1987 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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Some of the research reports presented herein were conducted "off station" by Whiteville Methods Development Center personnel or Dillon Witchweed Station personnel. Leaders/participants are listed under each project title. Organizational structure for the Whiteville Methods Development Center (WMDC) is as follows:

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

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

Compiled and Edited by:

Homer L. Collins

April, 1988

CONTENTS

FY 1987 OBJECTIVES

IMPORTED FIRE ANT STATION

GULFPORT, MS

Objective #1: Development of eradication procedures for small isolated infestations: Evaluate combinations of chemicals, dose rates, application procedures, treatment intervals, etc. to determine the most effective method of eliminating small isolated infestations before spread occurs. Based on results obtained, prepare guidelines and protocol for use by others to achieve eradication of small infestations.

Objective #2: Development of quarantine treatments for certification of regulated articles: Emphasis on development of in-field treatments and management systems for field grown stock. Continue screening for alternate potting soil and grass sod treatments.

Objective #3: Continue testing and development of chemical bait formulations: Small plot field evaluation of new bait formulations (primarily new attractants, inert carriers and stabilizers). Evaluation of pheromone based baits (at least in small quantities or crude form) if ARS research has advanced to the appropriate stage.

Objective #4: Preparation/distribution of technical information on control, quarantine procedures, new technology, biological hazards, etc. to State agencies, the media, and the public.

SUMMARY

Rate of Degradation of Dursban and Triumph in Nursery Potting Soil (Page 1): Both EC and granular formulations of Dursban and Triumph degraded rapidly when blended into nursery potting media and weathered outdoors under natural conditions. However, EC Dursban remained active for over nine months, although only a 90 day certification period is currently approved for drench treatments with EC Dursban.

Leaching Studies with Granular Dursban and Triumph in Nursery Potting Soil (Page 6): Results incomplete when this report was prepared.

Dose Rate Trials with Triumph 1G (Page 9): Triumph 1G blended into nursery potting media at rates ranging from 5.6 to 44.8 gm AI/cubic yard was aged outdoors under natural conditions for 24 months. Bioassays against alate queens indicated that 5.6 gm AI/cubic yard remained active for 7 months. Other rates remained active for more than 14 months.

Evaluation of Potting Soil Toxicants (Page 11): Only a limited number of candidate compounds were evaluated in 1987. Results with an experimental formulation of trimethacarb were not promising. Stauffer SC-956-10G remained active for three months and results with this compound were incomplete when this report was prepared.

Persistence of Triumph 1G Insecticide in Various Types of Potting Media (Page 16): Triumph remained active in a high vermiculite potting media and a milled pine bark mixture for 16 months or longer.

Phytotoxicity of Dursban Drench Quarantine Treatment (Page 19): Dursban drenches applied at rates ranging from 4 fluid ounces 4E/100 gallons of water to 20 fluid ounces/100 gallons of water (1X to 5X dose rates) were not phytotoxic to a representative group of eight plant species including azaleas and ferns.

Bioassays of Nursery Soil Samples (Page 27): Soil samples submitted to the National Monitoring and Residue Analysis Laboratory for GLC analysis were bioassayed with alate queens. Since many different pesticides are used as standard agronomic practices, it was possible that secondary effects might be manifest indirectly by providing IFA control. However, the results of the bioassays did not confirm this hypothesis.

Diazinon Pour-on Treatment for Containerized Plants (Page 31): The only approved pour-on quarantine treatment for containerized nursery stock is based upon Dursban, and Dursban cannot be used on blueberries or other food producing plants. Diazinon was highly efficacious when applied as a drench (2 pints 2EC/100 gallons of water), and equally important, is labelled for use on blueberries at this rate of application.

Toxicity of Triumph and Dursban to IFA Workers and Alate Queens (Page 38): Dosage mortality studies indicated that the LD_{99} of Dursban was 1.75 ppm for alate queens. LD_{99} of Triumph was .372 ppm for alate queens and .035 ppm for IFA workers.

Evaluation of Topically Applied Granular Dursban and Triumph for Treatment of Containerized Nursery Plants (Page 45): Granular formulations of both Triumph and Dursban are highly effective when blended or incorporated into potting media. Since surface applied (i.e., "over-the-top" treatments) with these insecticides had not been tested, a series of trials to evaluate this procedure was initiated. Bioassays with whole colonies and alate queens were conducted following application at rates of 0.5, 1.0, and 2.0 lbs. AI/cubic yard of potting media. The erratic results obtained with all rates of Dursban may be attributed to relative soluability of the compound in water. Results with Triumph were very encouraging and additional studies with Triumph will be conducted.

Sequential Applications of Baits and Dursban for Control of Fire Ants in Field Grown Nursery Stock (Page 54): Combination treatments of baits followed by granular Dursban were highly effective in reducing the IFA population in field grown nursery stock.

Efficacy of Dursban on Irrigated Grass Sod (Page 60): Bioassays of soil samples collected from irrigated turf plots indicated activity for at least 84 DAT when Dursban 10G was applied at 5.0 lbs. AI/acre.

Small Plot Field Tests with Bait Toxicants (Page 65): Three series of small plot field trials with bait toxicants were conducted in 1987. Good to excellent control was achieved with the commercial formulation of LOGIC as well as with three experimental formulations. GX-071 also provided excellent control following summer applications. Rate of activity was greatly decreased following a late season (October 15) application.

Evaluation of Acephate for Treatment of Individual IFA Colonies (Page 72): Acephate is labelled for IFA colonies as either a drench or by direct application of the 75S formulation to the colony. Effective control was not obtained with either method of application.

Label Expansion of LOGIC Fire Ant Bait (Page 76): Residue trials involving hay, pecans, and peaches were conducted as part of an effort to obtain registration for application to these crops.

Effect of Method of Application on IFA Bait Efficacy (Page 79): In general, baits that were applied broadcast (either with mechanized or manual equipment) were more effective than single mound treatments.

Impact of IFA on C-7 Production in Field Insectaries (Page 83): Observations made in C-7 production plots near Byron, Georgia indicated that IFA probably did not greatly affect the C-7 population although some predation on immatures may have occurred.

Equipment Testing and Development (Page 88): Two types of commercially available bait application equipment were evaluated. The HERD GT-77 can be calibrated to disperse IFA baits if the terrain permits relatively high speed operation. Attempts to increase precision in calibration through modification of the calibration plate were unsuccessful. A Solo backpack blower was modified by insertion of various types of slow restrictors, but none of the modifications tested were totally successful in reducing output of IFA baits to labelled rates of application.

PROJECT NO: FA02G017

PROJECT TITLE: Rate of Degradation of Dursban 2.5G, 4EC, Triumph 1G and 2EC in a Typical Nursery Potting Soil Environment.

LEADER/PARTICIPANTS: Homer Collins and Avel Ladner (IFA Station), and J.C. Hawthorne (NMRAL).

INTRODUCTION:

Dursban 2.5G applied as a preplant incorporated treatment is approved for certification of nursery potting soil under the IFA quarantine. Dursban 4EC is also an approved treatment for containerized nursery plants, but is applied as a drench (4 fl. oz./100 gals. H_2O). A certification period of 24 months is listed in M301.81 for the 2.5G formulation and 90 days for the drench treatment. Triumph (CGA-12223) is a relatively new product from Ciba-Geigy that has shown promise as a potting soil toxicant. A study was initiated to determine degradation curves for each of these insecticide treatments in a typical potting soil environment. Initial dose rates for each of the 4 insecticide treatments are shown in Table 1. Information gained from this experiment could result in changes in the certification period (especially the Dursban 4EC), and will definitely expand our data base for Triumph.

METHODS AND MATERIALS:

Granular formulations (Dursban 2.5G and Triumph 2G) were blended into potting

soil with a cement mixer at a rate of 11.3 grams AI/cubic yard of soil (equivalent to 10 lbs. AI/3" acre). EC formulations were applied at a rate of 4 fl. oz. 4E/100 gallons of water to potting soil contained in 6" x 6" plastic pots. Following treatment, all pots were weathered outdoors under natural conditions. No irrigation water was added. At monthly intervals, 3 pots from each treatment were composited and uniformly mixed together. From the composite sample, a 150 gram sub-sample was taken for GLC analysis by NMRAL. A separate Form 602 was completed for each sample; copies of the 602 were retained/distributed in the prescribed manner. Analyses will continue until each treatment falls below the limits of detectability (0.1 ppm for Dursban). At the termination of the test, degradation curves for each treatment will be plotted.

RESULTS:

Results are incomplete at the present time, but partially completed degradation curves for each treatment are depicted in Figures 1 and 2. These results indicate that both formulations of Dursban and Triumph rapidly dissipate in the first few months after treatment. Perhaps the most important finding of this study is that EC Dursban provided at least 9 months residual activity.

TABLE 1. Dose Rates for Triumph/Dursban Degradation Study.

TREATMENT	DOSE RATES				
	GRANULAR FORMULATIONS			EC FORMULATIONS	
	Gms. AI/YD^3	Lbs. Formulated Material per Cubic Yard	Grams formulated material per cubic foot	Fluid oz./100 gal. H_2O	Ml./Gal. H_2O
DURSBAN 2.5G	11.2	1.0	16.8	—	—
TRIUMPH 2G	11.2	1.25	21.0	—	—
DURSBAN 4EC	—	—	—	4	1.2
TRIUMPH 4 EC	—	—	—	4	1.2

Fig 1. Degradation curves for Dursban and Triumph EC formulations in potting media.

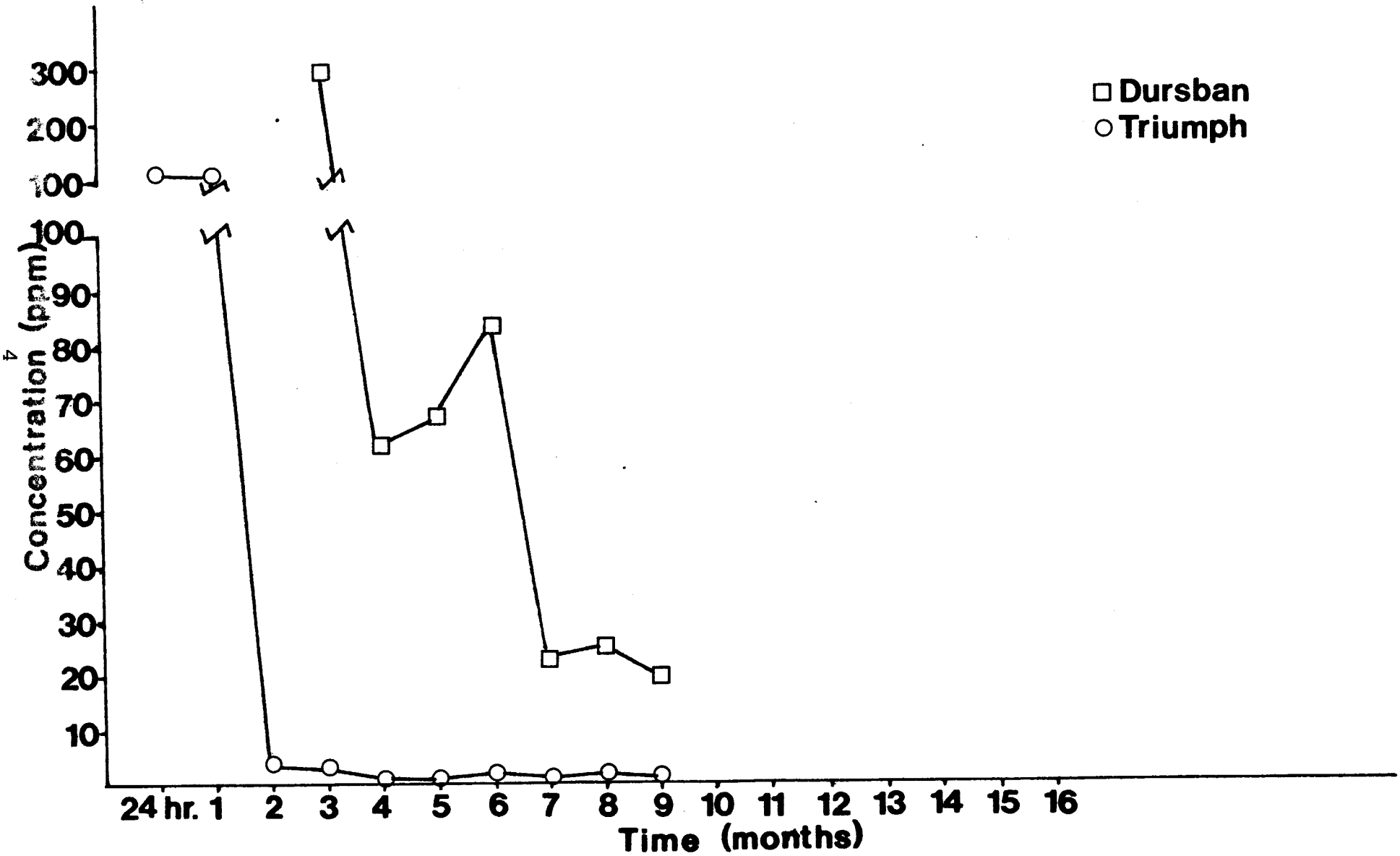
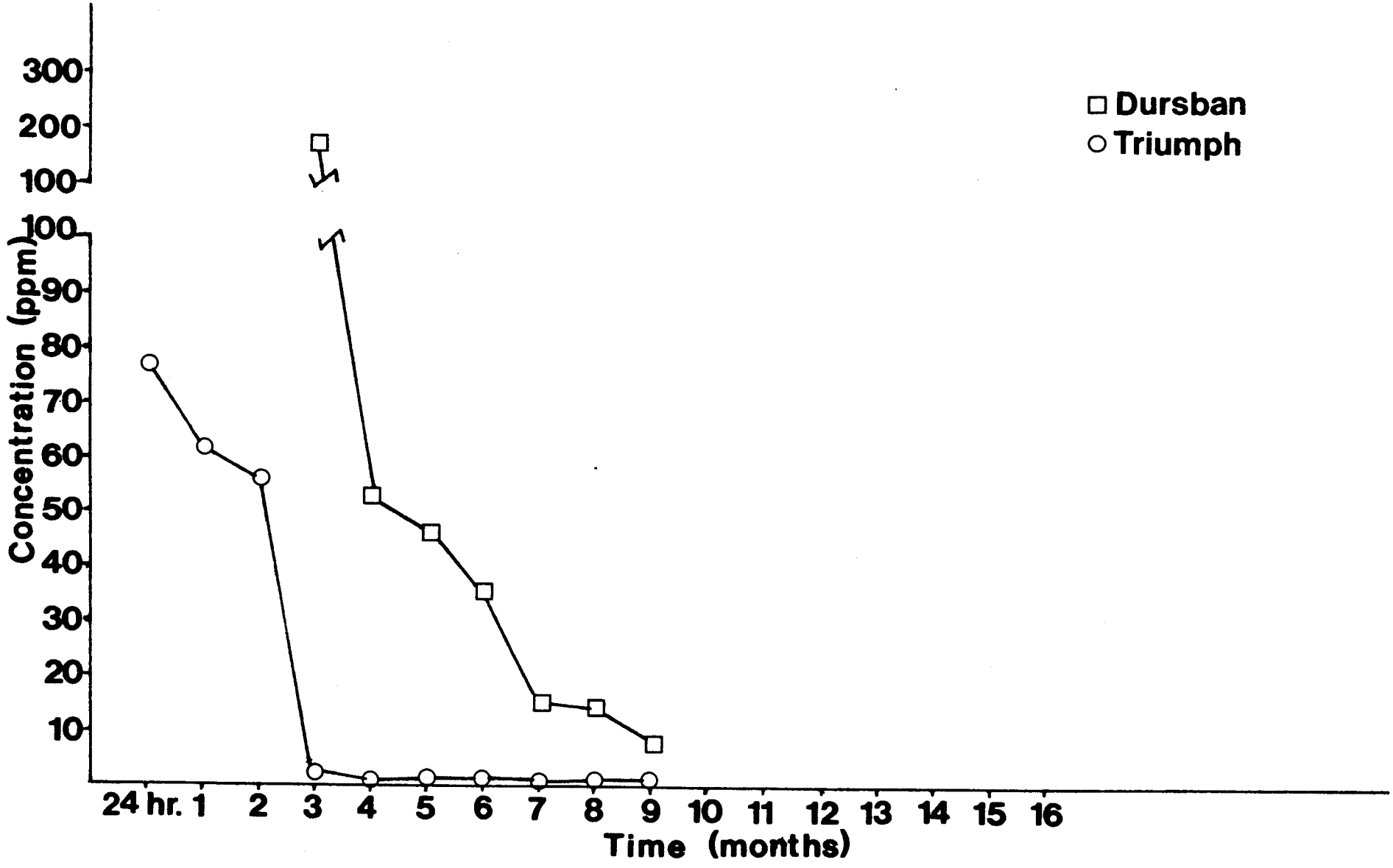


Fig 2. Degradation curves for Dursban and Triumph granular formulations in potting media.



