2001 ACCOMPLISHMENT REPORT

GULFPORT PLANT PROTECTION STATION

CENTER FOR PLANT HEALTH SCIENCE AND TECHNOLOGY

PLANT PROTECTION AND QUARANTINE

U.S. DEPARTMENT OF AGRICULTURE

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These reports were prepared for the information of the U.S. Department of Agriculture, Animal and Plant Health Inspection Service personnel, and others interested in imported fire ant control programs. 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 herein. Mention of trade names or proprietary products does not constitute an endorsement or recommendation for use by the U.S. Department of Agriculture.

Compiled and Edited by:

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2001 IMPORTED FIRE ANT OBJECTIVES

GULFPORT PLANT PROTECTION STATION
GULFPORT, MS

OBJECTIVE 1: Development and refinement of quarantine treatments for certification of regulated articles.

- Empha
  nursery stock.
- Evaluate candidate toxicants, formulation, and dose rates for various use patterns.
- Test and ev
  grown nursery stock.
- Assist in registration of all treatments shown to be effective.

OBJECTIVE 2: Advancement of technology for population suppression and control.

- New product/formulation testing and evaluation.
- Conduct label expansion studies.
- Evaluation of non-chemical biocides including microbial, nematodes, and predaceous arthropods.

OBJECTIVE 3: Preparation/distribution of technical information on control, quarantine procedures, new technology, biological hazards, etc., to state agencies, the media, and the public.

- Provide training to state regulatory agencies and nursery associations.
- Publish and distribute informational aids for state agencies, nursery associations, PPQ personnel, and other interested stakeholders.

OBJECTIVE 4: Determine impact of IFA on biodiversity of various ecosystems.

- Provide technical support and assistance to other research organizations such as ARS, Universities, Mississippi Heritage Foundation, etc. to expedite ecological studies on the impact of IFA on T&E species.

- Conduct bait transects and compare current myrmecofaunal records IFA on other ant species.

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BIOLOGICAL CONTROL AND BIODIVERSITY

PROJECT NO: FA01G067

PROJECT TITLE: Residual Activity of Fipronil 0.05G Incorporated into Potting Media and Applied "Over-the-Top"

TYPE REPORT: Final

LEADER/PARTICIPANTS: Lee McAnally

INTRODUCTION:

Fipronil is produced by Aventis Corp. (Montvale, NJ)(formerly Rhone-Poulenc Ag. Co. Research Triangle Park, NC) and is currently marketed in numerous countries for control of many insect pests in a variety of crops. Currently, U.S. registrations for the product include mole cricket control on golf courses, termites in structures and fleas on dogs. Our laboratory has achieved excellent results with a 0.1% granular formulation of the product when used as a preplant incorporated treatment for containerized nursery stock (FA01G123, FA01G025). In 1996, we expanded our evaluation of the 0.1% granular formulation of fipronil, and also began preliminary testing of a water dispersible formulation as a drench treatment (FA01G076). In 1997, we again expanded our evaluation of the 0.05% granular formulation to include incorporation and an over-the top application.

MATERIALS AND METHODS:

Incorporated Treatment:
Granular 0.05% fipronil was blended into nursery potting soil (MAFES mix, 650 pounds per cubic yard) on 2 October 1997. A portable cement mixer (2 cu ft capacity) was used to blend the toxicant into the potting media, and was operated for 15 minutes per batch to insure thorough blending. Treatments rates used were 5, 10, 15, 25, and 50 ppm. Treated media was then poured into one-gallon capacity plastic nursery pots and weathered outdoors under simulated nursery conditions for one month prior to the first bioassay. Subsequent bioassays were conducted at monthly intervals. A pulsating overhead irrigation system supplied ca. 1-1½" water per week. 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 absorbs moisture from an underlying bed of damp peat moss. There were four replicates per treatment in each bioassay. alate queens. Initially queen mortality was assessed after seven days of continuous confinement to the treated soil. At 6 months post-treatment, bioassays were checked daily for 14 days or until 100% mortality was attained. On 23 June 1998 Windmill potting media (Windmill Nursery, Folsom, LA, 200 pounds per cubic yard) at rates of 5, 10, 15, 20, 25, 40, and 50 ppm was added to the trial. On 1 July 1998 Flowerwood potting media (Flowerwood Nursery, Mobile, AL, 390 pounds per cubic yard) was also added at the same rates as the Windmill media. Both of these later trials were bioassayed in the same manner described above and were evaluated daily for 14 days or until 100% mortality.

Over-the-top Treatment:
One gal. nursery pots were filled with media and placed on a masonry brick in a 12" x 18" x 5" plastic pan. The sides of the pan were talced and ca. 1" of water was added to prevent escape. Five replicates per treatment rate were set up. Field collected colonies were separated from their nest tumulus by the floatation method (Banks et al. 1981) and 50 cc of workers and brood were added to each media-filled pot. The fragmented colonies were allowed to acclimate 3-5 days before treatment. Fipronil 0.05G was applied by sprinkling over the surface of the soil. Each container was then watered in with approximately 400 ml of water. Rates of 0.012, 0.12, and 1.2 grams per pot were used in the first trial (approximately 0.01 ppm, 0.1 ppm, and 1 ppm). A second trial was initiated using rates of 12, 18, and 25 grams per pot (10 ppm, 15 ppm, and 25 ppm). Containers were watered as needed for the duration of the 7 day trial. Ants were inspected daily for mortality and colonies were considered dead when less than 20 workers were present.

RESULTS:

Incorporated Treatment:

Results for the various media tested are summarized below and in the tables referenced below. The results for the MAFES media are final. The Flowerwood and Windmill media are still being tested.

MAFES Media:
When using the 7 day exposure period, the 50 ppm rate provided 95-100% efficacy for 38 months, except for an anomaly at 26 months. The 25 ppm rate maintained 85-100% efficacy through 24 months. The 15 ppm
months post- 21 months and
became erratic thereafter. The 10 ppm rate maintained 95-100% efficacy through 21 months except for a drop to 80% at 13 months. The 5 ppm rate has been erratic through the entire test (Table 1). However, the 15, 25 & 50 ppm rates were still attaining 95-100% mortality through 29 months using the 14 days exposure period with the exception of the 15 ppm rate attaining only 75% efficacy at 14 days exposure at the 23 month time period. The 5 and 10 ppm rates maintained 100% efficacy through 31 and 35 months respectively (Table 2).

Windmill Media:
At six months post-treatment, the 5, 10, 15 and 20 ppm rates evaluated at the 7 day exposure period showed poor results and became erratic after that (Table 3). The 25 ppm rate showed a decline at 6, 11, and 13 months, the 40 ppm rate showed a decline at 6 and 11 months but otherwise maintained 100% through 21 months. The 50 ppm rate has provided 95-100%. At 14 days exposure the 5 ppm rate attained 100% mortality through 27 months except for a drop in month 22. The 10 ppm rate had maintained 90-100% through 30 months. All other rates remained at 100% through termination at 38 months (Table 4).

Flowerwood Media:
At 7 days exposure the 5 ppm ra
months and became erratic after that. The 10 ppm rate maintained 80-100 % efficacy through 14

months. The 15 ppm rate maintained 90-100% through 25 months. The 20 & 25 ppm rates maintained 100% through 26 months with the exception of a dip to 75% at 17 months for the 20 ppm rate. The 40 & 50 ppm rates have maintained 100% through termination at 32 months (Table 5). All rates except the 5 & 10 ppm rates were at 100% at 14 days exposure or less. The 5 ppm rate was at 100% through 26 months while the 10 ppm was at 100% through 27 months. (Table 6).

Over-the-top Treatment:
In the first trial, no treatment rate provided more than 30% efficacy. In the second trial, no treatment rate provided more than 75% efficacy. This is probably due to the low mobility of fipronil in soil, and supports the necessity of incorporation into potting media.

CONCLUSIONS:

Fipronil is slower acting than traditional chemicals used for IFA control in nursery media. However, control is achieved at very low rates of application, with excellent residual activity (see below).

	Months residual activity		
PPM	MAFES-final	Windmill-final	Flowerwood-final
5	31	21	26
10	35	30	28
15	38	35	>32
20	-----	>38	>32
25	>38	>38	>32
40	-----	>38	>32
50	>38	>38	>32

Data marked with > indicate that those rates were at 100% at termination of test

References Cited:

Banks, W.A., C.S. Lofgren, D.P. Jouvenaz, C.E. Stringer, P.M. Bishop, D. F. Williams, D.P. Wojcik and B.M. Glancey.
imported fire ants. USDA, ARS, Science & Education Administration, Advances in Agricultural Technology, Southern Series, No. 21.

