban 4E, 1 gallon of .1% $H_2O$ solution per mound | 6/6/78 | 1 acre | 49 | - 39 | - 69 | - 66 | | |
| Untreated Check | 6/6/78 | 1 acre | 61 | + 1.6 | - 13 | - 7 | | |

Table 20 (continued)

| Formulation | Bulk Rate/Acre 1/ (lbs) | % Mortality at indicated post-treat interval 2/ 4 wks | 8 wks | 12 wks |
|---|---|---|---|---|
| .375% on corn cob grits 3/ | 2.6 + 3.2 = 5.8 | 0 | 9 | 3 |
| .375% on corn cob grits | 2.6 | 12 | 20 | 13 |
| .375% on corn cob grits | 5.6 | 37 | 62 | 58 |
| .75% on corn cob grits | 2.4 | 6 | 11 | 32 |
| .75% on corn cob grits | 5.4 | 0 | 31 | 27 |
| Untreated check | - | 0 | 6 | 0 |

1/ Applied to 3-acre test blocks; Three 1/2-acre check plots/block.
2/ Corrected for check mortality by Abbott's formula.
3/ Second application of bait applied to test plot on 12/7/78.

Table 21 (continued)

| Treatment 2/ | Date Applied | Plot Size | No. Mounds/Subplot prior to Treatment 1/ | % Change in No. Active Mounds at indicated post-treat interval | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2 wks | 4 wks | 8 wks | 12 wks | 16 wks |
| Series IV | | | | | | | | |
| Vaporette® 3/ Fire ant killer 2 fl. oz/gal. $H_2O$/mound | 6/22/78 | 1 acre | 36 | - 42 | - 78 | - 39 | | |
| Imidan 50 wp, 7.6 grams/gal. $H_2O$/mound | 6/22/78 | 1 acre | 35 | + 17 | - 32 | - 15 | | |
| Vaporette® fire ant killer 3/ 2 fl. oz/gal. $H_2O$/mound | 6/22/78 | 1 acre | 32 | + 18 | - 69 | - 22 | | |
| Untreated Check | 6/22/78 | 1 acre | 39 | + 2.6 | - 45 | - 8 | | |
| Series V | | | | | | | | |
| 1,1,1 Trichlorethane 125 ml per mound | 8/17/78 | 1 acre | 21 | | - 73 | | - 70 | |
| Untreated Check | 8/17/78 | 1 acre | 14 | | - 7 | | + 21 | |

Table 21 (continued)

| Treatment 2/ | Date Applied | Plot Size | No. Mounds/Subplot prior to Treatment 1/ | % Change in No. Active Mounds at indicated post-treat interval | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2 wks. | 4 wks | 8 wks | 12 wks | 16 wk |
| Series VI | | | | | | | | |
| Imidan 50 wp 7.6 grams/gal $H_2O$/mound | 11/9/78 | 1 acre | 26 | | - 35 | | | |
| Orthene 75 Sp. 1 gallon of .1% $H_2O$ solution per mound | 11/9/78 | 1 acre | 23 | | - 17 | | | |
| Vaporette® Fire Ant 3/ Killer, 2 fl. oz/gal $H_2O$/mound | 11/9/78 | 1 acre | 26 | | - 65 | | | |
| Untreated Check | 11/9/78 | 1 acre | 19 | | - 53 | | | |

1/ All subplots were 1/2 acre in size, with a circular configuration.
2/ All rates were suggested by Industry Tech. representatives or were printed on container labels.
3/ 6.7% Dursban formulated and marketed by Zoecon Corp, Palo Alto, Calif.

10. Publications, Oral Presentations and Meetings Attended

A. Publications:

Imported Fire Ant Control with Ferriamicide, 1978. Submitted for publication in Insecticide and Acaracide Tests, Vol. 4.

B. Oral Presentations:

1. Gulfport Methods Development Center, USDA, APHIS, PPQ Who we Are and What we Do, Southern Plant Board meeting Asheville, N. C., April 5, 1978.

2. Summary of IFA Projects for 1977. Annual IFA Research Conference, Raleigh, N. C., April 25-27, 1978.

3. Field Studies with American Cyanamid AC-217,300 for Control of the Red Imported Fire Ant. SE Branch meeting ESA, Nashville, Tenn., Jan. 23-25, 1979.

C. Meetings Attended:

1. IFA Technical working Group Meetings:

(a) Gainesville, Fla. Jan. 26-27, 1978.

(b) Raleigh, N.C. April 25, 1978.