PROJECT NO: FA02G027

PROJECT TITLE: Leaching Studies with Granular Dursban and Triumph in Nursery Potting Soil.

LEADER/PARTICIPANTS: Anne-Marie Callcott and Stephen Trostle

INTRODUCTION:

PPQ Manual 301.81 (January 1985) states that potting soil treatments shall consist of granular chlorpyrifos incorporated into the potting media to control IFA. Triumph is a relatively new product from Ciba-Geigy that has shown promise as a potting soil control. A topical application of granular chlorpyrifos or Triumph to containerized plants would be an additional means of certification for nurserymen who did not incorporate chlorpyrifos into the soil mixture prior to potting. Extensive applications of water may leach the insecticide in treated nursery pots. For products that are soluable in water, the amount of insecticide leached into the soil will theoretically correspond to the amount of water applied.

METHODS AND MATERIALS:

6 1/2" x 6 1/2" plastic pots were modified by cutting 1 1/2" from the bottom and glueing a fiberglass mesh screen on the pot to form the new bottom. (Fig. 3). Two inches of Baccto® potting soil (Michigan Peat Co., Houston, Texas)

were placed in each pot. Six pots were placed on top of one another (nested) to obtain six 2" levels of soil per test. A seventh pot was cut 3 1/4 inches from the bottom, inverted and placed on the bottom pot to act as a stand to allow drainage of the leachate (Fig. 4).

Dursban 2.5G, Orthene 75S, and Triumph 2.0G were topically applied at a rate of 2.0 lbs. AI per cubic yard. A different rate of water (from 1 to 20 inches) was applied to each leaching stand and the stands were allowed to drain for 24 hours. Each level (i.e. sample) of soil was sifted through a sieve 3 times, stirred by hand, then canned, labelled, and frozen until GLC analyses were conducted by NMRAL to determine PPM of corresponding chemical in the different levels of soil.

RESULTS:

Due to several unrelated factors, the results of this study were incomplete when this was written. Results will be included in the 1988 Annual Report.

Fig 3. Plastic pot showing point of cut and attachment of screen.

Fig 4. Leaching stand.

Scale ¼" = 1"

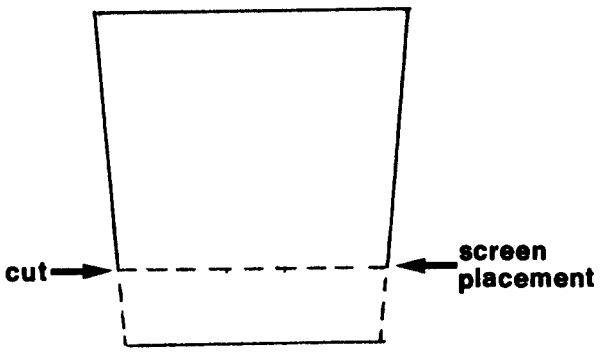


Fig 3

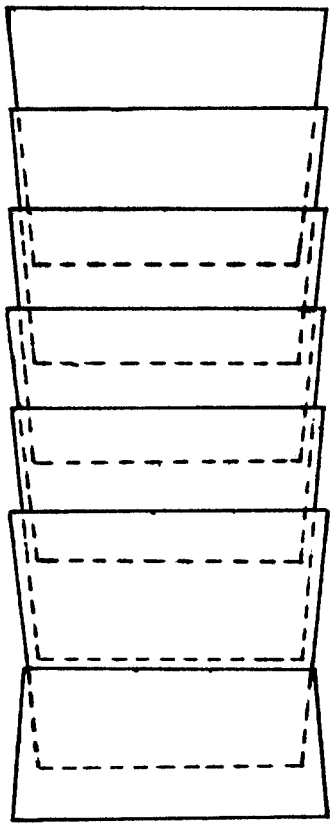


Fig 4

PROJECT NO: FA02G036

PROJECT TITLE: Dose Rate Trials with Triumph 1G

LEADER/PARTICIPANT: Avel Ladner

INTRODUCTION/METHODS & MATERIALS:

Based on previous results with Triumph, additional dose rate studies with Triumph 1G were initiated in January 1986 and continued throughout 1987. Dose rates of 5.6, 11.2, 22.4, and 44.8 grams AI per cubic yard of potting media (Baccto Brand, Michigan Peat Co., Houston, Texas) were thoroughly blended into the media with a portable cement mixer. Treated media was then weathered outdoors under natural conditions in 1 gallon plastic pots to simulate actual nursery conditions. Bioassays were periodically conducted according to procedures described elsewhere in this report (Page 11).

RESULTS:

Results to date are incomplete, but as shown in Table 2, 5.6 grams AI/Cu. yd provided 7 months residual activity. All other rates continued to provide 100% mortality for 14 months or longer. This trial will be continued until all rates become ineffective.

Table 2. Residual Effectiveness of TRIUMPH 1G in Nursery Potting Soil. 1/

DOSE RATE (Gm AI/Cu. Yd)	Mean % Mortality to alate queens confined to treated soil. (7 days continuous exposure) Age of treated soil (months)												
	(1)	(3)	(7)	(9)	(12)	(13)	(14)	(18)	(19	(20)	(21)	(22)	(24)
5.6	100	100	100	60	55	30	10	65	35	5	5	0	5
11.2	100	100	100	100	100	100	100	80	90	45	70	80	35
22.4	100	100	100	100	100	100	100	100	100	100	100	100	85
44.8	100	100	100	100	100	100	100	100	100	100	100	100	100
Check	5	10	10	10	0	0	0	0	0	10	5	5	10

1/ Test initiated January 30, 1986.

PROJECT NO: FA02G037

PROJECT TITLE: Evaluation of Potting Soil Toxicants

LEADER/PARTICIPANT: Avel Ladner

INTRODUCTION:

Chlordane applied at a rate of 4 ounces of 5% per cubic yard of potting soil was used as a quarantine treatment for containerized nursery stock until cancellation of registration in December 1979. An on-going screening program to evaluate insecticides applied as a pre-plant incorporated treatment for nursery potting soils has been conducted by the PPQ IFA Station since 1974. The most effective treatment thus far is chlorpyrifos (Collins et al. 1980). In January 1980, Dow Chemical Company obtained registration of a 5% chlorpyrifos granule which was marketed under the trade name FA-5. This product was applied at a rate of 0.5 lbs. FA-5 per cubic yard of potting media. Several cases of possible FA-5 related phytotoxicity to greenhouse grown succulent plants in Central Florida prompted the registrant to withdraw this product from the market in the fall of 1981. Registration of a second chlorpyrifos formulation (a 2.5% granule) for treatment of potting soil was obtained in July 1984 by Ford's Chemical and Service, Inc., Pasadena, Texas. At the current time this is the only registered product for this use pattern.

A limited number of candidate potting soil toxicants were evaluated in 1987 in an effort to expand the number of options available to growers who ship

containerized plants outside the IFA regulated area. As in previous years, our efforts were impeded by the small number of suitable candidates.

METHODS AND MATERIALS:

Test procedures used to evaluate all candidate toxicants were as follows: Granular or dust formulations of each product tested were blended into nursery potting soil, (Baccto®, 818 pounds per cubic yard) at an initial rate of 10 lbs. AI per three-inch acre (equivalent to 11.2 grams AI per cu. yd. of media). A portable cement mixer (2 cu. ft. capacity) was used to blend the toxicants into the potting media, and was operated for one hour per batch to insure thorough blending. Treated media was then poured into two-quart plastic pots and weathered outdoors under natural conditions for one month prior to the first bioassay. No additional irrigation water was added.

Bioassays were conducted in the laboratory by confining alate queens to treated soil placed in 2" x 2" plastic flower pots equipped with a Labstone® bottom. The labstone absorbed moisture from an underlying bed of damp peat moss. There were four replicates per treatment in each bioassay. Each pot (replicate) contained 20 cc. of treated soil and five alate queens. Queen mortality was assessed after seven days of continuous confinement to the treated soil. Treatments which were effective at the first bioassay interval were aged and retested periodically to measure and compare residual activity with chlorpyrifos. Several granular formulations of chlorpyrifos have

provided up to 24 months residual activity under these conditions.

RESULTS:

As shown in Table 3, Stauffer SC-056-10G (Phosphorodithioate) demonstrated excellent residual activity for at least three months. Bioassays will continue until activity ceases. As in previous trials, no activity was achieved with Trimethacarb.

Table 3. Residual Activity of Candidate Potting Soil Toxicants, 1987. 1/

TOXICANT	Rate (Gm. AI/yd.)	Mean % Mortality of Alate Queens Confined to Treated Soil for 7 Days Age of Treated Soil 24 Hrs.	1 Month	2 Months	3 Months	5 Months
Stauffer SC-056-10G (Phosphorodithioate)	11.2	100	100	100	100	90
UC-27BF33-3G (Trimethacarb)	11.2	5	35	5	—	—
TRIUMPH 2G (Standard)	11.2	100	100	100	100	100

1/ Trial initiated September, 1987.

REFERENCES CITED:

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

PROJECT NO: FA02G046

PROJECT TITLE: Persistence of Triumph 1G Insecticide in Various Types of Potting Media

LEADER/ PARTICIPANT: Avel Ladner

INTRODUCTION:

All available evidence indicates that Triumph 1G is an effective IFA quarantine treatment for potting soil. However, all trials to date have involved a single type of potting soil (Baccto®), (Michigan Peat Co., Houston, Texas). Since potting soils vary greatly in composition, % organic matter, pH, density, and numerous other factors which could affect residual activity of insecticides, more information on the performance of Triumph in various types of potting media was needed.

METHODS AND MATERIALS:

The performance of Triumph 1G in two types of potting media was compared to Dursban 2.5G applied at equivalent rates of application (11.2 gms. AI/Cu. yard of media). One potting mix consisted of milled pine bark (Forest Gardens, Inc.) the other was a high vermiculite mix containing bark, vermiculite, peat and pearlite (Ball Growing Mix, Ball Seed Co.). Each insecticide was blended into the mixes with a portable cement mixer on September 25, 1986 and then

weathered outdoors under natural conditions (no irrigation water added) in plastic 1 gallon pots and bioassayed periodically utilizing procedures described elsewhere (page 11).

RESULTS AND DISCUSSION:

As shown in Table 4, both Triumph 1G and Dursban 2.5G were highly effective in both types of potting media. Bioassays will be continued until activity ceases.

Table 4. Efficacy of Triumph 1G in Two Different Types of Nursery Potting Media.

Type of Media	Insecticidal Treatment	X % Mortality to Alate Queens (7 Days Exposure) Age of Treated Media (Months) 1/ 1	3	6	9	10	12	14	16
Milled pine bark	TRIUMPH 1G, 11.2 Gm AI/cu yd	100	100	100	100	100	100	100	100
Milled pine bark	DURSBAN 2.5G, 11.2 Gm AI/cu yd	100	100	100	100	100	100	100	85
Milled pine bark	Untreated	15	0	5	0	0	20	0	10
Grow Mix 2/	TRIUMPH 1G, 11.2 Gm AI/cu yd	100	100	100	100	100	100	100	100
Grow Mix 2/	DURSBAN 2.5G, 11.2 Gm AI/cu yd	100	100	100	100	100	100	100	100
Grow Mix 2/	Untreated	35	0	0	0	0	15	0	10

1/ Test Initiated September 25, 1986.

2/ A high vermiculite media available from Ball Seed Company.

PROJECT NO: FA02G047

PROJECT TITLE: Phytotoxicity of Dursban Drench Quarantine Treatments

LEADER/PARTICIPANTS: Homer Collins, Avel Ladner, and Jeannine Levandoski

INTRODUCTION:

One of the approved procedures for imported fire ant quarantine certification of containerized or balled and burlapped plants is the use of a Dursban drench or pour-on treatment (M301.81 Pg. 9-10). A rate of 4 fl. oz. 4E per 100 gals. H_2O is specified. However, the following generalized warning statement appears on the insecticide label (Dow Chemical Co.): "Do not use on azaleas, camellias, poinsettias, rose bushes, or variegated ivy because of possible injury to those plants". Since the IFA drench treatment is directed at the soil or root ball rather than foliage, it has long been assumed that the above warning statement is not directly related to this use pattern. However, since some foliar contact is inevitable, a study was initiated to determine if Dursban drenches would injure a representative group of 8 plant species including azaleas, camellias, ferns, photinia, japanese holly, and leriope. A review of the literature was also conducted to determine if other plant species have been injured by Dursban.

METHODS AND MATERIALS:

Twelve specimens of the following plant species, growing in 6" x 6" plastic pots, were purchased from a local nursery on February 13, 1987:

Common Name	Variety	Scientific Name
Azalea	formosa	Azalea spp.
Azalea	coral bell	Azalea spp.
Camellia	assorted	Camellia japomica
Photinia	-	Photinia frazeri
Japanese holly	helleri	Ilex crenata
Monkey grass	green	Leriope spp.
Monkey grass	variegated	Leriope spp.
Boston ferns	bostoniensis	Nephrolepis exaltata

The plants were transferred into a greenhouse and subjected to normal agronomic practices throughout the remainder of the test. On February 17, the plants were divided into 4 groups with 3 plants (replicates) per group. Each group of plants was then drenched with one of the following treatments:

Treatment	Dose Rate
4 fl. oz. Dursban 4E/100 gal. H_2O	1X
8 fl. oz. Dursban 4E/100 gal. H_2O	2X
20 fl. oz. Dursban 4E/100 gal. H_2O	5X
Untreated CK.	0X

All treatments were applied to the point of run-off (totally saturated) with a ordinary garden watering can. Each plant (replicate) received approximately 1 quart of solution applied to the soil surface as well as the foliage.

Phytotoxicity ratings were conducted weekly for 6 weeks following treatment at which time the test was terminated. Possible damage or injury to the plants was evaluated on the basis of overall appearance of the treated plants compared to an untreated check of the same variety. The phytotoxicity rating scale used to compare the effects of each treatment was as follows:

(1) Plants healthy; not different from untreated check.

(2) Slight yellowing, wilting, or other mild symptoms such as marginal chlorosis.

(3) Symptoms more severe, leaf drop or necrosis.

(4) Severe stunting, abnormal leaf or stem structure.

(5) Dead.

RESULTS AND DISCUSSION:

As shown in Table 5 no adverse effects were noted for any plant species or dose rate. A cursory review of the literature indicated that dose rates ranging from .25 to 3.4 lb. AI/100 gallons of water produced no effect on approximately 30 different plant species (Table 6). However, damage to orchids and geraniums was noted.

From these results, we conclude that IFA quarantine treatments with Dursban drenches should produce no adverse effects on woody ornamental plants. It must also be noted that this procedure has been used and approved for over 8 years without any reports of injury to treated plants.

TABLE 5. Phytotoxicity Ratings for Various Containerized Plants Drenched with 1X, 2X, 5X Dose Rates of Dursban Solution.

PLANT	RATING AT INDICATED DOSE RATE AND POST-TREAT INTERVAL 1/								
	1 WEEK			3 WEEKS			6 WEEKS		
	1X	2X	5X	1X	2X	5X	1X	2X	5X
Azalea (Formosa)	1	1	1	1	1	1	1	1	1
Azalea (Coral Bell)	1	1	1	1	1	1	1	1	1
Camellia(assorted varieties)	1	1	1	1	1	1	1	1	1
Ferns (Boston)	1	1	1	1	1	1	1	1	1
Japanese Holly	1	1	1	1	1	1	1	1	1
Monkey Grass (Green)	1	1	1	1	1	1	1	1	1
Monkey Grass (variegated)	1	1	1	1	1	1	1	1	1
Photinia	1	1	1	1	1	1	1	1	1

1/ Average rating for 3 plants (replicates) per dose rate. 1X dose rate = 4 fl. oz. Dursban 4EC/100 gals. H_2O applied to runoff (approximately 1 quart of solution/plant to foliage and soil). Phytotoxicity rating scale as follows:

1) Plants healthy; not different from untreated check.
2) Slight yellowing, wilting, or other mild symptoms such as marginal chlorosis.
3) Symptoms more severe, leaf drop or necrosis.
4) Severe stunting, abnormal leaf or stem structure.
5) Dead.