Table 1. Residual Activity of Fipronil 0.05G in MAFES Media (7 days exposure)

Rate of Application (ppm)	% mortality of alate females at indicated months post-treatment *																
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**18**
5	100	30	100	100	75	95	60	60	25	20	60	100	100	50	90	100	15
10	100	100	100	95	100	100	100	100	100	100	100	100	80	100	95	100	100
15	55	100	100	50	100	100	100	100	100	100	100	100	100	100	100	100	100
25	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
50	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Check	5	0	0	10	0	20	10	15	15	0	15	35	15	10	15	10	0

* not evaluated at 17 months due to lack of alate queens

Table 1. (cont.) Residual Activity of Fipronil 0.05G in MAFES Media (7 days exposure)

Rate of Application (ppm)	% mortality of alate females at indicated months post-treatment *																	
	19	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**
5	100	95	20	85	5	55	55	45	90	0	80	60	15	100	45	5	15	5	0
10	100	100	5	100	20	95	95	100	100	50	55	85	25	100	100	15	6.7**	25	10
15	100	100	50	15	80	100	35	80	100	25	85	75	100	100	100	20	5	15	5
25	100	100	85	95	100	60	100	100	85	90	100	100	100	100	100	100	65	100	50
50	100	100	100	100	100	100	35	100	100	100	100	100	100	100	100	100	100	100	100
Check	10	0	10	10	0	0	5	5	5	5	0	5	15	0	0	0	5	5	0

* not evaluated at 20 months due to lack of alate queens
** Queens escaped from one replicate

Table 2. Residual Activity of Fipronil 0.05G in MAFES Media During 14 Day Exposure Periods.

Rate of Application (ppm)	% mortality of alate females at indicated months post-mortality at 14 days exposure) **																
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**18**
5	--	--	--	--	--	8d*	10d	10d	10d	11d	8d	5d	7d	10d	11d	6d	13d
10	--	--	--	--	--	7d*	5d	7d	7d	6d	5d	5d	9d	6d	11d	7d	6d
15	--	--	--	--	--	5d*	5d	5d	7d	7d	5d	4d	6d	6d	6d	7d	6d
25	--	--	--	--	--	5d*	4d	3d	5d	5d	5d	3d	6d	6d	5d	4d	3d
50	--	--	--	--	--	5d*	4d	3d	4d	4d	5d	5d	6d	6d	4d	3d	3d
Check	--	--	--	--	--	20%*	10%	20%	20%	5%	15%	35%	25%	25%	15%	10%	5%

** 17 months not evaluated due to lack of alate queens

Table 2. (cont.) Residual Activity of Fipronil 0.05G in MAFES Media During 14 Day Exposure Periods.

Rate of Application (ppm)	% mortality of alate females at indicated months post-mortality at 14 days exposure) *																		
	19	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**
5	6d	8d	10d	8d	10d	12d	11d	11d	8d	12d	11d	12d	65%	6d	11d	13d	90%	13d	13d
10	6d	7d	10d	7d	10d	9d	10d	7d	7d	10d	11d	8d	13d	7d	6d	11d	53.3%	11d	13d
15	6d	6d	10d	75%	10d	7d	10d	11d	7d	10d	11d	12d	7d	6d	7d	11d	14d	14d	95
25	5d	6d	10d	8d	7d	12d	10d	5d	8d	10d	7d	6d	7d	4d	6d	6d	11d	7d	65
50	4d	4d	5d	6d	4d	5d	10d	4d	7d	5d	4d	4d	6d	4d	5d	5d	7d	4d	5d
Check	10%	10%	15%	15%	10%	20%	10%	5%	5%	5%	10%	15%	15%	0%	15%	10%	15%	10%	10%

* 20 months not evaluated due to lack of alate queens

Table 3. Residual Activity of Fipronil 0.05G in Windmill Media (7 days exposure)

Rate of Application (ppm)	% mortality of alate females at indicated months post-treatment *																	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**9**	**10**	**11**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
5	70	20	40	35	0	5	60	35	25	5	45	10	55	0	60	25	5	5
10	95	80	65	55	20	10	100	70	75	15	100	70	90	10	100	80	85	40
15	100	100	95	90	75	45	100	100	100	20	100	55	65	30	100	95	35	85
20	100	100	100	100	85	95	100	100	100	45	100	75	100	80	100	100	95	100
25	100	100	100	100	100	75	100	100	100	45	80	100	100	100	100	100	100	100
40	100	100	100	100	100	75	100	100	100	75	100	100	100	100	100	100	100	100
50	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Check	60	20	50	35	20	25	5	5	10	5	20	5	5	0	5	0	0	0

* 8 & 12 months not evaluated due lack of alate queens

Table 3. (cont.) Residual Activity of Fipronil 0.05G in Windmill Media (7 days exposure)

Rate of Application (ppm)	% mortality of alate females at indicated months post-treatment *																
	21	**22**	**23**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**
5	20	10	40	5	30	10	0	5	0	0	0	0	5	5	**	**	**
10	15	30	75	10	40	25	0	15	0	0	0	0	10	15	5	0	0
15	45	45	75	35	65	70	10	50	30	5	5	10	0	20	5	10	0
20	85	53.3	90	100	75	35	20	70	100	50	60	65	10	35	25	35	40
25	100	66.7	100	65	90	60	35	65	100	80	80	70	10	85	60	40	35
40	100	60	100	100	90	85	35	80	100	65	90	75	50	100	100	75	60
50	100	95	100	100	100	100	70	95	100	85	100	100	50	100	100	95	90
Check	15	5	5	0	0	0	0	5	0	0	0	5	0	0	0	0	0

* 24 months not evaluated due lack of alate queens

** Removed from test

Table 4. Residual Activity of Fipronil 0.05G in Windmill Media During 14 Day Exposure Periods.

Rate of Application (ppm)	% mortality of alate females at indicated months post-treatment (# of days to reach 100% mortality or % mortality at 14 days exposure) *																	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**9**	**10**	**11**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
5	10d	11d	13d	10d	14d	14d	10d	9d	11d	11d	12d	10d	11d	11d	12d	12d	11d	13d
10	8d	8d	9d	10d	11d	14d	7d	9d	10d	10d	7d	10	10d	10d	8d	8d	8d	12d
15	7d	6d	8d	10d	9d	9d	6d	7d	6d	9d	7d	10d	10d	9d	8d	8d	11d	9d
20	6d	6d	7d	5d	8d	9d	6d	6d	6d	8d	7d	10d	7d	8d	7d	5d	8d	7d
25	6d	5d	7d	5d	7d	9d	6d	6d	5d	8d	8d	7d	7d	7d	7d	5d	7d	7d
40	6d	5d	7d	4d	7d	9d	5d	5d	5d	8d	5d	4d	5d	7d	6d	5d	7d	6d
50	6d	5d	7d	4d	4d	7d	5d	5d	5d	4d	4d	5d	5d	7d	6d	5d	7d	5d
Check	60%	20%	50%	40%	30%	25%	10%	15%	20%	15%	25%	10%	5%	5%	10%	0%	5%	15%

* 8 & 12 months not evaluated due lack of alate queens

Table 4. (cont.) Residual Activity of Fipronil 0.05G in Windmill Media During 14 Day Exposure Periods.

Rate of Application (ppm)	% mortality of alate females at indicated months post-treatment (# of days to reach 100% mortality or % mortality at 14 days exposure) *																
	21	**22**	**23**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**
5	14d	55%	14d	12d	13d	14d	80%	75%	85%	65%	45%	20%	5%	15%	**	**	**
10	10d	90%	11d	12d	12d	11d	11d	95%	13d	80%	65%	55%	60%	40%	45%	20%	25%
15	10d	10d	10d	8d	11d	9d	12d	12d	12d	14d	14d	14d	14d	95%	85%	60%	45%
20	10d	10d	10d	6d	11d	10d	12d	9d	7d	11d	9d	12d	13d	12d	11d	11d	13d
25	7d	10d	7d	8d	8d	9d	12d	12d	7d	9d	8d	9d	9d	10d	11d	14d	13d
40	6d	10d	7d	6d	8d	8d	12d	8d	7d	9d	8d	8d	9d	7d	7d	9d	9d
50	7d	10d	7d	4d	7d	7d	8d	8d	6d	8d	7d	6d	9d	6d	7d	8d	8d
Check	15%	10%	10%	5%	10%	5%	0%	5%	15%	5%	10%	10%	20%	5%	15%	10%	5%

*24 months not evaluated due lack of alate queens

Table 5. Residual Activity of Fipronil 0.05G in Flowerwood media (7 days exposure)

Rate of Application (ppm)	% mortality of alate females at indicated months post-treatment *																	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**9**	**10**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
5	75	100	100	100	50	55	100	80	90	70	30	75	30	5	15	10	15	0
10	100	100	100	100	90	95	100	80	100	100	95	100	45	65	50	100	100	70
15	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	90
20	100	100	100	100	100	100	100	100	100	100	100	100	100	100	75	100	85	95
25	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
40	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
50	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Check	0	0	5	5	20	20	0	15	20	15	0	15	10	5	0	5	0	16.7**

* 8 &11 months not evaluated due to lack of alate queens

** Queens escaped from one replicate

Table 5. (cont.) Residual Activity of Fipronil 0.05G in Flowerwood media (7 days exposure)

Rate of Application (ppm)	% mortality of alate females at indicated months post-treatment *											
	21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
5	25	65	20	85	50	35	10	60	0	5	5	10
10	30	75	55	100	100	55	45	20	0	65	20	20
15	100	100	100	100	100	30	40	55	20	100	70	40
20	100	100	95	100	100	100	25	95	30	80	80	40
25	100	100	100	100	100	100	65	100	50	100	100	100
40	100	100	100	100	100	100	100	100	100	100	100	100
50	100	100	100	100	100	100	100	100	100	100	100	100
Check	0	5	20	5	10	0	0	5	0	0	0	5

Table 6. Residual Activity of Fipronil 0.05G in Flowerwood media During 14 Day Exposure Periods.