(c) Gulfport, Ms. Sept. 12, 1978

(d) Beltsville, Md. Dec. 5, 1978

2. Southeastern Branch Meeting ESA, Gainesville, Fla., Jan. 27, 1978.

3. American Cyanamid Research planning Conferences: Atlanta, Ga. July 31, 1978 and Beltsville, Md. August 1, 1978.

4. Annual Methods Development Meeting, Otis AFB, Mass. Sept.18-20,1978.

11. Cooperative Agreements between GMDC and other Agencies involved in IFA Research

We have recently entered into a series of cooperative agreements which defines the role of the GMDC in IFA research and development:

I. Cooperative agreement between Mississippi Department of Agriculture, Imported Fire Ant Division and USDA, APHIS, GMDC and EPA Office of Pesticide Programs for calendar year 1978. In compliance with this agreement, the responsibilities of each agency are as follows:

1. APHIS Responsibilities:

The Gulfport Methods Center will continue to do some screening trials of new compounds. Personnel of this laboratory will do some plot field trials of compounds that give favorable results in APHIS and State laboratories. They will also complete intermediate field tests of bait and/or compounds that gave good control in the small plot trials.

Personnel of the Gulfport APHIS Laboratory will cooperate with the personnel of the Mississippi Imported Fire Ant Division in doing large field tests of promising compounds. APHIS will do the efficacy study and the State Division personnel will make the application. The personnel of the two agencies will cooperate when environmental monitoring is done.

2. The Mississippi Imported Fire Ant Division Responsibilities:

Since the employment of a highly trained chemist, this agency has and will continue to give priority to laboratory screening of new compounds. As stated under APHIS responsibilities the State will furnish equipment and personnel to make application of promising new materials when large field tests are warranted. This division will assist in the immediate field tests; also assist with environmental monitoring studies.

3. EPA Responsibilities:

The U. S. Environmental Protection Agency, Office of Pesticide Programs will contribute professional personnel to evaluate the registration potential of successful screening compounds and to advise on acceptable test protocol prior to, during, and following screening and field testing. EPA will contribute funds for the 1978 calendar year not to exceed $100,000.

II. A second Cooperative Agreement or Memorandum of Understanding between APHIS, PPQ Gulfport Methods Development Center and her sister agency SEA, FR was signed into effect last year. This agreement was a result of mutual desire to closely coordinate an ongoing research and development program for the imported fire ant. Obviously, there are areas of research and/or development for which clear lines of responsibility cannot be readily defined. Under the terms of the Memorandum of Understanding, APHIS and SEA coordinate their respective activities through a technical working group comprised of 3 to 5 members from each Service. The following guide lines for research activities are recognized:

1. SEA, FR responsibilities:

   a. Research on phermones, growth regulators, etc.

   b. Insecticide screening

   c. Formulations research

   d. Biological Studies (Predators, Parasites, life history, etc.)

2. APHIS responsibilities:

   a. Development of regulatory treatments

   b. Equipment development and modification

   c. Large-scale field tests of promising control agents.

   d. Mass rearing and release techniques for biological control.

12. Goals and Objectivies - Fiscal Year 1979

I. Continue cooperative projects with SEA

A. Large scale field testing of Stauffer MV-678, a growth regulator 2500 acres under EUP)

B. Field evaluation of marginal toxicants.

II. Continue testing of Ferriamicide

A. Assist MACFA under present cooperative agreement on 20,000-acre test should EPA grant the proposed EUP.

B. Continue shelf life studies

C. Additional tests to be conducted depending upon outcome of current litigations, etc.

III. Continue and expand testing and possible development of AC-217,300 as a bait toxicant.

A. 90-acre test by ground equipment in Fall of 1978.

B. Assist American Cyanamid in obtaining EUP in winter of 1979.

C. Conduct first aerial test in Spring of 1979.

D. 5-10,000 acre test Summer 1979.

E. Assist with Sec. 18 or other means of development as appropriate.

F. Evaluate 20 Analogues of AC-217,300.

IV. Lab. screening of new compounds for bait toxicants.

A. Test 20 new compounds in the lab.

B. Small plot field tests of any promising candidates

V. Development of Regulatory treatments.

A. Test Dursban under actual nursery conditions in 4 different states.

B. Screen 5 new compounds and/or formulations.

C. Develop phytotoxicity date.

D. Evaluate Dursban dip treatment for B & B ornamental plants.

E. Develop Dosage-mortality data for Dursban in 4 different types of soil.