TABLE 6. Information on Phytotoxicity of Dursban

PLANT SPECIES	FINDINGS	REFERENCES
Azalea	No Effect at 1.0 lb AI/100 gal. water	Shetlar, David J. & Heller, Paul R. Insecticide and Acaricide Tests. Volume 4:181, 1979
Scots Pine	No effect at .5 lb AI/100 gal. water	Applyby, J.E. & Randell, R. Insecticide and Acaricide Tests Volume 4:191, 1979
Kentucky Blue Grass	No effect at 4.0 lbs AI/Acre	Heller, Paul R. & Shetlar, David Insecticide and Acaricide Tests Volume 4:197, 1979
Chrysanthemum	No effect at .5 lb AI/100 gal. water	Schuder, Donald L. Insecticide and Acaricide Tests Volume 5:169, 1980
Pachysandra	No effect at .5 lb AI/100 gal. water	Pilitt, Dana R. & Neal, John W. Jr. Insecticide and Acaricide Tests Volume 5:182, 1980
Roses	No effect at 1.0 lb AI/100 gal. water	Shetlar, David J. & Heller, Paul Insecticide and Acaricide Tests Volume 5:185, 1980
Cottonwood	No effect at .25 lbs AI/Acre	Newsome L. & Solomon, J.D. Insecticide and Acaricide Tests Volume 5:187, 1980
Bentgrass	No effect at 1.0 lb AI/Acre	Hellman, John L. & Curtis, William Insecticide and Acaricide Tests Volume 5:189, 1980
Arborvitae Hedge	No effect at .25 lb AI/100 gal. water	Ree, Bill; Pinkston, Ken Price, Richard Insecticide and Acaricide Tests Volume 6:160, 1981

Table 6 (cont'd).

PLANT SPECIES	FINDINGS	REFERENCES
Flowering Crab	No effect at .25 lb AI/100 gal. water	Neal, John W., Jr. Insecticide and Acaricide Tests Volume 6:162, 1981
Birch, European White	No effect at 2.0 AI/100 gal. water	Nielson, David G. & Dunlap, M.J. Insecticide and Acaricide Tests Volume 8:62, 1983
Woody Ornamentals	No effect at 8 oz./100 gal. water	Swier, Stanley R. & Spinney, Tim Insecticide and Acaricide Tests Volume 8:78, 1983
Wandering Jew	No or little effect at .5 lb AI/100 gal.	Vittum, P.J. and Mimms, R.A. Insecticide & Acaricide Tests Volume 8:80, 1983
Rhododendron	No effect at .50 lb AI/100 gal. water	Stephenson, J.C. & Holt, G.A. Insecticide and Acaricide Tests Volume 9:346, 1984
Honeysuckle	No effect at 3.4 lb AI/100 gal. water	Jones, J. Ackland Insecticide and Acaricide Tests Volume 9:368, 1984
Ash Green	No effect at 1.0 lb AI/100 gal. water	Nielson, D.G. & Dunlap, M.J. Insecticide and Acaricide Tests Volume 10:265, 1986
Hemlock, Canadian	No effect at 4.0 lb (AI)/A	Baker, P.B. Insecticide and Acaricide Tests Volume 10:295, 1986

Table 6 (cont'd).

PLANT SPECIES	FINDINGS	REFERENCES
Anthurim	No effect at 4.0 lb AI/100 gal. water	Hara, A.H. Insecticide and Acaricide Tests Volume 10:305, 1986
Orchid	Damage noted at 1 and 2 lb AI/100 gal.	Hara, A.H. Insecticide and Acaricide Tests Volume 10:305, 1986
Geranium	Slight to moderate necrosis was observed at .5 lb AI/100 gal. water	Robb, K.L. & Parrella, M.P. Insecticide and Acaricide Tests Volume 10:310, 1986
Poinsettia	Little or no effect at 1.0 lb AI/gal.	Mimms, R.A.S. & Vittum, P.J. Insecticide and Acaricide Tests Volume 10:318, 1986.
Bedding Plants: Geranium, Impatiens, Marigold, Periwinkle, Petunia	No effect at 1.0 lb AI/100 gal.	Pinkston, Ken & Gladin, Jodie Insecticide and Acaricide Tests Volume 11:417, 1986
Bedding Plants: Aster, Carnation, Coleus, Dahlia, Impatiens, Eggplant, Petunia Snapdragon, Verbuna, Zinnia,	No effect at .5 lb AI/100 gal. except, just a slight effect on eggplant	Robb, K.L. & Parrella, M.P. Insecticide and Acaricide Tests Volume 9:383, 1984

PROJECT NO: FA02G057

PROJECT TITLE: Bioassays of Nursery Soil Samples

LEADER/PARTICIPANT: Avel Ladner

INTRODUCTION:

In 1987 USDA, APHIS, PPQ Southeastern Region initiated a sampling program to confirm the use and presence of chlorpyrifos in nursery potting soils. All nurseries which ship regulated articles outside the IFA infested area are under compliance agreement to use chlorpyrifos as a preventative measure to prevent artificial spread of the IFA. Spot checks of nurseries were made by PPQ Officers throughout the Southeast, and approximately 300 samples were collected and submitted to the National Monitoring and residue Analysis Laboratory (NMRAL) for GLC analysis. All samples were analyzed for both chlorpyrifos and chlordane (J.C. Hawthorne, NMRAL, Personal Communication). Since many different pesticides are utilized in the nursery industry, it was hypothesized that these other pesticides might offer an additional benefit of controlling IFA, especially in situations in which neither chlorpyrifos nor chlordane were present. Bioassays of a representative group of samples were conducted in order to confirm this hypothesis.

METHODS AND MATERIALS:

Bioassays were conducted in the laboratory by confining alate queens to subsamples placed in 2" x 2" plastic flower pots equipped with a Labstone® bottom. The labstone absorbed moisture from an underlying bed of damp peat moss and maintained mositure and humidity at optimum levels. Each sample was divided into four replicates in each bioassay. Each pot (replicate) contained 20 cc. of treated soil and five alate queens. Queen mortality was assessed after 1, 7, 14, and 21 days of continuous confinement to the sample.

RESULTS:

The results of this study are shown in Table 7. Bioassay results generally confirmed GLC analyses, i.e. queens confined to soil samples which analyzed positive for either chlorpyrifos or chlordane did not survive. Conversely, no queen mortality occurred in samples with a negative analysis (less than .01 ppm) for either compound. From these results we concluded that the incidental use of non-IFA pesticides has limited, if any, effect on IFA infestation of containerized nursery plants.

TABLE 7. Bioassays of Nursery Soil Samples Submitted to NMRAL for GLC Analysis.

SITE NO.	NMRAL LAB SAMPLE NO.	NURSERY	RESULTS OF GLC ANALYSIS (PPM) DURSBAN	CHLORDANE	RESULTS OF BIOASSAY (% Mortality to Alate IFA Queens after indicated exposure (Days) 2/ 1	7	14	21
MS0005	701806	Glen Read Red Tip Block	130.0	< .10	100	-	-	-
AL0014	701326	Clark's	78.0	< .10	100	-	-	-
FL0002	701896	Liewald's Block 11	68.0	< .10	0	100	-	-
AL0002	701523 1/	Rudy Martin's Block 2C	44.8	3.01	25	100	-	-
AL0004	701536 1/	Blackwells	34.2	< .10	0	15	85	-
---	---	Untreated Ck.	-	-	0	0	0	-
FL0001	701895	Liewalds	5.2	< .10	0	95	100	-
NC0001	701438	Tinga's Block #2	2.7	< .10	0	0	0	0
AL0004	701537	Blackwells	3.2	.36	0	0	0	5
AL0002	701527	Buddy Martin Block #3	< .10	14.3	0	0	50	100
AL0001	701517	Tom Dodds Block G2	< .10	3.3	0	0	35	80
---	---	Untreated Ck.	-	-	0	0	0	0
NC0002	701442	Flips New Hanover Co.	< .01	< .01	0	0	-	-
AL0006	701548	Cottage Hill	< .01	< .01	0	0	-	-

Table 7 (Cont'd).

SITE NO.	LAB SAMPLE NO.	NURSERY	RESULTS OF GLC ANALYSIS (PPM) DURSBAN	CHLORDANE	RESULTS OF BIOASSAY (% Mortality to Alate IFA Queens after indicated exposure(Days) 2/ 1	7	14	21
NC0003	701777	Lanvale Block 1	< .01	< .01	0	0	-	-
NC0004	701781	Phillips Block #3	< .01	< .01	0	0	-	-
AL0034	701782	Arabs #2	< .01	< .01	0	0	-	-
AL0034	701784	Arabs #6	< .01	< .01	0	0	-	-
AL0035	701786	Evas #3	< .01	< .01	0	0	-	-
AL0031	701797	Flowerwood Woodsite	< .01	< .01	0	0	-	-
AL0036	701800	Liberty #2	< .01	< .01	0	0	-	-
FL0001	701811	Mayday Shade House #1	< .01	< .01	0	0	-	-
---	---	Untreated Ck.	-	-	0	0	-	-

1/ Atypical potting mix consisting primarily of wood shavings.

2/ Average for 4 replicates, 5 alate queens/replicate.

PROJECT NO: FA02G067

PROJECT TITLE: Diazinon Pour-On Treatment for Containerized Plants

LEADER/PARTICIPANTS: Stephen Trostle and Avel Ladner

INTRODUCTION:

The imported fire ant (IFA) Quarantine 81, as amended, (7 CFR 301.81) sets forth conditions governing the movement of regulated articles. PPQ Manual 301.81 (January 1985) authorizes chlorpyrifos solution (4.0 fluid ounces Dursban 4EC/100 gallons water) to be added to plants in containers for a certification period of 90 days. Due to label restrictions, chlorpyrifos (Dursban) cannot be used for IFA quarantine treatment of bedding plants, blueberries, and other food producing plants.

Several publications (Hillman 1977, Morrill 1976, Francke 1983, Williams and Lofgren 1983) have reported the effectiveness of diazinon when used as a mound drench against IFA. Under current labeling, diazinon can be used to treat blueberries and other woody food plants. A study was undertaken to determine the effectiveness of diazinon as a pour-on treatment for certification of XFA infested containerized plants, primarily blueberries.

METHODS AND MATERIALS:

Three trials were initiated on the following dates: July 27, December 11, and December 15, 1987. Each trial consisted of both a colony infested pot study and an alate queen bioassay study. Both studies were necessary since infestation could occur as either a colony present at the time of treatment or through newly mated queens flying into pots following treatment.

A. Colony Infested Pot Study

In this study, nine standard 6" nursery pots were three-quarters filled with potting soil, saturated with water, and allowed to drain for 24 hours. The commercial potting media used was STRONG-LITE® which consists of a blend of pine bark, peat moss, and vermiculite (Strong Lite Products, P.O. Box 8029, Pine Bluff, Arkansas). A 50 cc. fragmented IFA colony (queen status not determined) was introduced into each moist pot for a 24 hour acclimation period before treatment. After dividing the nine infested pots into three groups of three pots, the three groups were treated as follows: 2.0 pints Diazinon 2EC/100 gallons water; 4.0 fluid ounces Dursban 4EC/100 gallons water (per PPQ manual); and an untreated check. Pots were maintained in fourteen-quart pans with talced sides to prevent escape. Twenty-four hours post-treatment, the contents of each were "dumped" and evenly spread in order to determine the status of each ant colony. If less than 20 workers were alive the "colony" was rated as "dead".

B. Alate Queen Bioassay Study

In each trial, thirty standard 6" nursery pots were three-quarters filled with potting soil, saturated with water, and allowed to drain for 24 hours. The commercial potting media used was STRONG-LITE® as previously described. The thirty moist pots were divided into three groups of ten pots. The three groups were treated as follows: 2.0 pints Diazinon 2EC/100 gallons water; 4.0 fluid ounces Dursban 4EC/100 gallons water (per PPQ manual); and an untreated check. All pots were maintained outdoors on raised benches. From each treatment a composite sample of soil was collected from two pots mixed together at 24 hours and every week for four weeks. The diazinon treated soil not used for the alate queen bioassays was canned, labelled, and stored in a freezer for future gas liquid chromatography analysis. Bioassays were conducted in the laboratory by confining five alate queens to 20 cc. treated soil placed in four 2"x2" plastic flower cups equipped with an inverted petri dish top and Labstone® bottom. The petri dish top prevented the alate queens from escaping while the Labstone® bottom absorbed moisture from an underlying bed of damp peat moss. Alate queen mortality was assessed after seven days of continuous confinement to the treated soil.

RESULTS:

A. Colony infested pot study

Both treatments of 2.0 pints Diazinon 2EC/100 gallons water and 4.0 fluid ounces Dursban 4EC/100 gallons water were 100% effective within 24 hours as a pour on treatment of colony infested pots (Table 8). Casual observation indicated that the colonies were "dead" within six hours.

B. Alate queen bioassay study

As of four weeks post-treatment, diazinon demonstrated to be 100% effective against alate queens in the second and third trials with rainfall of 5.32 inches and 5.27 inches, respectively. Loss of effectiveness occurred at two weeks post-treatment in the first trials, possibly due to the relatively large amount of rainfall (8.62 inches), (Table 9).

Table 8. Effectiveness of Diazinon 2EC Pour-on Treatment for Elimination of IFA Colonies Infesting Nursery Pots.

TREATMENT 1/	TRIAL I % Colony Mortality	TRIAL II % Colony Mortality	TRIAL III % Colony Mortality
2.0 pints Diazinon 2EC/ 100 gallons water	100	100	100
4.0 fluid oz. Dursban 4EC/ 100 gallons water	100	100	100
Check	0	0	0

1/ 3 colonies/treatment/trial

TABLE 9. Residual Activity of Diazinon Drench Against Alate IFA Queens.

Treatment	% Mortality at Indicated Post-Treat Interval				
	24 Hr.	1 Wk.	2 Wk.	3 Wk.	4 Wk.
Trial 1 - 7/27/87					
2.0 pints Diazinon 2EC/ 100 gal. water	100	100	15	—	—
4.0 fluid oz. Dursban 4EC/100 gal. water	—	—	—	—	—
Untreated Check	0	15	10	—	—
Cumulative Rainfall (inches)	0	3.75	8.62	—	—
Trial 2 - 12/14/87					
2.0 pints Diazinon 2EC/ 100 gal. water	100	100	100	100	100
4.0 fluid oz. Dursban 4EC/100 gal. water	100	95*	100	100	100
Untreated Check	5	0	0	10	15
Cumulative Rainfall (inches)	0.10	1.27	3.77	4.87	5.32
Trial 3 - 12/16/87					
2.0 pints Diazinon 2EC/ 100 gal. water	100	100	100	100	100
4.0 fluid oz. Dursban 4EC/100 gal. water	100	100	95*	100	100
Untreated Check	0	5	0	0	15
Cumulative Rainfall (inches)	0	1.77	3.67	4.77	5.27

* Escape of one queen from one replicate.

REFERENCES CITED:

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

Francke, O.F. 1983. Efficacy tests of single mound treatments for control of Red imported fire ants. Southwestern Entomologist. 8:42-45.

Hillman, R.C. 1977. Red imported fire ant control with conventional insecticides, 1975, 1976. Insecticide and Acaracide Test. 2:135.

Morrill, W.L. 1976. Red imported fire ant control with mound drenches. Jour. Econ. Ent. 69:542-544.

PROJECT NO: FA02G077

PROJECT TITLE: Toxicity of Triumph and Dursban to IFA Workers and Alate Queens

LEADER/PARTICIPANTS: Anne-Marie Callcott, Rebecca Norris, Linda Ward, and Gilbert Nance

INTRODUCTION:

Triumph is a relatively new organophosphate insecticide from Ciba-Geigy that has shown promise as a quarantine treatment for nursery potting media. Triumph's efficacy when incorporated into soil, used as a single topical application for containerized plants and it's residual activity are currently being tested. Because of promising results thus far, a study to establish initial toxicity and LD_{99} of technical Triumph insecticide against IFA workers and alate queens was initiated. The worker ant study was done in Whiteville, North Carolina by Rebecca Norris, et al., and the alate queen study in Gulfport, Mississippi by Anne-Marie Callcott.