Rate of Application (ppm)	% mortality of alate females at indicated months post-treatment (# of days to reach 100% mortality or % mortality at 14 days exposure) *																	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**9**	**10**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
5	8d	7d	5d	6d	10d	11d	7d	9d	8d	8d	11d	8d	10d	14d	13d	11d	11d	10d
10	6d	5d	5d	6d	8d	11d	5d	8d	7d	7d	10d	7d	10d	12d	10d	7d	7d	10d
15	6d	5d	5d	6d	6d	6d	4d	6d	6d	6d	6d	6d	7d	7d	7d	7d	6d	10d
20	4d	5d	3d	6d	6d	7d	4d	6d	6d	5d	6d	5d	7d	7d	10d	6d	8d	10d
25	4d	5d	5d	6d	6d	5d	3d	6d	6d	5d	6d	5d	7d	6d	5d	6d	6d	6d
40	4d	5d	3d	6d	6d	6d	3d	3d	5d	5d	4d	5d	5d	6d	5d	5d	5d	6d
50	4d	5d	3d	3d	6d	4d	3d	3d	4d	5d	4d	5d	4d	5d	4d	4d	6d	5d
Check	0%	0%	5%	5%	25%	20%	0%	15%	20%	20%	5%	15%	20%	10%	10%	5%	0%	16.7%**

* 8 &11 months not evaluated due to lack of alate queens
** Queens escaped from one replicate

Table 6. (cont.) Residual Activity of Fipronil 0.05G in Flowerwood media During 14 Day Exposure Periods.

Rate of Application (ppm)	% mortality of alate females at indicated months post-treatment (# of days to reach 100% mortality or % mortality at 14 days exposure)											
	21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
5	14d	12d	13d	11d	10d	12d	85%	14d	60%	60%	14d	80%
10	11d	12d	10d	6d	6d	11d	11d	95%	85%	9d	10d	14d
15	7d	7d	7d	6d	6d	11d	11d	11d	12d	7d	9d	11d
20	7d	7d	8d	6d	6d	7d	11d	11d	9d	8d	9d	9d
25	7d	5d	6d	4d	6d	4d	11d	7d	8d	6d	7d	7d
40	7d	5d	6d	4d	5d	6d	7d	7d	7d	6d	7d	7d
50	7d	4d	6d	4d	5d	5d	6d	6d	7d	6d	7d	7d
Check	10%	15%	20%	5%	15%	5%	5%	5%	10%	0%	5%	5%

PROJECT NO: FA01G019

PROJECT TITLE: Further Testing of Chlorfenapyr as an Imported Fire Ant Quarantine Treatment

REPORT TYPE: Final

PROJECT LEADER/PARTICIPANT(s): Lee McAnally

INTRODUCTION:

The Federal Imported Fire Ant Quarantine Program (7CFR §301.81) states that all regulated products (nursery stock) leaving the quarantined area must be treated in a prescribed manner. Currently, treatments for containerized nursery include the use of granular insecticides incorporated into potting media or liquid drenches applied prior to shipping. Nursery stock treated with incorporated insecticides (bifenthrin or tefluthrin) may be certified for 6 months to 2 years, depending on the rate incorporated into the media (10-25 ppm based on bulk density of media). This allows the grower to use less insecticide on nursery stock that will be held on site for a short period of time, and more on those that need a longer growing period prior to selling. Drench treatments (chlorpyrifos, diazinon or bifenthrin) are generally used just prior to shipping, and those currently approved for use in the quarantine have certification periods of 10 days to 6 months. Since drench treatments are used just prior to shipping, long residual activity is not a requirement.

Chlorfenapyr is an experimental insecticide-miticide under development by American Cyanamid (now BASF, Princeton, NJ). The product is active against many pests, and works as a broad spectrum contact and stomach poison. Previously we tested a liquid formulation to determine whether the product showed significant activity against IFA in containerized nursery stock. In August 1997, we began testing a 0.5G granular formulation as an incorporated treatment (FA01G097).

In August 1999, we initiated an expanded test of chlorfenapyr using a 2SC liquid formulation as ch on two different carriers (clay and corn cob grit) as incorporated treatments. All of these treatments were applied to three different potting media.

MATERIALS AND METHODS:

Drench Treatments:
A 2SC liquid formulation of chlorfenapyr was tested as a drench application for containerized nursery stock. Trade gallon nursery pots were filled with three different media, our standard (MAFES) potting media (3:1:1 pine bark: sphagnum peat moss sand - bulk density = 720 lb/cu yd), Flowerwood media (Flowerwood Nursery, Mobile, AL, bulk density = 470 lb/cu yd), and Windmill media (Windmill Nursery, Folsom, LA, bulk density = 235 lb/cu yd). The filled pots were left for 3-5 days under simulated nursery conditions (ca. 1-1½" irrigation per week) to

allow the media to become fully s
on 28 June 1999 at rates of 25, 50, 75, 100, and 200 ppm. Each pot was drenched with a volume of solution equal to 1/5 the volume of the pot (i.e. 400 ml solution). Standard alate queen bioassays were then performed at 24 hrs., 1 week, 2 weeks, and monthly through 6 months after treatment.

Incorporated Treatments:
Granular treatments included 1, 1.5 and 2% products formulated either on clay or corn cob grit carriers. Each of the granular formulations was blended into each of the three media described above at rates of 10, 25, 50, 75 and 100 ppm. A portable cement mixer (2 cu ft capacity) was use to blend the toxicant into the pott
thorough blending. Treated media was then poured into one-gallon capacity plastic nursery pots and weathered outdoors under simulated nursery conditions. A pulsating overhead irrigation system supplied ca. 1-1½ inches water per week. At monthly intervals, subsamples were taken from 3 pots of each treatment and composited and subjected to standard alate queen bioassay. The 1.0G formulations were mixed from 30 June to 2 July 1999, the 1.5G formulations were mixed from 17 through 20 August 1999, and the 2.0G formulations were mixed from 15 through 17 September 1999.

RESULTS:

Drench Treatments:
Results indicated that media type had an impact on chlorfenapyr efficacy (summary table below). Rates of 100 ppm and greater provided 100% mortality in both Flowerwood and MAFES media in 7 days or less up to 1 month after treatment. At exposures of 14 days or less rates of 75 ppm or greater in the Flowerwood media and the 100 and 200 ppm rates in the MAFES media were 100% effective through 6 months (Table 1). In the Windmill media only the 200 ppm was 100% effective up to 1 month against IFA.

Incorporated Treatments:
Results of the granular treatments also indicated that media type effects the efficacy of chlorfenapyr (summary table below). Carrier formulation also appeared to effect the efficacy. At 5-7 months post-treatment American Cyanimid decided not to pursue further testing with clay carrier formulations due poorer results achieved by those formulations. Those formulations were therefore dropped from further testing. Windmill media showed erratic results regardless of percent a.i. or carrier type (Tables 2, 3 & 4). Rates of 50 ppm and higher of the grit formulation of chlorfenapyr provided excellent control of IFA in Flowerwood and MAFES media 27-29 months post-treatment regardless of % a.i. Some dose dependency was noted in that the 50 ppm rate generally required 10-14 days to provide 100% mortality while the 75 and 100 ppm rates required 7-10 days.

DISCUSSION:

Windmill media provided significantly shorter residual activity of chlorfenapyr in both the liquid drench and granular incorporation treatments. The Windmill media we used was comprised of 100% pine bark, while the other mediums contained more “filler” material, i.e. sand and/or peat

moss. This filler material may have allowed the insecticide to bind more efficiently with the media and not be "washed out" with irrigation, thus resulting in the erratic and unacceptable results with the Windmill media.

For an insecticide to be included in the Federal Imported Fire Ant Quarantine, it must provide consistent and effective results in all media types. While rates of 50-75 ppm, in both drenching and incorporation applications, provided residual activity in line with other quarantine approved insecticides, in two media types, the significant decline in activity in the Windmill media is of concern. Additional testing of the product in MAFES media occurred in 2000, however at that time, additional Windmill media was not available. We anticipate acquiring more Windmill media in 2002 and doing additional testing pending company interest.

Summary Table.

PPM	Months residual activity within media types and insecticide formulations											
	Flowerwood				MAFES				Windmill			
	SC	1.0G	1.5G	2.0G	SC	1.0G	1.5G	2.0G	SC	1.0G	1.5G	2.0G
10	---	1	7	7	---	<1	<1	<1	---	<1	<1	<1
25	<1	3	8	7	<1	<1	1	<1	<24h	<1	<1	<1
50	2	29+	28+	27+	1	29+	28+	27+	<24h	<1	<1	<1
75	6+	29+	28+	27+	4	29+	28+	27+	<24h	<1	<1	<1
100	6+	29+	28+	27+	6+	29+	28+	27+	<24h	3	1	3
200	6+	---	---	---	6+	---	---	---	1	---	---	---

Table 1. Residual activity of chlorfenapyr 2SC - Drench.