A study of toxicity of Dursban to IFA workers, conducted in 1979, (Annual Report, USDA, APHIS, PPQ, IFA Station), showed the LD_{50} approximately .18 ppm and LD_{99} to be .28 ppm. This study was repeated because of recent interest in the minimum dose rate required for IFA control in potting media.

METHODS AND MATERIALS:

Procedures described elsewhere were slightly modified to meet the criteria here (Banks et al. 1964, Collins and Ladner 1981, Collins et al. 1982). Stock solutions of technical Triumph (94.4%), and technical Dursban (99%), were mixed in acetone. Serial dilutions of the stocks were added to 150 g. local sandy loam top soil to obtain various dosage rates. Additional acetone, to bring total liquid to 40 ml., was added to acquire a thoroughly saturated soil mixture. The solvent was evaporated by drying under a hood for 1 hour (Dobbs 1985). Bioassays, using 20 workers or 5 alate queens per replicate, and four replicates per soil sample (treated or check), were performed. Check soil was treated with 40 ml. acetone and dried under the hood. PPM dosage rates showing 10% to 90% mortality were bioassayed three times and percent mortality of each rate recorded at 7 days post-treatment.

RESULTS:

Toxicity of Triumph to alate queens shows a LD_{99} of .372 ppm and LD_{50} of .172 ppm (Fig. 5). The results of toxicity tests on IFA workers indicates a LD_{99} of .035 ppm and LD_{50} of .015 ppm (Fig. 6). These results confirm the findings of Dobbs (1985) who used a different procedure to show that Triumph is highly toxic to the IFA. Dursban's toxicity to alate queens showed LD_{99} to be approximately 1.75 ppm and LD_{50} about 1.39 ppm (Fig. 7). The results of

the toxicity of Dursban to IFA workers has not been completed. Replicates are needed to verify the present results of both of these tests in the Dursban series. Because of the variances in the numbers obtained in the Dursban tests, some trials were omitted from results, and retested.

Because of the small number of alate queens used in each bioassay replicate, averages of the four replicates in each trial were used as data points in constructing the dosage mortality curves (Figs. 5 & 7). Individual replicates were used in the worker dosage mortality curve (Fig. 6), since a greater number of workers was used per replicate.

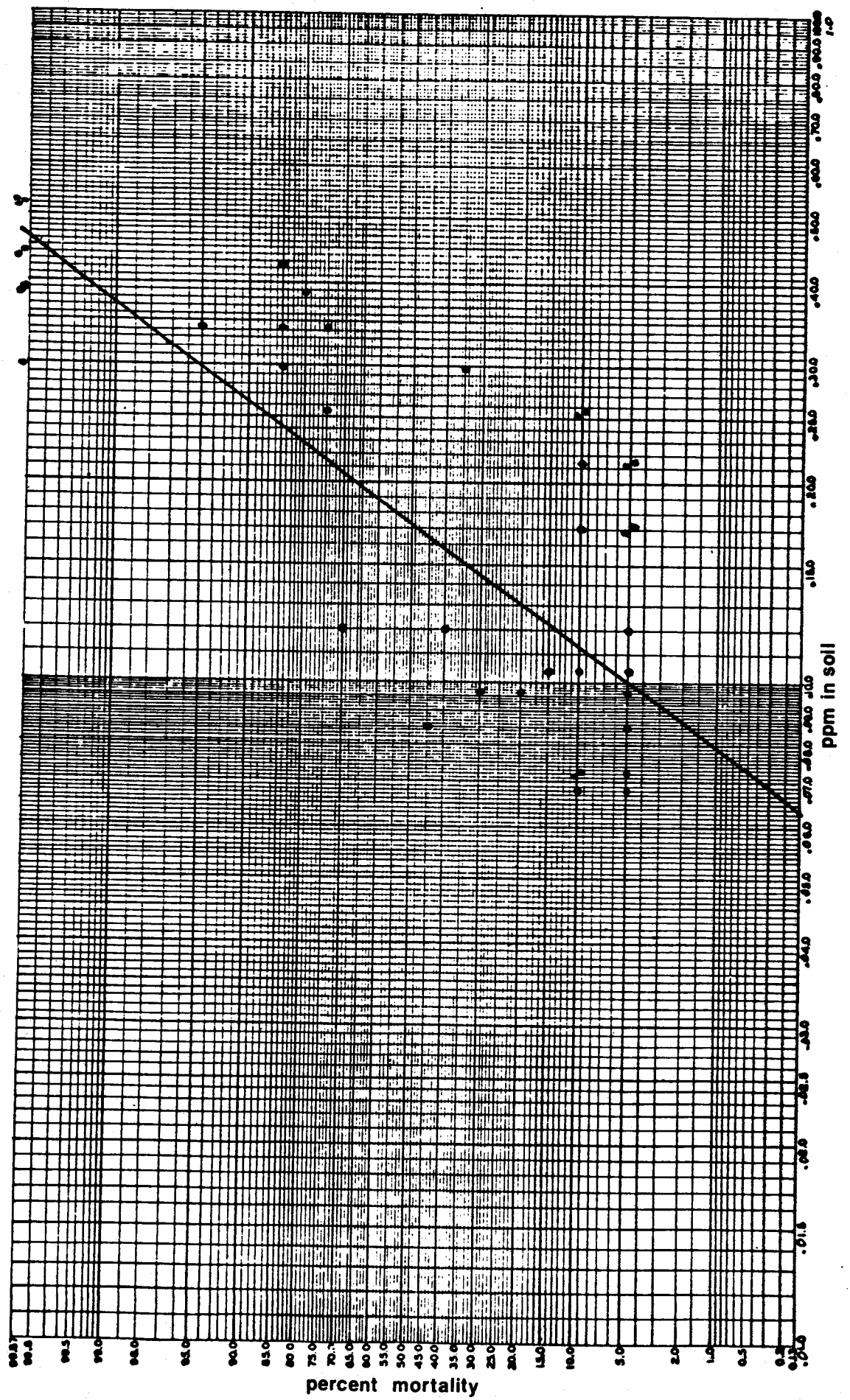
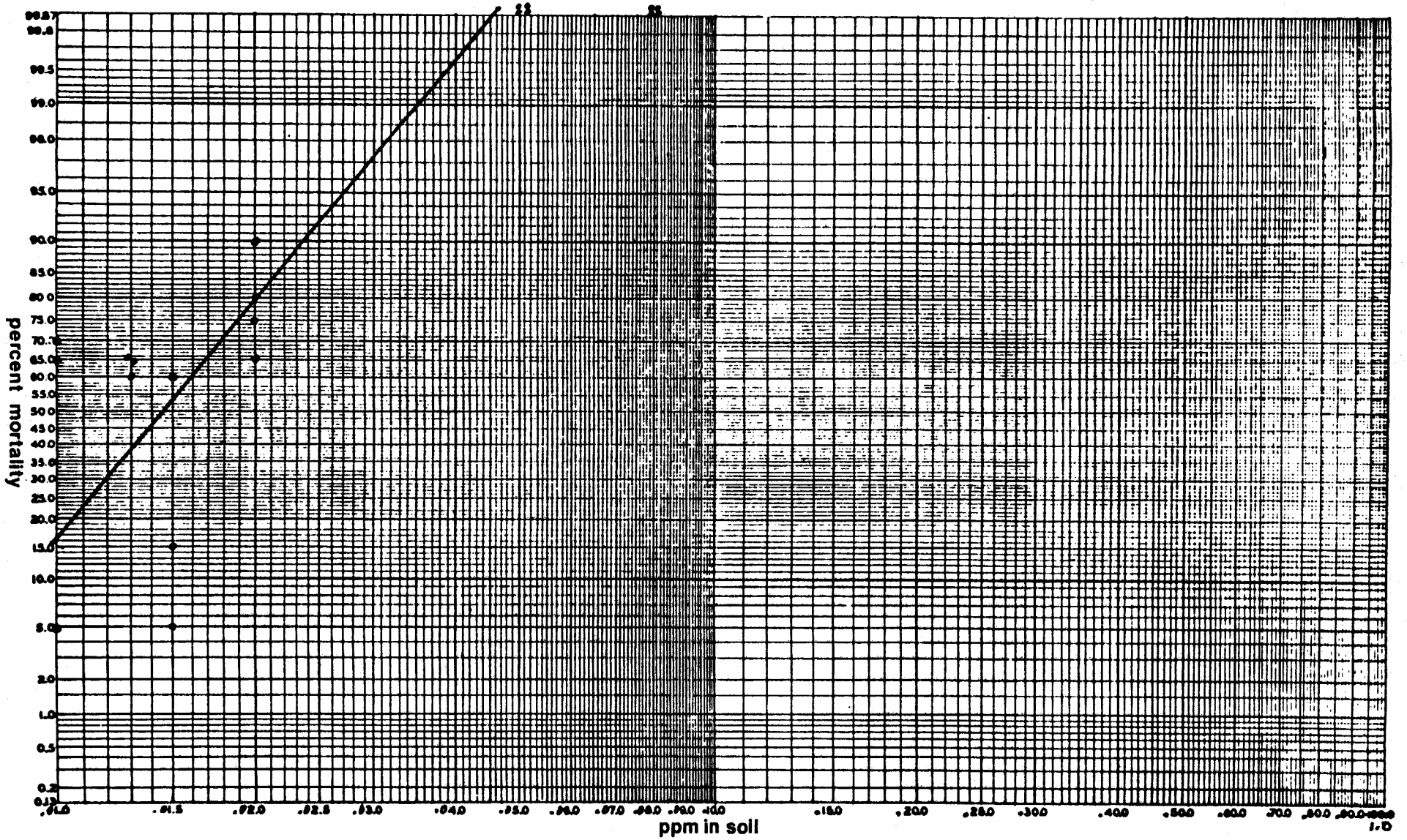


Fig 5. Dosage mortality curve - toxicity of Triumph to IFA alate queens.

Fig 6. Dosage mortality curve—toxicity of Triumph to IFA workers.



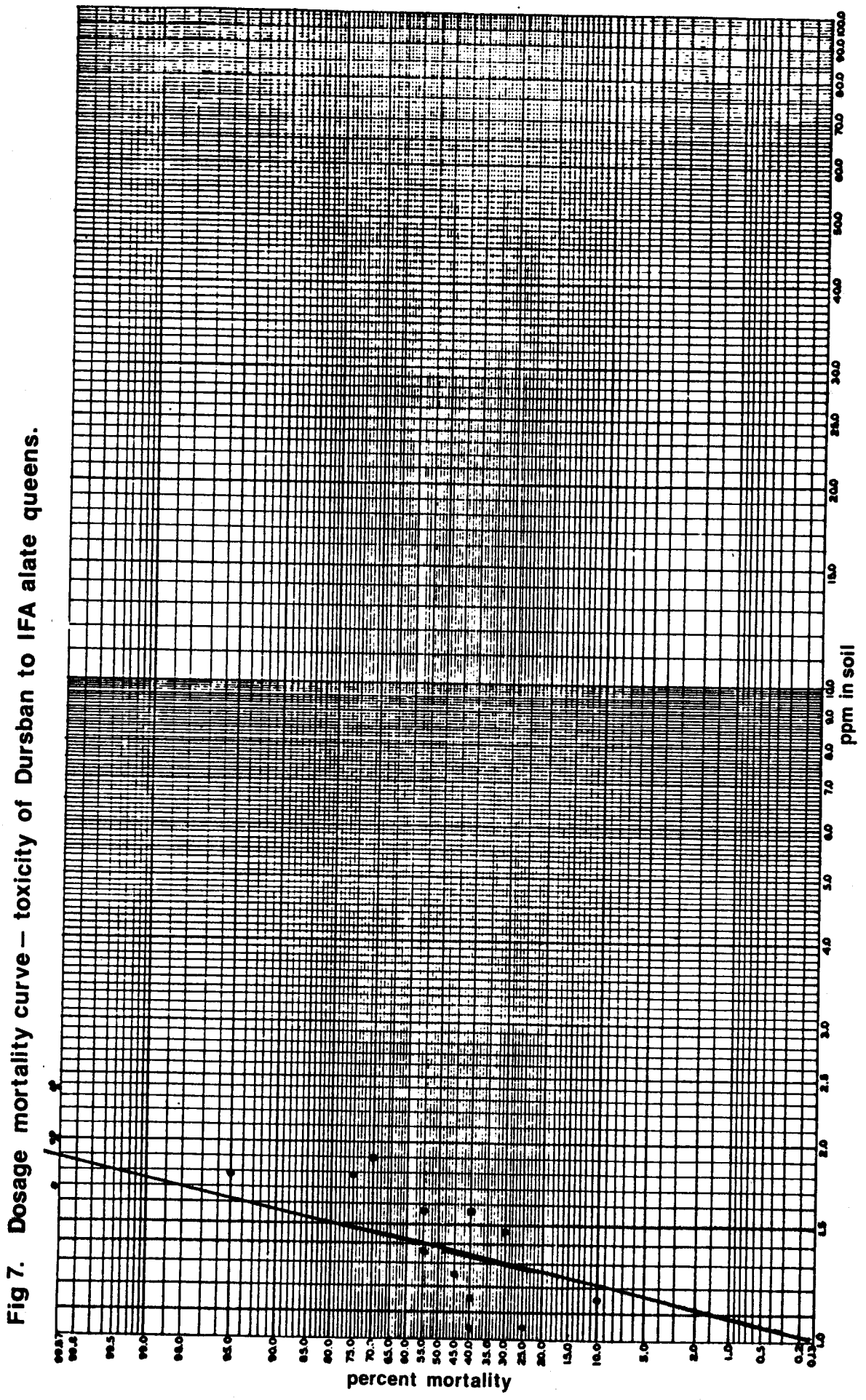


Fig 7. Dosage mortality curve – toxicity of Dursban to IFA alate queens.

REFERENCES CITED:

Banks, W.A., C.S. Lofgren and C.E. Stringer, Jr. 1964. Laboratory evaluation of certain chlorinated hydrocarbon insecticides against the imported fire ant. J. Econ. Entomol. 57:298-299.

Collins, H.L. and A.L. Ladner. 1981. Evaluation of lindane for quarantine treatments. Annual Report, USDA, APHIS, PPQ, IFA Station, Gulfport, MS. p. 81-84

Collins, H.L. et al. 1982. Evaluation of lindane for IFA quarantine treatments. Annual Report, USDA, APHIS, PPQ, IFA Station, Gulfport, MS. p. 22-39.

Development of Quarantine Treatments. 1979. Annual Report, USDA, APHIS, PPQ IFA Station, Gulfport, MS. p. 31-66.

Dobbs, T. 1985. Relative toxicity of several insecticides to red imported fire ant queens. Annual Report, USDA, APHIS, PPQ, IFA Station, Gulfport, MS. p. 66-68.

PROJECT NO: FA02G087

PROJECT TITLE: Evaluation of Various Rates of Topically Applied Granular Dursban and Triumph for IFA Quarantine Treatment of Containerized Nursery Plants.

LEADER/PARTICIPANTS: Stephen Trostle and Anne-Marie Callcott

INTRODUCTION:

PPQ Manual 301.81 (January 1985) states that soil (potting and bench) treatments shall consist of granular Dursban (chlorpyrifos) incorporated into the potting media to control IFA. Triumph is a relatively new organophosphate insecticide from Ciba-Geigy that has shown promise as a potting soil toxicant. A topical application of granular Dursban or Triumph to containerized plants would be an additional means of certification for nurserymen who did not incorporate chlorpyrifos into the soil mixture prior to potting. The objective of this study was to determine if various rates of chlorpyrifos (Dursban 2.5G) and Triumph 2G applied as single topical applications would eliminate existing colonies and also provide effective residual activity to prevent alate queen infestation of containerized plants.

METHODS AND MATERIALS:

I. Colony infested pot study (kill of existing colonies):

STRONG-LITE® potting media (Strong-Lite Products, P.O. Box 8029, Pine Bluff, Arkansas), consists of a blend of pine bark, peat moss, and vermiculite, and was used to three-quarters fill twenty-one (21) 6" x 6" standard plastic nursery pots. A field collected fragmented colony (queen status unknown) of 50 cc. was then introduced into each pot. The pots were divided into seven groups of three pots and treated after five days acclimation by the ants. The groups were topically treated as follows:

0.5 lb. Dursban 2.5G/cu. yd. media,
1.0 lb. Dursban 2.5G/cu. yd. media,
2.0 lb. Dursban 2.5G/cu. yd. media,
0.5 lb. Triumph 2.0G/cu. yd. media,
1.0 lb. Triumph 2.0G/cu. yd. media,
2.0 lb. Triumph 2.0G/cu. yd. media,
untreated check.

In order to simulate a nursery watering schedule, 0.65 inches of water were applied to each pot weekly. Sustenance for the treated colonies consisted of one teaspoon of peanut butter per week. Pots were disturbed daily for three weeks then weekly and evaluated for survival. Colonies were rated as active if 25 or more workers were observed after disturbing the treated pots.

II. Alate queen bioassay:

Residual activity of each treatment was determined by bioassaying treated media with alate queens. The commercial potting media used was Dodd's Potting Soil which consists of equal parts of bark and peat combined with 5% airlite, 1 1/2 lbs. per cubic yard of minor nutrients and 8 lbs. per cubic yard of lime (George Dodd Nursery Supply, P.O. Box 86, Semmes, Alabama). The standard treatment was 1.0 lb. Dursban 2.5G incorporated into one cubic yard of potting media (PPQ Manual 301.81). Ninety (90) standard treatment (incorporated Dursban) pots were used; and four-hundred ninety-five (495) 6"x 6" pots three-quarters filled with Dodd's Potting Soil were topically treated in the following manner:

90 pots treated with 0.5 lb. Dursban 2.5G/cu. yd.,
90 pots treated with 1.0 lb. Dursban 2.5G/cu. yd.,
90 pots treated with 2.0 lb. Dursban 2.5G/cu. yd.,
45 pots treated with 0.5 lb. Triumph 2.0G/cu. yd.,
45 pots treated with 1.0 lb. Triumph 2.0G/cu. yd.,
45 pots treated with 2.0 lb. Triumph 2.0G/cu. yd.,

From each respective treatment an 80-100 cc. composite sample of potting media was collected monthly from the top two inches of media from three pots. The pots were exposed to outdoor weather conditions and watered artificially to maintain a minimum of 0.5 inches water per week in the absence of sufficient

rainfall. Samples were subjected to standard alate queen bioassay procedure described elsewhere in this Annual Report. The test will continue until bioassays indicate that the pesticide has dissipated or degraded to sub-lethal levels.

RESULTS:

I. TRIUMPH

A. Nest Mortality

Three trials to evaluate the effects of Triumph on colonies infesting pots at the time of treatment (i.e. nest mortality) have been performed. The first trial was initiated September 28, 1987 and continued through November 30, 1987. The higher rate of Triumph (2.0 lbs./cu. yd.) was effective against IFA colonies within 3 weeks (Table 10). In two of the 2.0 lb. replicates, the ants (including brood) formed a "ball" on the outer surface of the plastic pot. The colony remained "clustered" on the exterior of both pots for 10 days prior to moving back into the pots. This may have been an avoidance reaction to the insecticide and probably accounts for the longer survival of these colonies. The 1.0 lb. rate also showed good control, being effective within 10 days of treatment. At the 0.5 lb. rate, two of three replicates showed mortality within 3 weeks. The third replicate was still active when the test was discontinued 2 months post-treatment.

A second trial was begun December 7, 1987. After the 5 day acclimation period, and before treatment, a number of workers of the fragmented colonies were dead. The cause of this mortality is not known and the checks sustained as many deaths as the treated colonies. The two higher rates of application were effective in less than 2 weeks and two of the three 0.5 lb. replicates were also effective within 2 weeks (Table 10). The third replicate was still active when the test was discontinued 2 months post-treatment. However, these results are questionable due to the mortality seen prior to treatment.

A third trial was initiated on December 22, 1987. The 0.5 lb. rate was effective in all three replicates in 3 days as were two of three replicates in both the 1.0 lb. and 2.0 lb. rates (Table 10). The third replicate in both higher rates showed 100% mortality in 8 days.

These 3 trials show varying degrees of control in the 0.5 lb. rate. The first 2 trials are comparable, with 2 of the 3 replicates in each trial providing 100% mortality in 7 to 18 days. The third trial was effective in all replicates in 3 days. The reason for this inconsistency is not known.

The 1.0 lb. rate was effective in all replicates and trials in 1 to 11 days. The 2.0 lb. rate was also effective in all cases in 1 to 21 days. This range was affected by the number of days the ants in 2 of the trial

l replicates clung to the outer surface of the plastic pot.

B. Residual activity against alate queens

The four monthly bioassays completed to date show 100% mortality of alate queens in all Triumph rates tested. The pots have received cummulative water fall over the four monthly periods of 2.26 in., 6.26 in., 8.98 in., and 14.58 in.

C. Discussion

The efficacy of Triumph at 1.0 and 2.0 lb./cu. yd. are at acceptable levels for control of IFA colonies. This "over-the-top" application may be a new method of treatment for nurserymen who need to treat containerized plants. The residual activity of Triumph against reinfestation of potted soil by alate queens is also showing favorable results thus far.

II. DURSBAN

A. Nest Mortality

After four trials of Dursban sprinkled "over-the-top", inconsistent results have occurred with existing rates and water schedules (Table 11). The insecticide treatments appear to stimulate an avoidance behavior;

namely, the workers relocate to the bottom one-third of the soil and under the pot. Occasionally, workers will form an amorphous mass (i.e., "cluster") on the outside of the pot. Soil working (colony maintenance) and feeding was greatly diminished. Although colony vigor is greatly decreased, some workers continue to survive and to infest treated pots.

B. Residual Activity Against Alate Queens

All rates of Dursban "over-the-top" and the standard of Dursban "incorporated" show 100% mortality against alate queens. As of this writing, four monthly bioassays have been completed with an accumulative monthly rainfall of: 2.26 in., 6.26 in., 8.98 in., and 14.58 in.

Table 10. Triumph Nest Mortality: Days Required to Produce Total colony Mortality Following Topical Application of Triumph 2G at Indicated Treatment Rates.

Treatment Rate (lb./cu. yd.)	Replicate No.	TRIAL 1	TRIAL 2	TRIAL 3
0.5	1	15	16	1
	2	18	7	1
	3	*	*	3
1.0	1	2	2	8
	2	8	11	1
	3	10	4	3
2.0	1	21**	2	1
	2	16**	4	8
	3	4	2	1
Check	1	*	*	*
	2	*	*	*
	3	*	*	*

* Colony still active when test discontinued 60 days post-treatment
** extended "ball" of ants formed on outside of pot day 5 after treatment; ants moved back into pot day 15

Table 11. Dursban Nest Mortality: Days Required to Provide Total Colony Mortality Following Topical Application of Dursban 2.5G at Indicated Treatment Rates.

Treatment Rate (lbs/cu. yd.)	Replicate No.	TRIAL 1 (Treated 9/28/87)	TRIAL 2 (Treated 12/7/87)	TRIAL 3 (Treated 12/22/87)	TRIAL 4 (Treated 1/12/88)
0.5	1	9	*	*	--
	2	*	*	19	--
	3	*	*	*	--
1.0	1	*	49	5	*
	2	*	2	9	4
	3	*	2	5	*
2.0	1	4	7		*
	2	2	15	43	*
	3	4	4		6
3.0	1	—	—	—	2
	2	—	—	—	*
	3	—	—	—	*
Untreated Ck.	1	*	*	*	*
	2	*	*	*	*
	3	*	*	*	*

* Colony still active when test discontinued 60 days post-treatment.

PROJECT NO: **FA02G097**

PROJECT TITLE: Sequential Applications of Baits and Dursban for Control of Fire Ants in Field Grown Nursery Stock

LEADER/PARTICIPANTS: Homer Collins and Avel Ladner

INTRODUCTION:

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

The most desirable treatment would be one that could be applied in the field, (i.e., preharvest), compatible with most nursery operations, relatively inexpensive, and effective. Any treatment that falls short of any of these criteria would result in reduced compliance, thereby reducing the effectiveness of the program. The purpose of this research was to test under actual field conditions a simple procedure that would be acceptable to both growers and regulatory officials. This procedures is based on sequential application of any registered IFA bait toxicant followed in 5 to 7 days by Dursban. The dual application is necessary since broadcast applications of Dursban (or other short term residual insecticides) usually do not eliminate large mature IFA colonies, and no bait is capable of providing a residual

barrier against reinfestation by new queens. Therefore, the treatment is based on the hypothesis that the bait application would drastically reduce the population while Dursban, applied approximately 3 to 5 days later, would hasten the demise of any remaining weakened colonies and perhaps more importantly, provide a residual barrier against reinfestation by new queens.

Field tests utilizing this procedure were conducted in previous years and reported in the 1986 IFA Station Annual Report. Two sets of trials were initiated in 1987, and the results reported here.

METHODS AND MATERIALS:

TEST I:

Test I was initiated on May 19, 1987 at Windmill Nursery near Folsom, Louisiana. Test plots were located in six month old plantings of crepe myrtle, red oak, magnolia, and other varieties of woody ornamentals. Each plot was approximately .75 to 1.0 acre in size. Treatments included Amdro, Affirm, and Logic alone and in combination with Dursban, Dursban alone, and untreated check (Table 12). Baits were applied at maximum labelled rate per acre with the USDA, APHIS, PPQ applicator (see Appendix I). Dursban 10G was applied at 6.0 lb. AI per acre with a Herd® Model M-96 Granular Applicator. In both cases, the spreaders were mounted on a Ford 1700 tractor which was operated at 4 mph.

Prior to treatment and each evaluation period, each plot was rated according to the population index system (Lofgren and Williams, 1982).

Test II:

Test II was conducted at the Diamondhead Airport in Hancock County, Mississippi. Test plots were comprised of grass sod which were undisturbed throughout the test except for routine mowing. Treatments included Amdro, Affirm, and Logic in combination with Dursban and an untreated check. All treatments were applied with the application equipment used in Test I, and plots were rated in the same manner as in Test I.

Results:

Test I:

The first post-treatment rating was conducted 30 DAT (Table 12). Drastic reductions in the IFA population in all combination treatment plots were noted at that time. A second evaluation was conducted 60 DAT, but some plots could not be rated because of a severe weed infestation, (primarily Sesbania). All subsequent ratings were cancelled due to the weed problem. Therefore data on residual effectiveness could not be obtained in this test.

Test II:

As shown in Table 12 all treatments were highly effective in eliminating the IFA population. Plots remained IFA free for 20 weeks.

Discussion:

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

While it does appear that the control period will vary from site to site (possibly dependent upon local climatic conditions, time of mating flights and numerous other factors), a 12 to 16 week certification period can be achieved with this procedure. Additional trials to more precisely determine the certification period are sorely needed. Impact of cultivation, weed control, rainfall, soil type, etc. have not yet been defined.

TABLE 12. Efficacy of IFA Baits Used in Combination with Granular Dursban for IFA Control in Field Grown Nursery Stock, 1987.

TREATMENT [1]	Date(s) Applied	Pre-Treatment Population [2] No. Colonies	Pop. Index	% Change in Pre-treatment Population Index at indicated weeks post-treatment [2] (4)	(5)	(8)	(10)	(20)
TEST I- Windmill Nursery								
Amdro + Dursban 10G	5/19, 5/22	17	275	-100		-100		
Logic + Dursban 10G	5/19, 5/22	13	190	-100		-100		
Affirm + Dursban 10G	5/19, 5/22	26	265	- 96		[3]		
Logic Only	5/19	16	215	- 85		[3]		
Dursban 10G Only	5/19	21	260	- 81		-96		
Amdro Only	5/19	25	362	- 79		-92		
Affirm Only	5/19	14	187	- 52		-86		
Untreated Check	—	26	348	- 56		-57		
TEST II-Diamondhead Airport								
Affirm + Dursban	6/29, 7/2	33	450		-100		-100	-100
Amdro + Dursban	6/29, 7/2	25	310		-100		-100	-100
Logic Std. + Dursban	6/29, 7/2	25	310		-100		-100	- 97
Logic APE + Dursban	6/29, 7/2	28	355		-100		-100	-100
Untreated Check	—	18	245		-45		- 57	0

1/ Rates if application as follows: Affirm 1 lb./acre; Amdro 1 1/2 lb./acre; Logic 1 1/2 lb./acre; Dursban 10G 60 lb./acre.

2/ Population index described by Lofgren and Williams (1982).

3/ Lost plot due to weedy conditions.

REFERENCES CITED:

Lofgren, C.S. and D.F. Williams. 1982. Avermectin Bla, a highly potent inhibitor of reproduction by queens of the red imported fire ant. Jour. Econ. Ent. 75:798-03.

PROJECT NO: FA02D017

PROJECT TITLE: Efficacy of Dursban on Irrigated Grass Sod

LEADER/PARTICIPANTS: M.A. Langston, T.J. English, and Rebecca Norris

INTRODUCTION:

Commercial lawn turf producers are closely regulated and soil movement prohibited if the imported fire ant (IFA) infests the production site. Dursban insecticide is used to rid soil of the IFA as a basis for legal regulated movement.

Sod for lawn turf can be treated with Dursban which will produce IFA free turf. However, while the majority of basic efficacy - longevity data regarding Dursban effect on IFA is under non-irrigated conditions, practically all commercial turf is produced under irrigation for maximum growth.

METHODS AND MATERIALS:

This test was conducted at Dillon, South Carolina in Centipede turf established in 1963. Dursban was applied on 7/22/87 at 5.0 pounds active ingredient per acre, or 50 pounds of Dursban 10% granule per acre. Each 1,000 square feet received 1,148 pounds Dursban 10G. Plots were replicated three times.

Plot	Plot Size	Square Ft.	Dursban 10G per Plot
A	65′ x 80′	5200	5.97 Pounds
B	60′ x 60′	3900	4.48 Pounds
C	32′ x 40′	1280	0 (Check)
D	44′ x 150′	6600	7.58 Pounds

Treatments were applied using a cyclone type seeder and placing the pre-weighted material uniformily within each described plots. All treatments were made on 7/22/87.

Soil samples were taken randomly with a minimum of 25 cores 1" x 8" deep from each plot at every sampling date. The cores were collected and composited for each plot assuring at least 2 pounds of soil at each sample date per plot. Samples were screened to remove grass and lumps then frozen at 0 degrees F until use. Sample collection, handling, and storage was done to insure no cross contamination. Sample dates were:

7/23 - One day after application

7/29 - One week after application

8/19 - One month after application

9/16 - Two months after application

10/14 - Three months after application

11/12 - Four months after application

Bioassays of the soil for the longevity of Dursban residue was conducted using alate queens. This test is as described by Collins and Ladner using 20 cc. of test soil in 2" square pots. Dental plastic was used to seal the bottom of each pot and to retain sufficient moisture. Five vigorous alate queens were placed per pot which was covered with an inverted petri dish to prevent escape or cross contamination. Bioassays were begun on all soil on 11/18/87 and conducted for 19 days.

RESULTS:

Precipitation as rainfall or irrigation occurred during the July-November 1987 period as follows:

Date	Inches	Date	Inches
7/25	1.00*	8/31	0.20
7/3	0.30	9/4	4.10
8/1	0.60	9/12	0.30
8/8	1.70	9/23	1.00*
8/11	0.36	9/30	0.24
8/17	0.22	10/11	0.75*
8/19	0.50	10/23	0.55*
8/23	1.60	10/27	0.42
8/29	1.10	11/10	0.45

* = Irrigated.

Mortality of alate queens confined to soil samples collected at various post-treatment intervals is shown in Table 13.

Mortality was slow on soil collected 7/23/87 (1 DAT). This collection was made before irrigation, so that leaching/diffusion of Dursban particles probably had not occurred. However, almost complete mortality occurred after the test insects had been confined to treated soil for 2 weeks.

Mortality was 100% after four days exposure to soil collected 7 days after treatment indicating effective application of the Dursban.

Soil collected 56 and 84 days after treatment provided 100-97% mortality after 14 days exposure. Mortality of alate queens placed on soil collected 113 days (4 months) after treatment with Dursban only reached 50%.

During this study, a total of 14.53 inches of precipitation fell either as rainfall or irrigation. This average of 1.10 inches of precipitation each week is optimum for turf growth. It would appear that turf treated with Dursban at 5.0 lb./A ai granular material would be free of IFA for 3 months after treatment.

TABLE 13. Residual Activity of Dursban 10G in Irrigated Grass Sod.