Media Treated	Rate of Application (ppm)	Mean % mortality to alate (days required to reach 100% mortality)								
		24 Hours	1 week	2 weeks	1 month	2 months	3 months	4 months	5 months	6 months
Flowerwood	25	90	70	100 (8)	100 (8)	55	90	70	35	60
	50	100 (7)	100 (9)	100 (8)	100 (8)	100 (7)	90	95	100 (13)	100 (13)
	75	100 (7)	100 (8)	100 (6)	100 (6)	100 (7)	100 (8)	100 (10)	100 (9)	100 (12)
	100	100 (7)	100 (6)	100 (5)	100 (5)	100 (5)	100 (6)	100 (6)	100 (7)	100 (6)
	200	100 (3)	100 (6)	100 (5)	100 (5)	100 (5)	100 (6)	100 (6)	100 (5)	100 (4)
	Check	10	40	70	15	25	15	5	5	10
MAFES	25	85	65	55	100 (13)	60	60	70	25	60
	50	100 (7)	100 (14)	100 (12)	100 (11)	85	100 (9)	75	75	95
	75	100 (11)	100 (7)	100 (9)	100 (6)	100 (9)	100 (8)	100 (8)	90	100 (12)
	100	100 (7)	100 (7)	100 (7)	100 (5)	100 (12)	100 (6)	100 (8)	100 (9)	100 (13)
	200	100 (7)	100 (6)	100 (7)	100 (4)	100 (6)	100 (6)	100 (6)	100 (7)	100 (8)
	Check	15	15	70	5	10	15	20	5	5
Windmill	25	15	5	75	60	85	30	0	0	0
	50	30	5	65	45	55	30	10	10	0
	75	70	60	65	55	30	35	5	10	0
	100	90	35	85	95	45	40	25	10	0
	200	100 (9)	100 (14)	100 (13)	100 (13)	95	65	50	30	80
	Check	10	25	95	20	30	20	0	5	5

Table 2. Residual activity of chlorfenapyr 1.0G - Incorporated.

Media Treated	Rate of Application (ppm)	Mean % mortality to alate females at indicated months post-treatment after 14 days exposure (days required to reach 100% mortality)								
		1	3	4	6	7	8	9	10	11
Flowerwood	Clay									
	10	100 (11)	65	0	25	35	*	*	*	*
	25	100 (7)	100(10)	70	15	30	*	*	*	*
	50	100 (4)	100 (8)	100 (8)	100 (8)	100 (10)	*	*	*	*
	75	100 (3)	100 (7)	100 (6)	100 (7)	100 (6)	*	*	*	*
	100	100 (3)	100 (7)	100 (5)	100 (5)	100 (6)	*	*	*	*
	Grit									
	10	100 (11)	80	25	5	10	10	20	50	40
	25	100 (8)	100 (7)	100 (12)	80	90	95	70	85	70
	50	100 (4)	100 (7)	100 (7)	100 (8)	95	100 (12)	100 (13)	100 (12)	100 (12)
	75	100 (2)	100 (7)	100 (6)	100 (7)	100 (10)	100 (8)	100 (11)	100 (9)	100 (8)
	100	100 (2)	100 (7)	100 (5)	100 (5)	100 (4)	100 (6)	100 (6)	100 (6)	100 (6)
	Check	5	20	20	5	10	10	5	10	10
MAFES	Clay									
	10	55	75	20	20	20	*	*	*	*
	25	80	90	10	100 (14)	70	*	*	*	*
	50	100 (10)	100 (10)	95	100 (11)	100 (10)	*	*	*	*
	75	100 (7)	100 (7)	95	100 (6)	100 (6)	*	*	*	*
	100	100 (7)	100 (7)	100 (8)	100 (6)	100 (6)	*	*	*	*
	Grit									
	10	35	60	0	10	15	0	40	45	25
	25	50	100 (14)	10	45	25	20	60	50	45
	50	100 (13)	100 (9)	100 (13)	100 (11)	100 (12)	100 (12)	100 (13)	100 (12)	100 (13)
	75	100 (7)	100 (7)	100 (10)	100 (7)	100 (7)	100 (11)	100 (10)	100 (9)	100 (9)
	100	100 (7)	100 (7)	100 (8)	100 (6)	100 (6)	100 (11)	100 (6)	100 (7)	100 (7)
	Check	10	10	0	5	5	5	10	5	5
Windmill	Clay									
	10	85	75	40	15	0	*	*	*	*
	25	50	70	35	20	15	*	*	*	*
	50	80	90	0	65	33.3	*	*	*	*
	75	100 (12)	95	45	10	80	*	*	*	*
	100	100 (12)	100 (13)	95	75	100 (13)	*	*	*	*
	Grit									
	10	40	60	0	25	15	*	*	*	*
	25	40	35	10	5	5	*	*	*	*
	50	70	95	40	10	10	*	*	*	*
	75	85	90	40	70	60	50	30	65	45
	100	100 (12)	100 (13)	75	95	95	45	90	100(14)	80
	Check	20	10	5	15	10	0	5	10	10

* Removed from evaluation

** Queens from one replicate escaped

Table 2. (Cont.) Residual activity of chlorfenapyr 1.0G - Incorporated.

Media Treated	Rate of Application (ppm)	Mean % mortality to alate females at indicated months post-treatment after 14 days exposure (days required to reach 100% mortality)								
		12	13	14	15	16	17	18	19	20
Flowerwood	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	50	65	45	50	55	60	5	10	0
	25	85	80	60	95	55	45	60	60	15
	50	100 (7)	100 (7)	100 (14)	100(13)	100(13)	95	100 (14)	100 (11)	85
	75	100 (5)	100 (5)	100 (12)	100 (7)	100 (8)	100(13)	100 (6)	100 (7)	100(10)
	100	100 (5)	100 (6)	100 (6)	100 (6)	100 (8)	100(9)	100 (6)	100 (6)	100(7)
	Check	10	5	5	5	5	10	5	0	5
MAFES	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	20	55	100 (8)	60	10	0	10	25	20
	25	75	95	100 (8)	90	85	25	40	100 (12)	40
	50	100 (10)	100 (10)	100 (8)	100 (10)	100 (13)	100(13)	100 (10)	100 (11)	100(13)
	75	100 (5)	100 (7)	100 (6)	100 (6)	100 (8)	100(9)	100 (10)	100 (7)	100(9)
	100	100 (5)	100 (5)	100 (6)	100 (6)	100 (7)	100(9)	100 (7)	100 (6)	100(10)
	Check	10	5	5	10	10	10	0	0	5
Windmill	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	100 (12)	65	95	70	75	40	55	100 (14)	100(14)
	100	100 (11)	100 (10)	90	85	100 (13)	46.7**	100 (14)	100 (11)	100(11)
	Check	5	15	6.7**	15	15	0	5	5	5

* Removed from evaluation

** Queens escaped from one replicate

Table 2. (Cont.) Residual activity of chlorfenapyr 1.0G - Incorporated.

Media Treated	Rate of Application (ppm)	Mean % mortality to alate females at indicated months post-treatment after 14 days exposure (days required to reach 100% mortality)								
		21	22	23	24	25	26	27	28	29
Flowerwood	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	100(14)	100(13)	100(11)	100(11)	100(10)	100(13)	95	95	100(12)
	75	100(9)	100(9)	100(10)	100(6)	100(7)	100(12)	100(10)	100(10)	100(11)
	100	100(8)	100(9)	100(10)	100(7)	100(7)	100(6)	100(11)	100(10)	100(6)
	Check	10	40	10	10	5	0	5	0	0
MAFES	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	100(10)	100(13)	100(10)	100(10)	100(10)	100(12)	100(12)	100(14)	100(11)
	75	100(8)	100(9)	100(10)	100(6)	100(10)	100(9)	100(10)	100(10)	100(8)
	100	100(9)	100(9)	100(10)	100(6)	100(6)	100(8)	100(10)	100(10)	100(7)
	Check	0	20	35	5	10	0	5	5	0
Windmill	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	65	50	75	100(10)	75	60	65	75	75
	100	90	65	100(13)	90	85	80	100(13)	100(14)	100(14)
	Check	10	5	53.3**	5	15	5	15	5	0

* Removed from evaluation

**Queens escaped from 1 replicate

Table 3. Residual activity of chlorfenapyr 1.5G - Incorporated.