Sample Date	Rate lb./A	Days After Treatment	% Mortality of Alate Queens Confined to Treated Soil for days indicated: 2 Days	4 Days	7 Days	11 Days	14 Days	19 Days
7/23/87	5	1	55	85	92	92	97	98
	0	1	0	0	0	0	0	0
7/29/87	5	7	83	100	100	100	100	100
	0	7	0	0	0	10	10	10
8/19/87	5	28	8	47	78	85	87	90
	0	28	0	0	0	5	10	10
9/16/87	5	56	8	28	60	90	100	100
	0	56	0	0	0	0	0	55
10/14/87	5	84	10	35	52	82	97	98
	0	84	10	0	10	10	10	10
11/12/87	5	113	12	35	45	48	50	50
	0	113	0	0	0	0	5	10

1/ Plots treated 7/22/87
Dursban 5.0 lb. AI/acre

PROJECT NO: FA03G017

PROJECT TITLE: Small Plot Field Tests with Bait Toxicants

LEADER/PARTICPANTS: Homer Collins, Avel Ladner, Steve Trostle, and Anne-Marie Callcott

INTRODUCTION:

Control of imported fire ants through the application of toxic baits is the most cost-effective procedure yet devised. Application of baits can be achieved by the use of specialized ground equipment, by aircraft, or by single mound treatment, depending upon the size of the area to be treated, label restrictions, and other factors. Although several baits are currently registered for use against IFA, there is a need to continue research and development of improved formulations(carriers, attractants, stabilizers, etc.). Several small plot field trials with unregistered IFA baits or formulations were conducted in 1987 and the results reported here.

METHODS AND MATERIALS/RESULTS:

A. LOGIC Formulation Tests

Efficacy of three experimental formulations of Logic was compared to standard or commercial formulations of Logic, Amdro and Affirm. One-acre test plots in Harrison County, Mississippi were treated on May 20, 1987 with a shop-built

granular applicator (Appendix I). Post-treatment ratings were conducted at 6, 12, and 18 weeks after application in 1/4 acre efficacy plots located in the center of each treatment plot. All IFA colonies were counted and rated by the system described by Lofgren and Williams (1982). Results of this trial are shown in Table 14.

B. GX-071 Tests

GX-071 is a bait formulation under development by the Griffin Corp., Valdosta, Georgia. The insecticidal properties of this class of delayed action insecticides was described by Vander Meer, et al. (1985). We reported the results of a preliminary trial with GX-071 in the 1986 IFA Station Annual Report. Two additional trials were initiated in August, 1987 and the results reported here.

TEST I - 8/18/87

GX-071 was applied broadcast at 1.0 and 2.0 lbs. bulk bait/acre to unreplicated 1 acre plots in Harrison County, Mississippi. Standard evaluation procedures were used to determine efficacy at 1 and 3 weeks after application. As shown in Table 15 100% colony mortality was achieved with both rates of GX-071 and Amdro.

TEST II - 8/25/87

A second trial with GX-071 was initiated on August 25, 1985. Application, plot size and evaluation procedures were the same as used in Test I, except that plots were rated at 2 and 4 weeks after treatment. As in the previous tests, both rates of application provided 100% colony mortality within a relatively short time span (Table 15).

C. Fall Trials

A study comparing efficacy of Amdro, Affirm, Logic and GX-071 following a late season application was initiated on October 15, 1987. Delayed effects associated with late season applications of most baits is a well documented phenomenon (Collins 1986) but limited information on GX-071 was available.

One-acre test plots (3 replicates/treatment) were treated with the USDA, APHIS shop-built granular applicator mounted on a farm tractor. All baits were applied at a bulk rate of 1.0 lb./acre. Post-treatment evaluations were conducted at 4, 8, and 24 weeks. The very rapid kill seen in the previous summer tests with GX-071 (Table 15) was greatly slowed following the mid-October application. Minimal colony mortality was achieved with any treatment at 4, 8, and 24 weeks post-treatment (Table 16). Evaluations will continue throughout spring and summer 1988.

TABLE 14. Small Field Trails with Bait Formulations. Unreplicated 1-Acre Plots were Treated on May 20, 1987 by USDA, APHIS, PPQ, Imported Fire Ant Station.

Bait	Formulation	Bulk Rate/Acre (lbs.)	Pretreat Population 1/ Colonies/ Subplot	Pretreat Population 1/ Pop. Index	Results at Indicated Weeks After Treatment: % colony mortality (6)	% colony mortality (12)	% colony mortality (18)	% change in pretreat pop. index (6)	% change in pretreat pop. index (12)	% change in pretreat pop. index (18)
LOGIC	Commercial	1.5	14	255	28	93	100	-88	-99	-100
LOGIC	RPS	1.5	12	235	33	83	100	-89	-94	-100
LOGIC	ACR	1.5	12	248	33	83	92	-89	-95	-99
LOGIC	APE	1.5	13	225	7	100	92	-85	-100	-93
AMDRO	Commercial	1.5	23	425	35	56	74	-84	-93	-83
AFFIRM	Commercial	1.0	13	210	23	77	69	-85	-92	-88
CHECK	---	--	9	180	0	0	11	-18	-27	-30

1/ Population index based on Lofgren Scale (Lofgren and Williams, 1982. Jour. Econ. Ent. 75: 798-803).

TABLE 15. 1987 Small Field Trails with GX-071. USDA, APHIS, PPQ Imported Fire Ant Station.

Bait Formulation	Rate/Acre 1/ Bulk (lbs)	AI (gm)	Pre-treat Population: Colonies/ Subplot	Pre-treat Population: Pop. Index/ Subplot	Results at Indicated Weeks Post-treatment: Colony Mortality (1)	(2)	(3)	(4)	% Change in Pre-treat Pop. Index (1)	(2)	(3)	(4)
Test I - 8/18/87												
AMDRO	1.5	6.0	7	64	100		100		-100		-100	
GX-071	1.0	2.7	8	105	100		100		-100		-100	
GX-071	2.0	5.4	10	155	90		100		- 99		-100	
CHECK	--	--	11	135	45		45		- 30		- 30	
Test II - 8/25/87												
GX-071	1.0	2.7	8	130		25		100		-31		-100
GX-071	2.0	5.4	12	200		75		100		-82		-100
AMDRO	1.5	6.0	12	170		50		92		-63		- 94
ACEPHATE	2 TBS/COLONY		12	165		0		8		+30		0
CHECK	--	--	8	105		0		0		+38		+28

1/ Applied broadcast with mechanized application equipment to unreplicated 1 acre test plots unless otherwise indicated.

TABLE 16. Results of Late Season Application of Bait Toxicants. Treatments applied October 15, 1987 by USDA, APHIS, PPQ, Imported Fire Ant Station.

Treatment		Pre-Treatment Population 1/		Results - Weeks Post-treatment					
				% Colony Mortality			% Change in Pre-Treat Pop. Index		
Bait	Bulk rate/acre (lbs.)	Average No. colonies/subplot 2/	Average Pop. index/subplot	(4)	(8)	(24)	(4)	(8)	(24)
AMDRO	1.0	12.3	218.3	26.6	18.0	14.9	-32.0	-58.8	-81.0
LOGIC	1.0	11.6	219.0	0	0	0	+26.3	-61.0	-66.0
AFFIRM	1.0	10.3	195.0	0	9.3	0	-48.6	-72.6	-75.1
GX-071	1.0	10.0	193.3	3.0	0	21.6	+16.6	-18.6	-84.4
Untreated Ck.	—	9.6	151.6	0	0	0	+132.6	+171.2	+70.2

1/ Population index based on Lofgren Scale (Lofgren and Williams), 1982. Jour. Econ. Ent. 75:798-803.

2/ Average of 3 replicates (plots) per treatment.

REFERENCES CITED:

Collins, H.L. 1986. Field evaluation of Affirm, Amdro, and Logic baits for control of red imported fire ants, 1984. Insecticide and Acaricide Tests. 11:468.

Lofgren, C.S. and D.F. Williams. 1982. Avermectin B_1, a highly potent inhibitor of reproduction by queens of the red imported fire ant. Jour. Econ. Ent. 75:798-803.

PROJECT NO: FA03G027

PROJECT TITLE: Evaluation of Acephate for Treatment of Individual IFA Colonies

LEADER/PARTICIPANTS: Homer Collins, Avel Ladner, and Steve Trostle

INTRODUCTION:

Acephate (Orthene 75S) is labelled for IFA control either as a dust by sprinkling two teaspoons over a mound, or as a drench. The drench is made by mixing 1 ounce of Orthene 75S in five gallons of water and then applying one g of the mixture on and around each mound (approximately 4 feet diameter). This study was initiated to compare efficacy of acephate using both **methods** of **application.**

METHODS AND MATERIALS:

The first trial was initiated on April 28, 1987. Three one-acre plots were laid out with a 1/4 acre efficacy plot in the center of each. Pre-treatment counts were taken and the plots then treated with acephate; one by dusting, one by drenching, and one untreated (check). Each mound treated was marked with an orange flag. Three weekly post-treatment ratings were made by the procedures described by Lofgren and Williams (1982).

The second trial was performed in conjunction with the August 25, 1987, GX-071

field test in Harrison County, Mississippi (Page 65 this report). The acephate in the second test was applied only as a dust (2 teaspoons/mound). Plots were rated at 1 and 3 weeks after application.

RESULTS:

The first trial showed marginal decrease in the number of colonies and population index (Table 17). The second trial showed an increase in both colony number and population index. These results indicate that acephate did not provide a satisfactory level of control for IFA.

TABLE 17. Acephate Field Trials, 1987.

Treatment		Pretreat Pop.[3]		Results at Indicated Weeks Post-Treatment							
Method of Application	Application Rate	Colonies/ Subplot	Pop. Index	% Colony Mortality (1)	(2)	(3)	(4)	% Change in pretreat Pop. Index (1)	(2)	(3)	(4)
Trial 1 4/28/87											
Dry	2 tsp./colony[1]	13	187	38	61	38		-.78	-2.7	-36	
Drench	1 gal. mix/mound[2]	16	257	0	6	31		-20	-44	-28	
Check	—	16	262	0	0	0		+8	+48	+28	
Trial 2 8/25/87											
Dry	2 tsp./colony[1]	12	165		0		8		+30		0
Check	—	8	105		0		0		+38		+28

1/ 2 tsp. Orthene 75S/colony

2/ 1 oz. 75 SP/5 gal. water

3/ Population index based on Lofgren Scale (Lofgren and Williams, 1982)

REFERENCES CITED:

Lofgren, C.S. and D.F. Williams. 1982. Avermectin B1A, a highly potent inhibitor of reproduction by queens of the red imported fire ant. Jour. Econ. Ent. 75:798-803.

PROJECT NO: FA03G037

PROJECT TITLE: Label Expansion of Logic Fire Ant Bait

LEADER/PARTICIPANT: Avel Ladner

INTRODUCTION:

At the present time, Logic is not labelled for IFA control on hay, pecans, or peaches. The Imported Fire Ant Station, in cooperation with Maag Agrochemicals(Vero Reach, Florida), undertook the present study to determine residue levels of Logic in hay, pecans, and peaches following normal and excessive rates of application. Information obtained in this study will be used to support a label expansion for use on these crops. Protocol and residue analyses for the study were provided by Maag Agrochemicals.

METHODS AND MATERIALS:

Hay Crop - Three 1/4 acre unreplicated plots were set up in a bahia, (Paspalum notatum), hay meadow in Hancock County, Mississippi. Logic was applied by the USDA, APHIS Granular applicator(Appendix I) mounted on a farm tractor. Block I received 1.5 pounds per acre, Block 11 received 3 pounds per acre, and Block III was the untreated check(Table 18). A recording hydro-thermograph and rain gauge were used to monitor weather conditions throughout the study. Hay was cut on July 27, 1987 (7 days post-treatment). Samples were collected

1, 7, and 11 days after treatment. Samples were frozen and shipped on dry ice to Maag Agrochemicals for residue analysis.

Peach Orchard - The peach test was set up at Byron, Georgia on the USDA, ARS Nut and Fruit Research Farm in cooperation with with Mr. Louis Tedders, Kirby Moncrief and Robby Wade (ARS). Three test plots consisting of four trees each were marked off in a peach orchard (Coronet variety) of 11 year old trees. Logic was applied using the USDA, APHIS bait applicator mounted on a farm tractor. Block I received the label rate of 1.5 pounds per acre, Block II received 15 pounds per acre, and Block III was used as the untreated check (Table 18). The first treatment was at fruit set and the second treatment was at fruit coloring. Samples were collected on August 6, 1987 and shipped on dry ice to Maag Agrochemicals for residue analysis.

Pecan Orchard- The pecan test was also conducted at the USDA, ARS Nut and Fruit Research Farm in Byron, Georgia. Three test plots consisting of 8 trees each (Stuart variety) were established in pecan orchard of six year old trees. Logic was applied using the USDA, APHIS bait applicator mounted on a farm tractor. Block I received 1.5 pounds per acre, Block II received 15 pounds per acre, and Block III was the untreated check plot (Table 18). First treatment was at nut swell and the second treatment was at shuck split. Samples were collected on December 3, 1987 and shipped to Maag Agrochemicals for analysis.

Table 18. Logic Label Expansion Studies: Dates and Rates of Application of Logic to various crops.

TEST SITE LOCATION	CROP	PLOT NO.	BULK RATE ACRE/LBS.	TIME OF TREATMENT	DATE
Byron, Georgia	Peaches	1 2	1.5 15	1st at fruit set 2nd at fruit coloring	4-21-87 5-28-87
Hancock County, Mississippi	Bahia Grass Hay	1 2	1.5 3	single treatment	7-20-87
Byron, Georgia	Pecans	1 2	1.5 15	1st at nut swell 2nd at shuck split	8-6-87 10-7-87

PROJECT NO: FA03W017

PROJECT TITLE: Effect of Method of Application on IFA Bait Efficacy

LEADER/PARTICIPANTS: Rebecca Norris, Linda Ward, and Gilbert Nance

INTRODUCTION/METHODS AND MATERIALS:

A comparison study to determine the effect of different methods of application on IFA bait efficacy was conducted in Georgetown, South Carolina, and Evergreen and Whiteville, North Carolina. Baits used were Amdro, Logic and Affirm. Methods of application were single mound, manual broadcast and mechanized broadcast treatments. Equipment used for manual broadcast was a Cyclone@ hand seeder and for mechanized broadcast, a modified Gandy® spreader mounted on a farm tractor. Rates of application are listed in Table 19. Treatment areas for each bait ranged from 1 acre to 5 acres. In each treatment area a 1/4 acre efficacy plot was established. Plots were rated by the method described by Lofgren and Williams (1982).

RESULTS:

Mechanized broadcast proved to be the most effective method of application (Table 19). With all three IFA treatments (baits), no surviving worker brood was found 18 weeks after treatment. The effectiveness of mechanized broadcast over manual and single mound treatments was probably due to a more even distribution of material over the treatment area.

Amdro appeared overall the most effective bait for IFA control over the 18 week evaluation period. None of the colonies treated with Amdro had surviving worker brood in comparison to Logic or Affirm. The mean colony mortality was also higher at 18 weeks with a range of 81 to 94%.

TABLE 19. 1987 Field Results Comparing Different Methods of Application to Bait Efficacy.

Test Location	Date Applied	Treatments Applied Bait-Treatment-Rate/Acre	Pre-Treatment Population X No. Colonies Per Subplot	Pre-Treatment Population X Pop. Index Per Subplot	Status of Population at Indicated Post-Treatment Interval (Weeks) X Colony Mortality (6)	(12)	(18)	X % Change in Pop. Index (6)	(12)	(18)	% Surviving colonies with worker brood (6)	(12)	(18)
Georgetown, SC	8/7/87	LOGIC single mound 3 Tbs/ colony	10	159	24	0	21	-80	-73	-78	7	11	11
		manually broadcast 1.5 lb/a	10	165	15	0	29	-82	-79	-87	0	0	*5
		mechanized broadcast 1.5 lb/a	8	109	41	59	30	-86	-91	-88	0	0	0
		nontreated check --	11	154	11	0	7	+42	+20	+40	55	56	52
Evergreen & Whiteville, NC	7/20/87	AMDRO single mound 5 Tbs/ colony	8	84	54	60	81	-76	-67	-94	23	14	0
		manually broadcast 1.5 lb/a	7	84	90	69	94	-96	-81	-99	0	17	0
Georgetown, SC	8/7/87	mechanized broadcast 1.5 lb/a	10	128	89	64	85	-94	-87	-97	33	30	0
		nontreated check --	7	76	0	0	0	+52	+51	+103	73	75	82
Whiteville, NC	6/5 and 8/11/87	AFFIRM single mound 5 Tbs/ colony	9	117	18	24	47	-80	-79	-81	9	18	17
		manually broadcast 1.0 lb/a	7	83	44	62	69	-87	-86	-90	0	1	6
Georgetown, SC	8/7/87	mechanized broadcast 1.0 lb/a	8	101	36	51	33	-70	-87	-89	14	4	0
		nontreated check --	7	65	0	0	0	+64	+127	-152	75	72	54

* This may be due to IFA re-infestation.

REFERENCES CITED:

Lofgren, C.S. and D.F. Williams. 1982. Avermectin B1A, a highly potent inhibitor of reproduction by queens of the red imported fire ant. Jour. Econ. Ent. 75:798-803.

PROJECT NO: FA04G017

PROJECT TITLE: Impact of IFA on Coccinella septempunctata (C-7) production in field insectaries

LEADER/PARTICIPANTS: Homer Collins, Avel Ladner, Dudley Adams, and Louis Tedders (ARS)

INTRODUCTION:

Coccinella septempunctata, commonly known as C-7, is a host specific aphid predator that potentially could be used in innundative biological control project. Louis Tedders (ARS) is developing techniques for rearing this insect in field insectaries at the ARS Fruit and Nut Tree Research Laboratory near Byron, Georgia.

The field plots (insectaries) are planted to various crops such as alfalfa, vetch, red clover and crimson clover. Theoretically large populations of both aphids and C-7 will develop on these plots. Observations by ARS researchers indicated that a sizeable IFA population was also present in and near these plots in the fall of 1986. The IFA is a noted opportunistic insectivore (Green 1952, Hays and Hays 1959, Wilson and Oliver 1969, Sterling 1978, Morrill 1978). It was therefore plausable that the IFA would prey upon C-7 immatures thereby producing a negative impact upon the success of the C-7 project.

METHODS AND MATERIALS:

This was a cooperative study conducted jointly by ARS and IFA Station personnel. Test plots planted to alfalfa, crimson clover, red clover, and vetch were grown by ARS (six 1.2 acre replicates per crop). The study area was divided into two blocks of approximately 15 acres each.

Original plans were to treat one block (crop replicates 4, 5, and 6) with Amdro bait to eliminate the IFA population. This treatment was originally planned for October 22, 1986. IFA population assessments were made on October 22, 1986 and again in April 1987. These counts were made within 6 efficacy subplots within both the "treated" and "untreated" block utilizing procedures described elsewhere (Lofgren and Williams 1982). Due to the long delay associated with fall applications of Amdro, and other bait toxicants (Collins 1986), only minimal colony mortality was expected to occur until the spring of 1987. However, decreased colony vigor, reduction in population indices and hopefully diminished foraging activity was expected to occur 1-2 months after treatment. Foraging activity in both treated and untreated plots were monitored by the technique described by Ali and Reagan (1986) utilizing 3" x 5" index cards soaked in peanut oil. Twenty-five bait cards were placed in a diagonal transect across each block at each sampling interval (1 in the fall of 1986 and again in April 1987). After one hour, the number of foraging workers on each bait card was enumerated.

RESULTS:

A. Fall 1986 Survey

Crop planting were completed on October 22, 1987. Mound counts and population index ratings were conducted in twelve 1/4 acre subplots within the 30.9 acre production area. Ten bait cards per quadrant were placed in the field for 1 hour to monitor foraging activity. Foraging activity was minimal and an extremely light population (average of 5 colonies/acre) was noted. Plowing, cultivating, planting, etc. had disturbed the colonies tremendously and undoubtedly influenced the counts and ratings. Casual observation indicated that many colonies (65 counted in a "windshield survey") were present along the field border and may have relocated there due to disturbance. After discussing our findings with Mr. Tedders, we elected not to apply an Amdro treatment at this time. However, it was assumed that disturbed colonies would rebuild both in numbers and mound structure in time, with possible inward migration of colonies in response to increasing food supplies (aphids, C-7's, and other insects).

B. Spring 1987 Survey

Test plots were revisited on April 21, 1987, and the following observations made:

1. All plots were very heavily vegetated, especially the rye/vetch.

2. The amount of vegetation prevented the standard survey procedure.
3. Random searches throughout the plots revealed very few IFA colonies within the plots, but colonies were seen around borders.
4. Forty peanut oil saturated 3" x 5" index cards that were placed within the plots indicated that minimal foraging activity was occurring within the plots on this date.
5. Due to dense vegetative cover, the plots were not considered to be prime IFA habitat.
6. Mr. Tedders indicated that sweep-net samples generally did not contain IFA workers.

Based on the above observations, we concluded that in this particular situation, some IFA predation on C-7 larvae may occasionally occur, but the overall impact of IFA on the C-7 population was probably minimal.

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PROJECT NO: FA04G027

PROJECT TITLE: Equipment Testing and Development

LEADER/PARTICIPANTS: Avel Ladner, Ken Jones, Anne-Marie Callcott, and Homer Collins

INTRODUCTION:

Although aerial application of baits remains the most cost-effective approach to IFA control over large areas, interest in small-scale treatments has increased in recent years due to label restrictions and other factors. No mechanized bait dispersal systems suitable for use with farm tractors, **ATV's** etc. are manufactured specifically for application of fire ant baits. Due to the extremely low rates of application (1 to 1 1/2 lbs. **bait/acre)** very few commercially available seeders or fertilizer applicators can be easily or inexpensively modified to apply IFA baits.

Herd Seeder Company (Logansport, Indiana 46947) has modified one of their models (GT-77) for use with IFA baits, and this system is designed for use with motorized vehicles. We evaluated the GT-77, before and after certain modifications of our own design as described below.

Solo® Backpack Mist Blowers (Solo Company, Republic of West Germany), are designed primarily for dispersal of liquid baits, but are also sold with a dusting attachment for application of granular chemcials. A Model 410 was modified and evaluated as described below.

A. Herd Seeder - Model GT-77

The Model GT-77 is a reostat operated electric seeder that is designed primarily for the dispersal of seeds and granular fertilizer (Photo 1). On October 13, 1987, a Model GT-77 was evaluated by first "static" calibrating the unit and then treating a one acre test plot. The seeder was slightly modified to fit a Category III 3-point hitch on a farm tractor. Static calibration parameters were as follows:

- 6 MPH
- 24 foot swath
- (= .29 acres/minute)
- gate setting of " 1 2/3 "
- reostate setting of " 2 1/2"
- desired rate of bait application was 1.5 lbs./acre

Output was weighed after collecting the bait in a plastic garbage bag. The theoretical rate of 198 grams/minute was approximated (195-200 grams/minute. The unit was then operated over a measured one acre plot utilizing a 24 foot swath at 6 mph. A rate of 1.79 lbs./acre was achieved in this application.

CONCLUSION:

Calibration of the seeder to apply IFA baits can be difficult. Several variables including gate opening, reostat setting (RPM of fan/agitator), ground speed and assigned working swath affect calibration. In summary, this unit, as supplied by the manufacturer, can closely approximate labelled rates of application on smooth terrain where relatively high ground speed (ca. 6 mph) can be maintained. In rough terrain, where slower operating speed must be utilized, over-treatment will likely occur.

Modifications tested:

In an effort to overcome problems with calibration at low rates of speed, a simple modification was made by varying the shape and configuration of the calibration plate orifice (Figure 8). By changing only the calibration plate, we hoped to make an inexpensive and easily obtainable modification. Five experimental calibration plates were evaluated. Based on results shown in Appendix II-A, the most optimum gate and reostat setting were selected and replicated "runs" (5/plate) were conducted with each calibration plate. The co-efficient of variation (CV) for each plate was then computed (Appendix II-C). These results indicate that none of the experimental plates increased precision during the static calibration trials. Many variables including temperature, relative humidity, and flowability of the bait itself probably affect calibration. The results of this study may have been partially due to

ideal weather conditions. Although the first attempt at improving precision in calibration through modification of the calibration plate was not succesful, we hope to conduct additional trials with the GT-77. By increasing the "length of travel" of the gate control lever it may be possible to more precisely calibrate for low rates of application. This will require much more extensive modification of the equipment however, and may be cost prohibitive. The re-designed gate would be much more narrow than the one presently in use by the manufacturer.

B. Solo Backpack Mist Blower -Model 410

A Solo Model 410 equipped with a factory dusting attachment was evaluated for dispersal of IFA bait on October 13, 1987 (Photo 2). Calibration of this unit can only be achieved by varying the size of the gate opening in the spray tube and the speed of the operator. After closing the aperture to the smallest setting, an operator treated a measured one acre plot (20 foot swath, normal walking speed). An output of over 12 lbs./acre was achieved. During operation of the unit, it was noticed that vibrations, etc. continued to open the aperture thereby creating a much heavier than desired rate of application.

CONCLUSION:

While well designed for application of higher rates of other granular

materials, this unit without modification was unsuitable for use with IFA baits.

Modifications tested:

Three modifications were tested by attempting to reduce the size of the opening between the dispersal tube and the hopper. The first modification involved the insertion of a small plastic funnel (varying sizes 1/4", 7/32", 15/16", 23/64", 9/32", 11/32", and 7/16") at the point of connection between the dispersal tube and the hopper (Fig. 9, Modification "A"). Bridging occurred and the consistent flow was never achieved.

The second modification involved fabrication of a new dispersal tube with a 3/4" PCV ball valve inserted midway in line with the dispersal tube and hopper (Fig. 9, Modification "B"). Bridging occurred in this trial also when the 1 to 1 1/2 lb./acre application rate was attempted.

The final modification involved the insertion of a 3/4" PCV gate valve directly below the hopper at the connection point between the hopper and dispersal tube (Fig. 9, Modification "C"). Consistent output could not be achieved at a given gate setting.

While various modifications were tested, none were consistently able to reduce the flow of material to a desirable application rate.

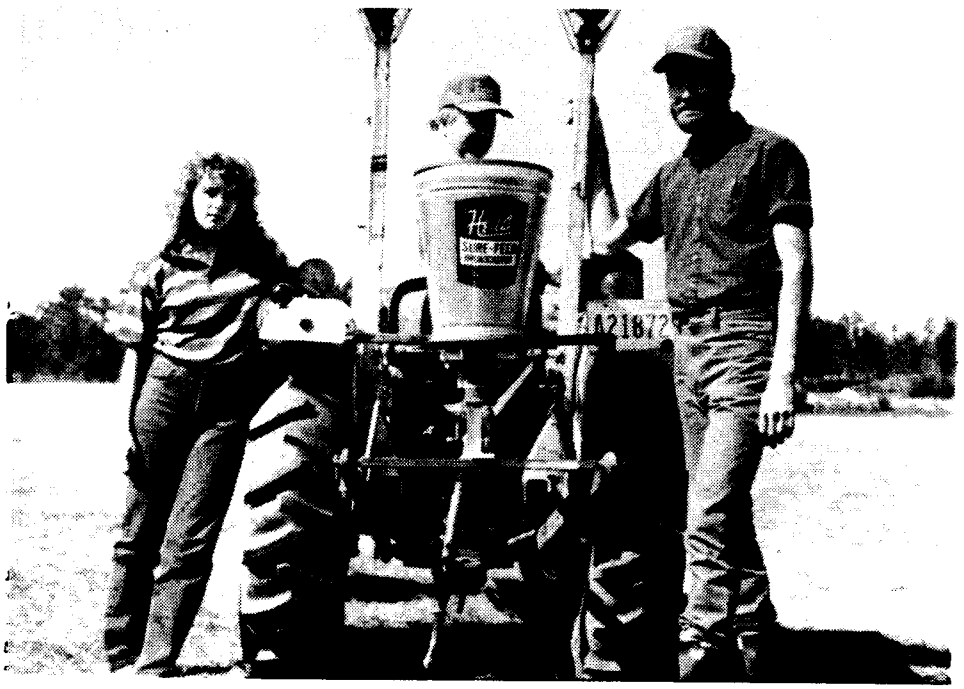


PHOTO 1. Herd GT-77 Granular Applicator.

Fig 8. Calibration plates for Herd GT-77 granular applicator. Plate A is standard factory design; B-F are experimental models.

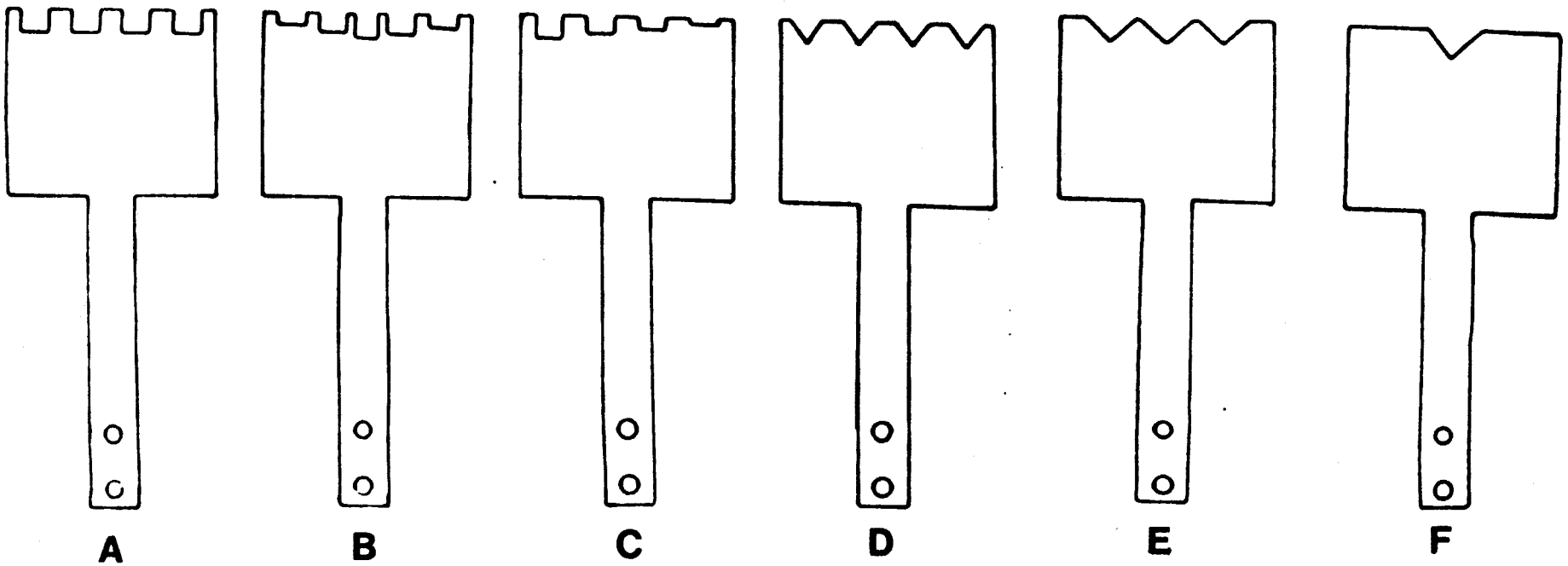
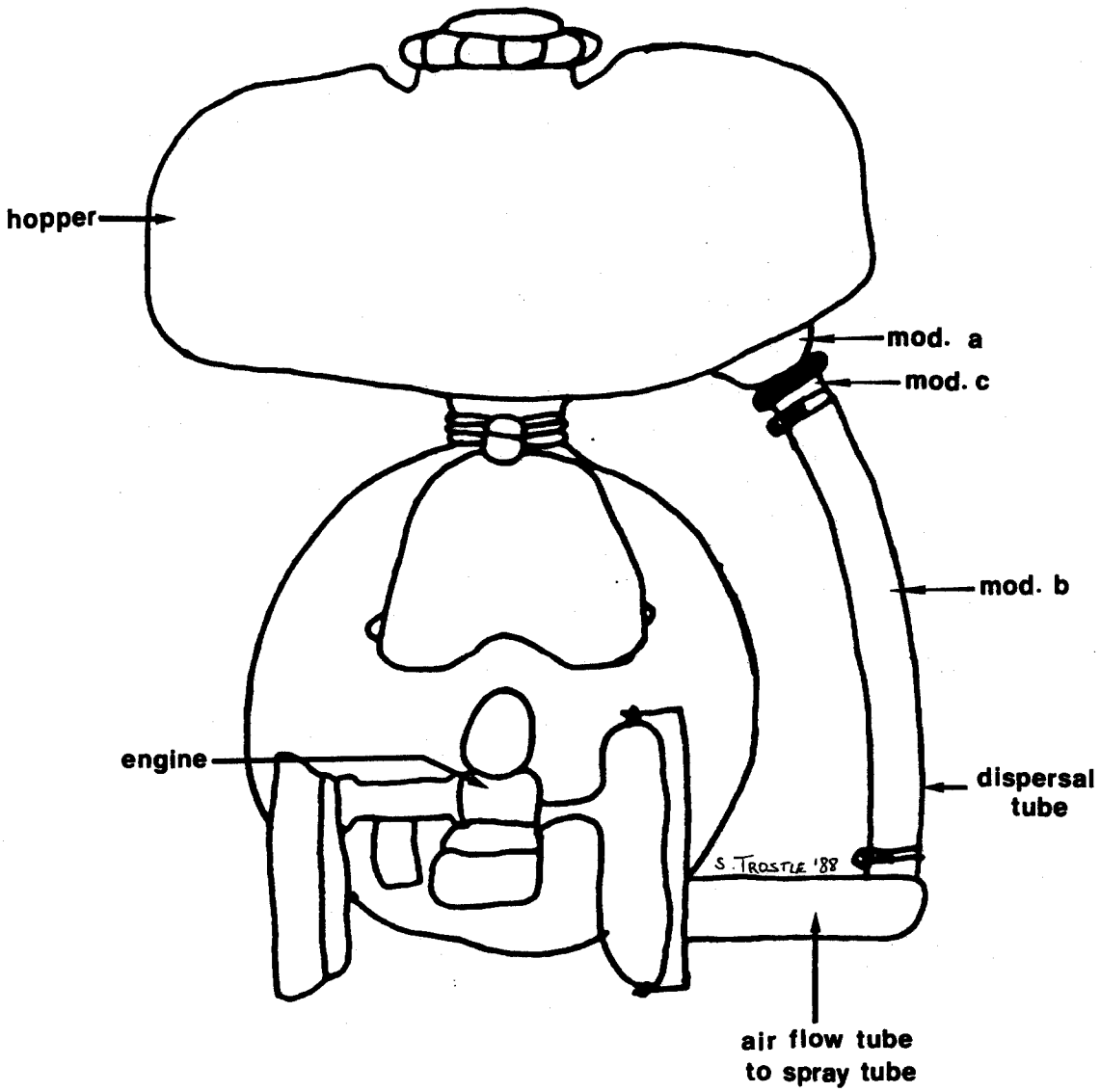


PHOTO 2. Solo Backpack Blower, Model 410.