Media Treated	Rate of Application (ppm)	Mean % mortality to alate females at indicated months post-treatment after 14 days exposure (days required to reach 100% mortality)								
		1	2	3	5	6	7	8	9	10
Flowerwood	Clay									
	10	100 (5)	85	100 (12)	85	100 (7)	*	*	*	*
	25	100 (6)	100 (7)	100 (9)	100 (11)	100 (6)	*	*	*	*
	50	100 (5)	100 (7)	100 (5)	100 (8)	100 (9)	*	*	*	*
	75	100 (4)	100 (7)	100 (5)	100 (4)	100 (3)	*	*	*	*
	100	100 (4)	100 (7)	100 (5)	100 (4)	100 (3)	*	*	*	*
	Grit									
	10	100 (6)	85	100 (12)	90	100 (6)	100 (14)	55	50	75
	25	100 (5)	100 (5)	100 (7)	100 (7)	100 (6)	100 (12)	100 (9)	75	100(13)
	50	100 (4)	100 (7)	100 (5)	100 (5)	100 (3)	100 (8)	100 (7)	100 (10)	100 (5)
	75	100 (4)	100 (5)	100 (5)	100 (4)	100 (3)	100 (5)	100 (6)	100 (7)	100 (5)
	100	100 (4)	100 (5)	100 (5)	100 (6)	100 (6)	100 (5)	100 (5)	100 (7)	100 (5)
	Check	5	15	10	5	5	5	15	15	10
MAFES	Clay									
	10	5	10	5	0	10	*	*	*	*
	25	20	15	20	15	53.3**	*	*	*	*
	50	85	50	85	90	100 (9)	*	*	*	*
	75	100 (11)	100 (12)	100 (11)	100 (11)	100 (7)	*	*	*	*
	100	100 (8)	100 (12)	100 (8)	100 (11)	100 (6)	*	*	*	*
	Grit									
	10	20	15	20	10	15	50	25	60	45
	25	100 (14)	60	100 (14)	30	25	85	60	50	95
	50	100 (8)	100 (12)	100 (8)	100 (11)	95	100 (7)	100 (12)	100 (10)	100 (6)
	75	100 (7)	100 (8)	100 (6)	100 (8)	100 (9)	100 (6)	100 (9)	100 (10)	100 (5)
	100	100 (6)	100 (7)	100 (5)	100 (8)	100 (7)	100 (5)	100 (6)	100 (10)	100 (5)
	Check	15	5	15	5	10	5	10	25	10
Windmill	Clay									
	10	0	5	5	0	*	*	*	*	*
	25	5	5	15	5	*	*	*	*	*
	50	10	0	50	10	*	*	*	*	*
	75	30	20	5	20	20	*	*	*	*
	100	65	65	50	65	65	*	*	*	*
	Grit									
	10	30	5	5	0	*	*	*	*	*
	25	5	10	0	20	*	*	*	*	*
	50	25	55	25	5	*	*	*	*	*
	75	80	50	40	30	40	100 (13)	55	75	100 (13)
	100	100 (11)	75	90	90	93.3**	100 (13)	100 (13)	100 (14)	100 (13)
	Check	10	0	0	0	5	10	10	5	15

* Removed from evaluation

** Queens from one replicate escaped

Table 3. (Cont.) Residual activity of chlorfenapyr 1.5G - Incorporated.

Media Treated	Rate of Application (ppm)	Mean % mortality to alate females at indicated months post-treatment after 14 days exposure (days required to reach 100% mortality)								
		11	13	14	15	16	17	18	19	20
Flowerwood	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	80	75	20	45	35	40	25	25	*
	25	75	85	50	40	45	45	35	40	*
	50	100(11)	100(14)	95	100(13)	100(13)	100(12)	100(11)	100(13)	100(13)
	75	100(6)	100(10)	100(11)	100(9)	100(9)	100(8)	100(10)	100(9)	100(9)
	100	100(6)	100(9)	100(10)	100(8)	100(7)	100(7)	100(7)	100(8)	100(7)
	Check	5	15	0	10	5	15	5	10	15
MAFES	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	25	30	15	10	20	10	15	5	*
	25	45	35	45	35	25	55	45	20	*
	50	100(11)	100(9)	100(12)	100(13)	100(9)	100(8)	10(10)	100(10)	100(10)
	75	100(6)	100(8)	100(7)	100(9)	100(8)	100(6)	100(7)	100(8)	100(6)
	100	100(6)	100(8)	100(6)	100(7)	100(7)	100(6)	100(7)	100(6)	100(6)
	Check	5	10	0	10	10	30	5	10	10
Windmill	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	80	100(14)	20	55	60	70	55	45	55
	100	90	100(14)	65	70	85	85	75	70	85
	Check	10	10	10	0	5	0	10	0	5

* Removed from evaluation

Table 3. (Cont.) Residual activity of chlorfenapyr 1.5G - Incorporated.

Media Treated	Rate of Application (ppm)	Mean % mortality to alate females at indicated months post-treatment after 14 days exposure (days required to reach 100% mortality)								
		21	22	23	24	25	26	27	28	29
Flowerwood	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	90	95	100(10)	100(14)	100(14)	95	95	50	
	75	100(9)	100(11)	100(10)	100(12)	100(13)	100(10)	100(11)	65	
	100	100(9)	100(10)	100(6)	100(10)	100(12)	100(10)	100(10)	100(14)	
	Check	15	15	10	15	5	5	5	15	
MAFES	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	100(13)	100(10)	100(7)	100(11)	100(12)	100(13)	100(13)	80	
	75	100(9)	100(10)	100(10)	100(10)	100(9)	100(7)	100(10)	100(14)	
	100	100(9)	100(10)	100(5)	100(6)	100(6)	100(6)	100(10)	100(14)	
	Check	0	20	5	0	0	5	0	10	
Windmill	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	35	70	100(12)	90	35	60	45	100(14)	
	100	50	75	100(11)	100(14)	80	100(12)	95	75	
	Check	5	20	10	20	5	5	20	15	

* Removed from evaluation

Table 4. Residual activity of chlorfenapyr 2.0G - Incorporated.

Media Treated	Rate of Application (ppm)	Mean % mortality to alate females at indicated months post-treatment after 14 days exposure (days required to reach 100% mortality)								
		1	2	3	4	5	6	7	8	9
Flowerwood	Clay									
	10	100 (8)	100 (10)	100 (11)	100 (7)	55	*	*	*	*
	25	100 (8)	100 (6)	100 (11)	100 (5)	100 (10)	*	*	*	*
	50	100 (11)	100 (7)	100 (6)	100 (4)	100 (4)	*	*	*	*
	75	100 (7)	100 (6)	100 (4)	100 (4)	100 (4)	*	*	*	*
	100	100 (6)	100 (6)	100 (4)	100 (4)	100 (4)	*	*	*	*
	Grit									
	10	100 (8)	100 (8)	100 (4)	100 (6)	90	100 (6)	90	45	45
	25	100 (8)	100 (6)	100 (7)	100 (4)	100 (6)	100 (6)	100 (12)	85	85
	50	100 (5)	100 (6)	100 (4)	100 (4)	100 (4)	100 (4)	100 (8)	100 (9)	100 (7)
	75	100 (6)	100 (3)	100 (4)	100 (4)	100 (4)	100 (4)	100 (8)	100 (6)	100 (6)
	100	100 (5)	100 (3)	100 (4)	100 (4)	100 (4)	100 (4)	100 (5)	100 (5)	100 (6)
	Check	10	25	33*	5	5	10	15	5	10
MAFES	Clay									
	10	45	5	0	0	0	*	*	*	*
	25	25	15	0	5	0	*	*	*	*
	50	70	25	30	50	25	*	*	*	*
	75	90	65	70	95	100 (14)	*	*	*	*
	100	100 (12)	85	100 (11)	100 (11)	100 (10)	*	*	*	*
	Grit									
	10	5	10	0	30	15	10	65	40	10
	25	65	30	0	100 (11)	20	75	55	60	90
	50	100 (9)	100 (10)	100 (13)	100 (7)	100 (13)	100 (11)	100 (14)	100 (9)	100 (14)
	75	100 (8)	100 (8)	100 (11)	100 (6)	100 (10)	100 (8)	100 (12)	100 (8)	100 (7)
	100	100 (7)	100 (8)	100 (11)	100 (6)	100 (10)	100 (7)	100 (8)	100 (8)	100 (6)
	Check	10	20	10	10	10	10	10	10	10
Windmill	Clay									
	10	15	0	15	0	5	*	*	*	*
	25	30	5	30	5	5	*	*	*	*
	50	10	0	10	10	20	*	*	*	*
	75	55	5	55	5	30	*	*	*	*
	100	40	20	40	60	50	*	*	*	*
	Grit									
	10	20	0	20	0	10	*	*	*	*
	25	20	20	20	10	10	*	*	*	*
	50	80	25	80	65	5	*	*	*	*
	75	85	80	85	90	60	85	65	80	90
	100	100 (11)	100 (14)	100 (13)	95	95	80**	40	100 (13)	100(14)
	Check	5	15	5	0	10	0	10	15	5

* Removed from evaluation

** Queens escaped from 1 replicate

Table 4. (Cont.) Residual activity of chlorfenapyr 2.0G - Incorporated.

Media Treated	Rate of Application (ppm)	Mean % mortality to alate females at indicated months post-treatment after 14 days exposure (days required to reach 100% mortality)								
		10	12	13	14	16	17	18	19	20
Flowerwood	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	55	70	35	45	60	10	15	*	*
	25	85	45	45	20	20	30	40	*	*
	50	100(11)	100(13)	100(9)	100(13)	100(14)	100(13)	100(13)	100(13)	100(13)
	75	100(6)	100(9)	100(7)	100(8)	100(7)	100(7)	100(8)	100(9)	100(9)
	100	100(5)	100(8)	100(7)	100(10)	100(7)	100(7)	100(8)	100(8)	100(9)
	Check	15	15	5	10	5	0	0	5	10
MAFES	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	5	35	15	10	5	5	5	*	*
	25	65	70	75	15	55	40	10	*	*
	50	100(13)	100(9)	100(10)	100(13)	100(14)	95	100(13)	100(13)	100(9)
	75	100(11)	100(8)	100(8)	100(10)	100(8)	100(10)	100(12)	100(13)	90
	100	100(7)	100(8)	100(7)	100(8)	100(8)	100(10)	100(8)	100(9)	100(9)
	Check	15	0	15	10	0	10	0	10	35
Windmill	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	75	100(13)	40	15	10	25	15	25	80
	100	90	100(14)	30	75	70	50	45	50	80
	Check	0	5	0	5	5	10	5	5	15

* Removed from evaluation

Table 4. (Cont.) Residual activity of chlorfenapyr 2.0G - Incorporated.