Fig 9. Solo Backpack Blower, Model 410.



APPENDIX I

Description of a "Shop-Built" Granular Applicator Designed and used by USDA, APHIS, PPQ, Imported Fire Ant Station

As detailed in project number FA04G027, (page 88, this report), application of IFA baits requires precise dispersal equipment, and such equipment is not commercially available. The requirements for experimental plot work wherein various bait carriers and formulations with varying bulk density, texture, oil content, etc. are applied are even more demanding than application of commercial bait formulations. Several custom designed IFA bait applicators have been used at various times (Markin et al., 1969, Williams et al., 1983). Throughout this document and others, reference is made to a "shop-built" granular applicator which was designed and constructed by USDA, APHIS, PPQ. Several people made significant contributions to this machine. A prototype unit was constructed by J.R. Stewart and Avel Ladner in the late 1970's. Dudley Adams refined several components, totally redesigned others, and constructed the model currently in use in 1986. A description of that applicator is as follows:

As depicted in Photo 3 and Figure 10, this unit is electronically driven, 3-point hitch mountable and constructed of several components. The upper section (hopper box, agitator system, and metering unit) is manufactured by the Gandy Company, (Awatonna, Minnesota). After metering, the bait falls onto

a spinning disk which is made by the Cyclone Company, (Urbana, Illinois). Innovations of this unit include: (1) portability, (2) "dump" capability (the hopper box can be totally inverted to facilitate cleanup), and (3) extreme precision in calibration for low rates of application on various types of terrain.

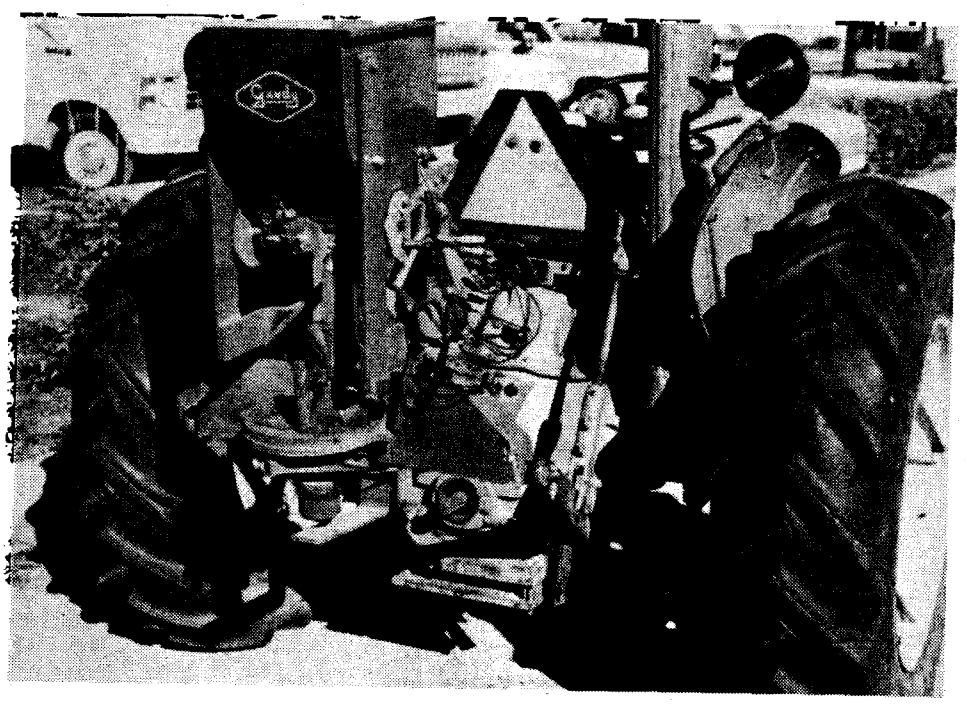
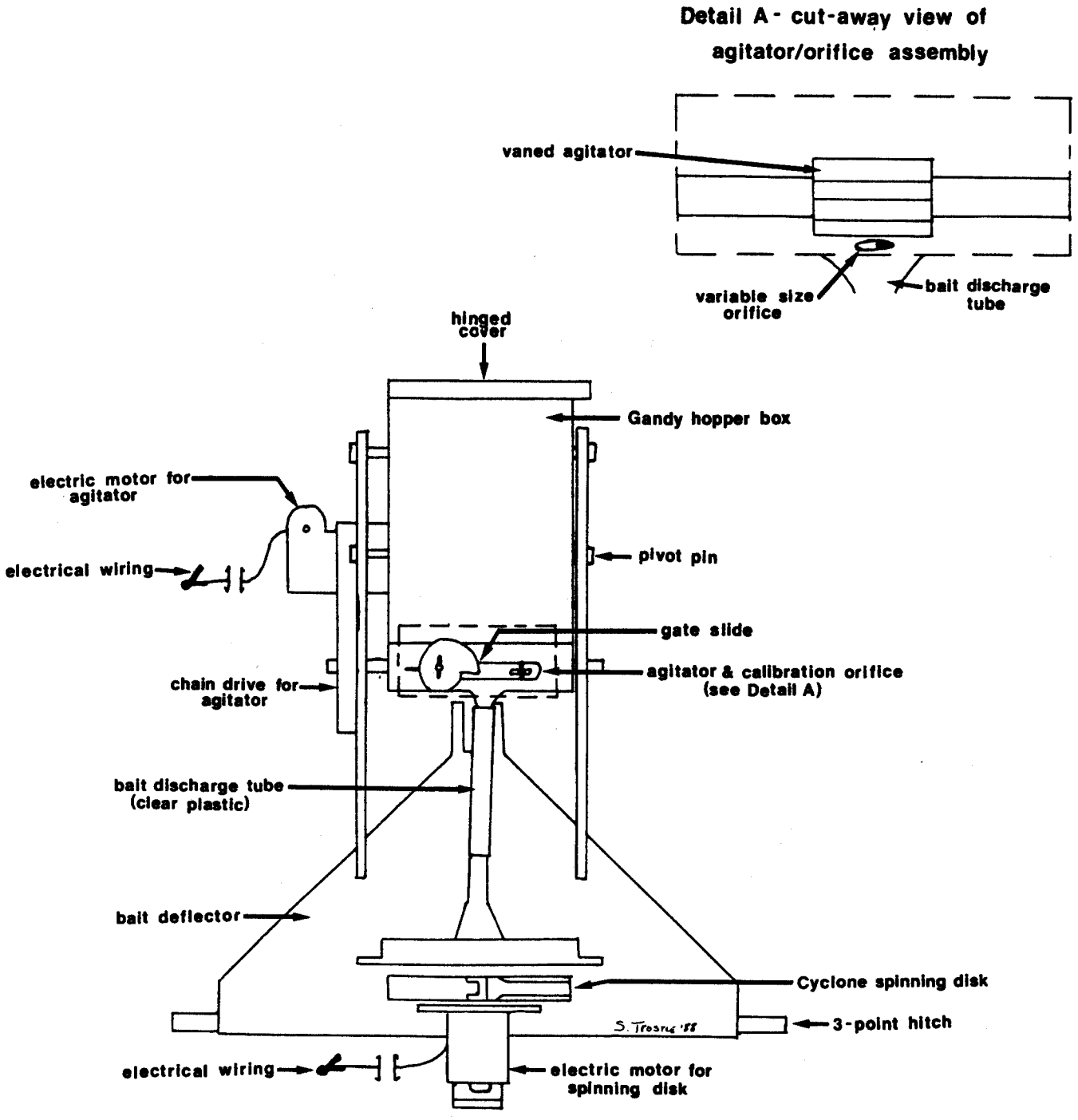


PHOTO 3. USDA, APHIS, PPQ, IFA Bait Dispersal System.

Fig 10. USDA, APHIS, PPQ, IFA Bait Dispersal System.



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APPENDIX II-A

Evaluation of Experimental Calibration Plates for Herd GT-77 Seeder

Assumed working swath of 20' x 4 mph = .16 acre/min.
= 73 gms/min. desired output
(1.0 lb. bait./acre)

Plate	Date	Temp. (°F)	Bait	Bulk Density lb./ft.^{3}	Gate Setting	Reostat Setting	Replicate No.	Output (gm/min.)
A	2/29	70	Amdro	20.0	1 1/2	1 1/2	1	73
					1 1/2	1 1/2	2	91
					1 1/2	1 112	3	95
	3/7	72	GX-071	18.7	1 1/2	5	1	+100
					1	5	1	20
					1 1/2	6	1	70
					1 1/2	6	2	68
					1 1/2	6	3	69
B	2/29	75	Amdro	20.0	1 1/2	6	1	65
					1 1/2	6	2	75
					1 1/2	6	3	60
	3/7	72	GX-071	18.7	1	3	1	29
					1 1/2	4	1	+100
					1 1/2	6	1	76
					1 1/2	6	2	75
					1 112	6	3	76
C	311	72	Amdro	20.0	1	4	1	20
					1 112	4	1	83
					1 112	5	1	72
					1 112	5	2	72
					1 1/2	5	3	75
	3/7	72	GX-071	18.7	1 1/2	4	1	87
					1 112	5	1	78
					1 1/2	5	2	80
					1 112	5	3	78
	3/7	69	Logic	23.25	1 1/2	5	1	93
					1	5	1	20
D	2/29	75	Amdro	20.0	2	6	1	40
					2	6	2	40
					2	4	1	58
					2	3	1	72
					2	3	2	74
					2	3	3	80

APPENDIX II-A (Cont'd)

Plate	Date	Temp. (°F)	Bait	Bulk Density lb./ft.^{3}	Gate Setting	Reostat Setting	Replicate No.	Output (gm/min.)
D	3/7	72	GX-071	18.7	2	4	1	+100
					2	5	1	89
					2	6	1	68
					2	6	2	73
					2	6	3	70
E	2/29	75	Amdro	20.0	2	5	1	100
					2	6	1	77
					2	6	2	76
					2	6	3	73
	3/7	69	Logic	23.25	1 1/2	6	1	35
					2	6	1	+100
					1 1/2	3	1	60
					1 1/2	2	1	70
					1 1/2	2	2	70
					1 1/2	2	3	67
F	3/22	70	GX-071	18.7	2	6	1	65
					2	6	2	60
					2	5	1	70
					2	5	2	70
					2	5	3	75
					2	5	4	75
					2	5	5	75
	3/23	70			2	5	1	85
					2	5	2	82
					2	5	3	76
					2	5	4	78
	3/22	70	Amdro	20.6	1 1/2	5	1	62
					2	5	1	+100
					2	6	1	83
					2	6	2	80
					2*	6	1	60
	4/4	78	Amdro	21.1	1 1/2	5	1	57
					1 1/2	4	1	57
					2	5	1	90
					2	6	1	81
		80			2	6	2	80
					2	6	3	78
					2	6	4	78
					2	6	5	81
					2	6	7	78
					2	6	8	80

* Slightly less than 2

APPENDIX II-B

Effect of Reostat Setting and Calibration Plate on Swath Width of a Herd *GT-77* Seeder.

Reostat Setting	Width of Swath (feet) at Indicated Reostat Setting and Calibration Plates				
	CALIBRATION PLATES				
	A	B	C	D	E
1	*31*	*28.5*	*30*	*30*	*28*
2	*30*	*26*	*27.5*	*30*	*27*
3	*29*	*24*	*26*	*27*	*23.42*
4	*27*	*24*	*24.5*	*26*	*22.5*
5	*25*	*21*	*22.5*	*26*	*22*
6	*25*	*20*	*20*	*22*	*21*

APPENDIX II - C

Replicated Trials Using Standard and Experimental Plates to Compare Consistency of Output.

Plate	Gate Setting	Reostat Setting	Replicate No.	Output[1/] (gm/min.)
A	1 1/2	6	1	65
			2	69
			3	71
			4	68
			5	70
			$\bar{x}$	68.60
			SD	2.30
			CV	.03
B	1 1/2	5	1	70
			2	71
			3	68
			4	71
			5	70
			$\bar{x}$	70.00
			SD	1.22
			CV	.01
C	1 1/2	5	1	69
			2	72
			3	73
			4	70
			5	68
			$\bar{x}$	70.40
			SD	2.07
			CV	.02
D	2	6	1	70
			2	69
			3	72
			4	68
			5	70
			$\bar{x}$	69.80
			SD	1.48
			CV	.02

APPENDIX II-C (cont'd).

Plate	Gate Setting	Reostat Setting	Replicate No.	Output 1/ (gm/min.)
E	1 1/2	3	1	70
			2	68
			3	70
			4	71
			5	73
			$\bar{x}$	70.40
			SD	1.81
			CV	.02
F	1 1/2	3	1	70
			2	69
			3	67
			4	68
			5	69
			$\bar{x}$	68.60
			SD	1.14
			CV	.01

1/ Trials conducted 4|8/88 using standard commercial Amdro (20.6 lbs./cu. ft.).

APPENDIX III

United States Department of Agriculture
Animal and Plant Health Inspection Service
Imported Fire Ant Station
3505 25th Avenue
Gulfport, MS 39501

Subject: Treatment of Nursery Potting Soils with Granular Dursban for IFA Quarantine

Date: February 24, 1987

To: Memo to the Files

Granular chlorpyrifos (Dursban) is listed in PPQ Control Manual M301.81 as a treatment for nursery potting and bench soils. The only EPA registered product available at the current time is a 2.5% granular formulation produced by Ford's Chemical and Service, Inc.. 2739 Pasadena Blvd.. Pasadena, Texas 77502 (Telephone: 1-800-231-9576). A dose rate of 1.0 lb. (16 oz.) per cubic yard of potting media is specified. Since potting soils vary tremendously in both content and bulk density, great variations in the actual dose rates administered can and do occur, i.e., treatment of "light soils" (those high in vermiculite or perlite content) at 1.0 lb. of Dursban per cubic yard of soil will result in a higher actual dose rate than will occur with a "heavier" mix.

The following table gives theoretical dose rates for potting mixes varying in bulk density from 200 to 2,000 lbs./cu. yd:

Bulk Density of Potting Soil (Lbs./yd.^{3})	Theoretical Dose Rate at 1.0 lb. of 2.5%G/yd.^{3} of soil PPM
200	125.0
300	83.3
500	50.0
850	29.4
1000	25.0
1250	20.0
1500	16.6
2000	12.5

Hopefully, this information will be useful in interpreting the results of GLC analysis of treated soils.

Homer Collins
Station Leader

cc:
H.R. O'Steen
J.H. Ford