Media Treated	Rate of Application (ppm)	Mean % mortality to alate females at indicated months post-treatment after 14 days exposure (days required to reach 100% mortality)								
		21	22	23	24	25	26	27	28	29
Flowerwood	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	100(12)	100(10)	100(11)	80	70	100(14)	75		
	75	100(10)	100(7)	100(10)	100(13)	100(11)	100(11)	65		
	100	100(10)	100(7)	100(10)	100(13)	100(10)	100(10)	100(14)		
	Check	15	15	5	0	0	10	15		
MAFES	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	100(12)	100(11)	100(11)	100(14)	100(10)	100(10)	95		
	75	100(10)	100(10)	100(10)	100(14)	100(12)	100(10)	100(14)		
	100	100(10)	100(10)	100(7)	100(12)	100(7)	100(10)	100(14)		
	Check	20	5	15	0	0	0	0		
Windmill	Clay									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	*	*	*	*	*	*	*	*	*
	100	*	*	*	*	*	*	*	*	*
	Grit									
	10	*	*	*	*	*	*	*	*	*
	25	*	*	*	*	*	*	*	*	*
	50	*	*	*	*	*	*	*	*	*
	75	40	85	55	30	70	80	60		
	100	45	75	70	35	55	95	70		
	Check	50	10	5	0	0	20	20		

* Removed from evaluation

PROJECT NO: GPPS00-01

PROJECT TITLE: Further Testing of Chlorfenapyr as an Imported Fire Ant Quarantine Treatment (2000)

REPORT TYPE: Interim

PROJECT LEADER/PARTICIPANT(s): Lee McAnally

INTRODUCTION:

The Federal Imported Fire Ant Quarantine Program (7CFR §301.81) states that all regulated products (nursery stock) leaving the quarantined area must be treated in a prescribed manner. Currently, treatments for containerized nursery include the use of granular insecticides incorporated into potting media or liquid drenches applied prior to shipping. Nursery stock treated with incorporated insecticides (bifenthrin or tefluthrin) may be certified for 6 months to 2 years, depending on the rate incorporated into the media (10-25 ppm based on bulk density of media). This allows the grower to use less insecticide on nursery stock that will be held on site for a short period of time, and more on those that need a longer growing period prior to selling. Drench treatments (chlorpyrifos, diazinon or bifenthrin) are generally used just prior to shipping, and those currently approved for use in the quarantine have certification periods of 10 days to 6 months. Since drench treatments are used just prior to shipping, long residual activity is not a requirement.

Chlorfenapyr is an experimental insecticide-miticide under development by American Cyanamid (Princeton, NJ). The product is active against many pests, and works as a broad spectrum contact and stomach poison. Previously w
product showed significant activity against IFA in containerized nursery stock. In August 1997, we began testing a 0.5G granular formulation as an incorporated treatment (FA01G097).

In August 1999, we initiated an expanded test of chlorfenapyr using a 2SC liquid formulation as
ch on two different carriers (clay and corn cob grit) as incorporated treatments. All of these treatments were applied to three different potting media (FA01G019).

In August 2000, another trial was initiated using the 1G and 1.5G formulations on the grit carrier.

MATERIALS AND METHODS:

Incorporated Treatments:
Granular treatments included 1% and 1.5% products formulated on a corn cob grit carrier. Each of the granular formulations was blended into the MAFES media (3:1:1 pine bark: sphagnum peat moss: sand - bulk density = 785 lb/cu yd) at rates of 50, 75, 100 and 200 ppm. A portable cement mixer (2 cu ft capacity) was use to blend the toxicant into the potting media, and was

operated for 15 minutes per batch to insure thorough blending. Treated media was then poured into one-gallon capacity plastic nursery pots and weathered outdoors under simulated nursery conditions. A pulsating overhead irrigation system supplied ca. 1-1½ inches water per week. At monthly intervals, subsamples were taken from 3 pots of each treatment and composited and subjected to standard alate queen bioassay. The 1.0G formulation was mixed on August 28 and the 1.5G formulation was mixed on August 29, 2000.

RESULTS:

All rates are producing 100% mortality in 12 days exposure or less through 15 months post-treatment (Table 1).

Table 1. Residual activity of chlorfenapyr 1.0G and 1.5G.

Formulation Tested	Rate of Application (ppm)	Mean % mortality to alate females at indicated months post-treatment (days required to reach 100% mortality)							
		1	2	3	5	6	7	8	9
1.0G	50	100(6)	100(8)	100(11)	100(10)	100(10)	100(8)	100(13)	100(8)
	75	100(5)	100(7)	100(7)	100(9)	100(7)	100(7)	100(6)	100(7)
	100	100(4)	100(7)	100(8)	100(9)	100(6)	100(7)	100(7)	100(7)
	200	100(3)	100(7)	100(5)	100(6)	100(4)	100(3)	100(8)	100(6)
1.5G	50	100(6)	100(8)	100(11)	100(11)	100(10)	100(9)	100(7)	100(9)
	75	100(6)	100(8)	100(8)	100(11)	100(7)	100(7)	100(7)	100(7)
	100	100(6)	100(4)	100(7)	100(9)	100(7)	100(7)	100(6)	100(7)
	200	100(4)	100(4)	100(5)	100(6)	100(6)	100(7)	100(6)	100(7)
	Check*	15	10	5	5	5	5	30	5

Formulation Tested	Rate of Application (ppm)	Mean % mortality to alate females at indicated months post-treatment (days required to reach 100% mortality)							
		10	11	12	13	14	15		
1.0G	50	100(10)	100(6)	100(9)	100(11)	100(12)	100(7)		
	75	100(10)	100(6)	100(8)	100(11)	100(11)	100(7)		
	100	100(7)	100(6)	100(7)	100(8)	100(7)	100(7)		
	200	100(7)	100(4)	100(7)	100(6)	100(5)	100(4)		
1.5G	50	100(10)	100(6)	100(8)	100(8)	100(11)	100(8)		
	75	100(7)	100(4)	100(7)	100(7)	100(7)	100(7)		
	100	100(6)	100(6)	100(7)	100(7)	100(6)	100(7)		
	200	100(10)	100(3)	100(6)	100(5)	100(5)	100(4)		
	Check*	10	10	5	10	5	0		

*Check mortality is shown at longest exposure time

PROJECT NO: FA01G069

PROJECT TITLE: Effectiveness of Permethrin Impregnated Nursery Pots in Preventing Imported Fire Ant Invasion of Containerized Nursery Stock, 1999

TYPE REPORT: Interim

PROJECT LEADERS: Homer Collins, Anne-Marie Callcott and Shannon Wade

COOPERATORS: Premium Compounded Products, LLC (Corinne Brothers)
Nursery Supplies, Inc. (Henry Guarriello, Jr.)
AgrEvo Environmental Health - now Aventis Environ. Sci. (John Lucas)
Windmill Nursery (Tom Cooper)

INTRODUCTION:

Nursery stock and other regulated articles cannot be shipped outside the imported fire ant (IFA) (7CFR §301.81) to prevent inadvertent spread of IFA. Several treatment options are approved and registered for this use pattern. Both liquid drenches (chlorpyrifos, diazinon, and bifenthrin), and granular insecticides (tefluthrin and bifenthrin) incorporation of either granular tefluthrin or bifenthrin into the potting media prior to "potting up". The residual activity of the insecticide prevents IFA invasion of containerized nursery stock for up to 24 months, depending upon dose rate employed.

New technologies utilizing insecticides applied to the nursery pot or insecticides impregnated into the plastic of the nursery pot to prevent IFA invasion have been investigated by our laboratory over the past several years. Preliminary work with permethrin impregnated nursery pots has shown the potential for preventing IFA infestation of small nursery containers (report FA01G038). This trial was initiated to expand on our preliminary observations and test the impregnated containers in actual nursery conditions with plants added.

MATERIALS AND METHODS:

Three sizes of nursery containers (1, 3, and 10 gallon) impregnated with permethrin or deltamethrin unded Products. Concentrations of permethrin deltamethrin were 0.025, 0.050, 0.075 and 0.10%. Containers were potted up at Windmill Nursery on May 1, 1999. Due to logistics and resources, only three treatments were subjected to bioassay at our laboratory: 0.5 and 1.0% permethrin, and 0.10% deltamethrin. Pots were transported to the Gulfport laboratory quarterly for bioassay testing. The 0.05% deltamethrin concentration was tested at another laboratory at 6 month intervals. The other rates will be held for testing as needed. Other trials, not reported here, were initiated in other nurseries and bioassays performed by other laboratories.

Bioassays were conducted in the laboratory in 2' x 8' test arenas (Figure 1). Sides of the test arena were talced to prevent ants from climbing out and escaping. An impregnated pot was placed at one end of the arena, and an untreated check container filled with potting media was placed at the distal end of the arena. A field collected IFA colony complete with associated soil and nest tumulus was then placed in the center of the arena. Overhead incandescent light bulbs (60 watts, placed 14" above the test arena) slowly desiccated the nest so that the ants were encouraged to migrate to the more moist containers. Therefore, the IFA colony had an equal opportunity to move into either a permethrin pot or the untreated check pot. Pots were observed at 24 hour intervals for 7 days after introduction, and the estimated number of worker ants successfully invading each pot was recorded. A pot was considered infested if there were +25 workers inside the pot. There were 3 replicates per sampling interval.

RESULTS:

Through 16 months after potting up, the 1.0% permethrin impregnated nursery containers excluded IFA in all container sizes (Figs. 2, 3 and 4). However, at 18 months, one 1.0% permethrin 1-gallon container had 50-100 workers in the container, and at 21 and 24 months . Results with both 0.5% permethrin and 0.1% deltamethrin have been erratic. The 3-gallon containers have been the most erratic with these treatments, with 50 to 5000 (whole colony) infesting the treated pots. In conversations with AgrEvo (now Aventis),
initiated under this protocol, indicating possible formulation/production problems with this container size.

At 21 months, evaluations of the 0.75% permethrin containers was initiated to determine if this rate was as effective as the 1.0% rate. At 21 months, one 1-gallon, all three 3-gallon, and one 10-gallon container contained 25-100 worker ants (Figures 2, 3 & 4). At 24 months, two 1-gallon and one 3-gallon container contained 100 workers, each.

DISCUSSION:

Data from similar trials initiated at other sites need to be compiled to determine true efficacy of permethrin impregnated nursery pots at excluding IFA. Results from this trial indicate that while only a few containers treated with rates of <1.0% permethrin were infested by whole colonies, these containers were regularly infested with 100 or more workers. The 1.0% permethrin impregnated containers of all sizes were very effective at excluding IFA through 16 months, and only allowed a few workers to get into the pots after that time. This only occurred in the 1 gallon containers, possibly indicating that the untreated container was not of sufficient size to contain the entire colony. Data supplied by the 0.75% rate does not appear to be as effective at 21 and 24 months as the 1.0% rate.

Figure 1. Diagram of test arena.

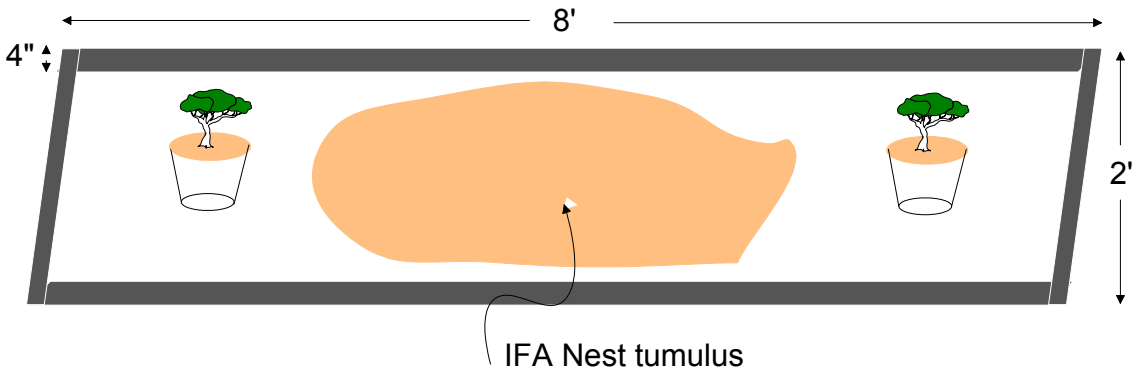


Figure 2. Percent of insecticide impregnated 1 gallon pots infested with IFA - Trial at Windmill Nursery - initiated 1999.

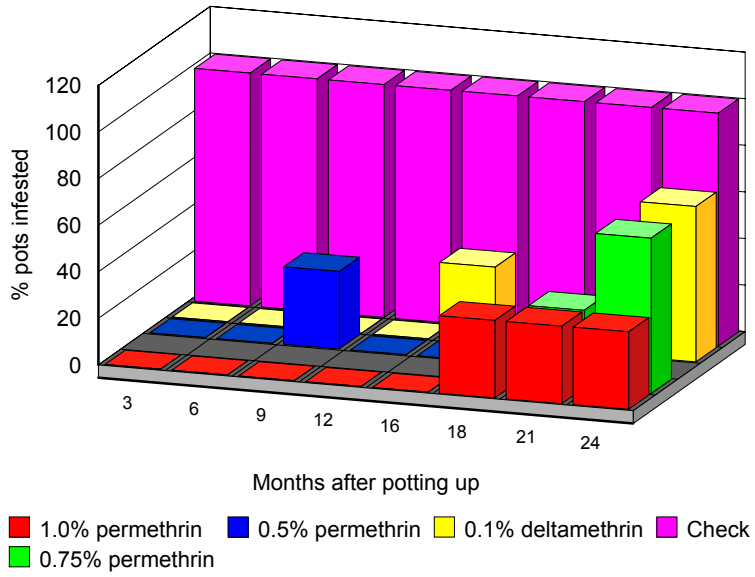


Figure 3. Percent of insecticide impregnated 3 gallon pots infested with IFA - Trial at Windmill Nursery - initiated 1999.

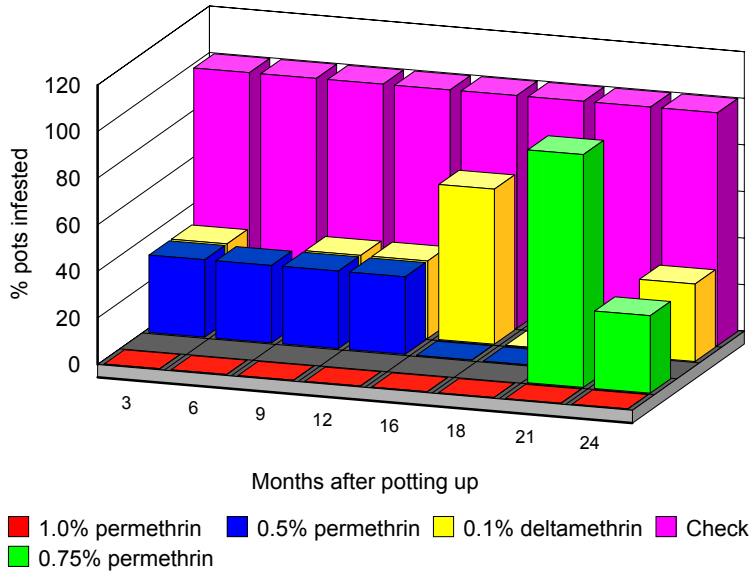
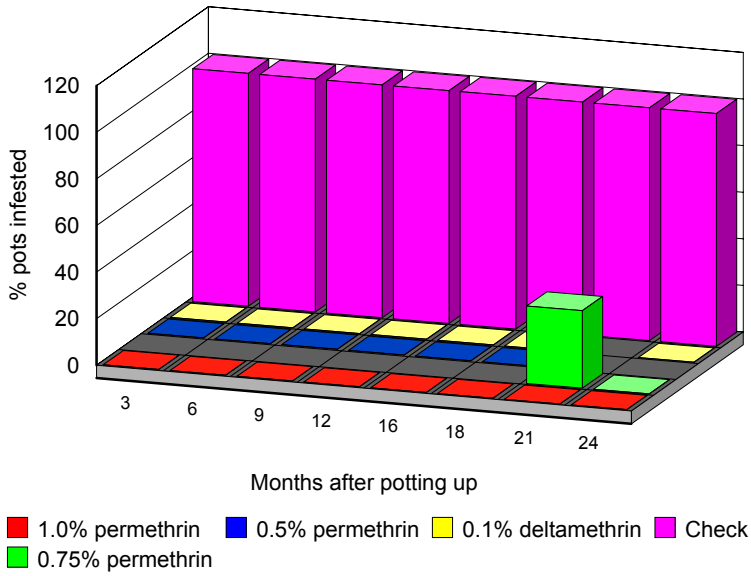


Figure 4. Percent of insecticide impregnated 10 gallon pots infested with IFA - Trial at Windmill Nursery - initiated 1999.



PROJECT NO: GPPS01-01

PROJECT TITLE: Additional Treatments for Field Grown Nursery Stock

TYPE REPORT: Interim

LEADER/PARTICIPANTS: Anne-Marie Callcott, Lee McAnally, Tim Lockley, Shannon Wade,
Chris Doxey

INTRODUCTION:

Current quarantine treatments for field grown nursery include a bait treatment followed in 3-5 days by a granular chlorpyrifos treatment. This treatment allows for 12 weeks of certification after a 30-day exposure period. With the impending loss of chlorpyrifos, we initiated a trial to replace the chlorpyrifos portion of this treatment regimen with more available chemicals.

MATERIALS AND METHODS:

The bait used was Distance (Valent Corp., Walnut Creek, CA). The contact insecticides were Talstar 0.2G, Talstar Flowable, and fipronil 0.0143G. We also tested a blend of fipronil bait (1.5 ppm) and fipronil

Insecticide	Formulation	Rate of Application
Distance	bait	1.5 lb/acre
Talstar	0.2G	200 lb/acre (0.4 lb ai/acre)
Talstar	Flowable	40 oz/acre (0.2 lb ai/acre)
fipronil	0.0143G	87 lb/acre (0.0125 lb ai/acre)
fipronil blend	15 lb bait + 87 lb granule	100 lb/acre

The test site was located at the Laurel Municipal Airport in Laurel, MS. As with many airport sites, the upkeep and accessibility is superior, but ant populations tend to be somewhat low. The bait was applied on June 18, 2001 with a shop built applicator mounted on a farm tractor. Air temperature was 85-87°F and the soil temperature was 72°F. Due to weather delays the contact insecticides were applied on June 21, 2001 and June 26, 2001. Air temperature was 87°F and soil temperature was 80°F on June 21 and 90°F and 80°F, respectively, on June 26. Granular material was applied with a Herd™ spreader mounted on a farm tractor. Liquid material was applied with a roller pump boom sprayer equipped with five TKSS tips with provided a 10 ft. swath. The system was operated at 50 psi providing 38 gallons of finished spray per acre. There were three replicates per treatment, and all test plots were 1.0 acre in size. A ¼-acre circular efficacy plot was established in the center of each 1.0 acre test plot. Prior to bait application and at 1, 2, and 4 weeks after final treatment (June 26), IFA populations in each efficacy plot were evaluated using the population index system developed by Harlan et al. (1981), and later revised by Lofgren and Williams (1982). Treatments were evaluated at 4 week intervals thereafter.

Using this data, both colony mortality and decrease in pretreatment population indices were calculated. Experimental data were statistically analyzed using analysis of variance, and treatment means were separated using the LSD test (P=0.05) for each posttreatment rating interval.

RESULTS:

Due to the difference in application times, evaluations were started 1 week after the last application. All treatments provided >90% mortality within 2 weeks of application of the granular/liquid insecticide, and by 4-5 weeks after treatment all treatments had provided 100% mortality (Tables 1 & 2). All treatments provided 100% control through 8-9 weeks after treatment and greater than 91% control through 23 weeks. High mortality in the check plots at weeks 12-17 is not unusual in south Mississippi in late summer. The continued high check mortality at week 23 (late Nov) is unexplained. Evaluations will continue.

RECOMMENDATION:

All treatments appeared to be excellent replacements for dursban in the "in-field" nursery stock treatment for IFA quarantine. However, due to the continued high check mortality in this trial, we propose to duplicate this trial in 2002, to verify results. Prior to the 2002 treatments, we will discuss necessary label changes with the companies involved to determine their current interest in this use pattern for their products.

References Cited:

Harlan, D. P., W. A. Banks, H. L. Collins, and C. E. Stringer. 1981. Large area tests of AC217,300 bait for control of imported fire ants in Alabama, Louisiana, and Texas. Southwest. Entomol. 8: 42-45.

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

Table 1. Bait followed by contact insecticide treatment - Decrease in colony numbers.

Treatment	Mean no. colonies/acre - pretreat	% decrease in no. pretreat colonies at indicated wks. after treatment							
		1*/2**	2*/3**	-4-	-8-	-12-	-17-	-23-	
Distance + Talstar F*	28.0	100.0a	95.8a	100.0a	100.0a	100.0a	95.2a	100.0a	
Distance + Talstar G**	26.7	95.8a	91.7a	100.0a	100.0a	100.0a	100.0a	100.0a	
Distance + Fipronil G*	28.0	91.1a	100.0a	100.0a	100.0a	96.7a	91.1a	100.0a	
Fipronil Blend**	32.0	90.9a	87.9a	100.0a	100.0a	100.0a	100.0a	97.0a	
Check	38.7	22.1b	17.1b	34.6b	43.3b	51.7b	59.6b	64.2b	

LSD test (P=0.05) means within a column followed by the same letter are not significantly different

Table 2. Bait followed by contact insecticide treatment - Change in population indices.

Treatment	Mean pop. index/acre - pretreat	% change in pretreat population indices at indicated wks. after treatment							
		1*/2**	2*/3**	-4-	-8-	-12-	-17-	-23-	
Distance + Talstar F*	380.0	-100.0a	-99.4a	-100.0a	-100.0a	-100.0a	-95.5a	-100.0a	
Distance + Talstar G**	360.0	-99.4a	-98.4a	-100.0a	-100.0a	-100.0a	-100.0a	-100.0a	
Distance + Fipronil G*	393.3	-98.4a	-100.0a	-100.0a	-100.0a	-95.2a	-94.1a	-100.0a	
Fipronil Blend**	426.7	-92.4a	-92.0a	-100.0a	-100.0a	-100.0a	-100.0a	-96.6a	
Check	500.0	4.0b	-6.3b	-9.1b	-29.8b	-42.8b	-52.4b	-59.9b	

LSD test (P=0.05) means within a column followed by the same letter are not significantly different

PROJECT NO: GPPS01-02

PROJECT TITLE: Spot Applications of Granular Insecticides for IFA Quarantine Treatment of Field Grown Nursery Stock in Tennessee

LEADERS/PARTICIPANTS: Anne-Marie Callcott, Tim Lockley, Lee McAnally, Shannon Wade

COOPERATOR: Dr. Jason Oliver, Tenn. State Univ., Nursery Crop Research Station, McMinnville, TN

TYPE REPORT: Final

INTRODUCTION:

Nursery stock and other regulated articles cannot be shipped outside the IFA quarantined area unless treated with an approved insecticide or other means of certification (7CFR § 301.81). Balled and burlapped (B&B) nursery stock can be certified by three mechanisms: (1) immersed in a chlorpyrifos solution (2) subjected to a twice daily spray-on chlorpyrifos solution for three consecutive days, (3) given an in-field treatment using a combination of baits plus granular chlorpyrifos (see APHIS Program Aid 1653). The immersion process is labor intensive and disruptive to the root ball. The spray-on treatment is also labor intensive and somewhat impractical. A simple, cost effective and practical treatment is badly needed to enable growers to ship non-infested nursery stock outside the quarantined area. The lack of simple, practical treatments for this commodity is especially important to Tennessee growers because the majority of nursery stock produced there is field grown rather than containerized.

diazinon, chlorpyrifos, acephate, and others are labelled for spot treatment of imported fire colonies. Imported fire ant colonies readily respond to any insecticide application made directly to the nest by relocating the colony (Collins & Callcott 1995, Hays et al. 1982, Franke 1983, Williams & Lofgren 1983). This insecticide induced movement is usually over a relatively short distance (1.5 to 3.0 meters), but can be greater (HLC, personal observation). The primary objective of a quarantine treatment for field grown nursery stock is to render the plants fire ant free. Therefore, it does not matter if colonies are killed outright by the treatment or simply induced to move away from the root ball of plants intended for harvest. Results of a preliminary study conducted previously indicated that Orthene® 75S and Talstar® T & O Granular (see report FA01G116) could possible be used as a quarantine treatment for field grown nursery stock. However, those trials were conducted in Southern Mississippi and Louisiana with temperatures in the low 70's(°F). The B&B shipping season in Tennessee extends from fall until mid April, with temperatures much lower than those in the preliminary trial. Imported fire ants are immobilized by low temperatures, and may not be able to respond to spot applications of insecticides by relocating the colony.

In this study we evaluated the effectiveness of spot insecticide applications against IFA under Mississippi and Tennessee conditions during the winter of 2000-2001.

MATERIALS AND METHODS:

Prior to application active fire ant mounds were marked with an engineering flag and rated as positive/active. Air and soil temperatures were recorded immediately prior to application. Insecticides were applied with a shaker can or teaspoon at the labelled rate of application to a circular area (radius of 1' - 2' or up to 12.5 ft^2) around each mound. Ten to twenty mounds (replicates) were treated with each insecticide, and a corresponding number of untreated controls were marked as active but not treated. Evaluations up to 3 months after treatment were performed depending on the continued availability of the test area. Evaluations consisted of a re-examination of each previously marked and treated fire ant mound (replicate) to determine if the mound remains active. All active mounds were rated as positive at each posttreatment rating interval. Inactive mounds, whether the colony succumbed to the treatment or simply relocated to a new mound site outside the individual treated area, were rated as negative. Rates of application are below:

Product	Rate of Application	Chemical
Acephate 75SP	2 tsp/mound	acephate
Fipronil G	0.0125 lb ai/acre or 9.7 g/m^2	fipronil
Fipronil G	0.01875 lb ai/acre or 14.7 g/m^2	fipronil
Fipronil G	0.025 lb ai/acre or 19.6 g/m^2	fipronil
Talstar G	0.2 lb ai/acre or 11.2 g/m^2	bifenthrin
Talstar G	0.4 lb ai/acre or 22.4 g/m^2	bifenthrin
Talstar F	0.2 lb ai (40 oz)/acre or 11.2 g/m^2	bifenthrin
DeltaGard G	0.13 lb ai/acre or 7.28 g/m^2	deltamethrin
DeltaGard SC	0.13 lb ai (39 oz)/acre or 7.28 g/m^2	deltamethrin
Check	untreated	---------

Trial I: Overwinter comparison of treatments in Mississippi and Tennessee
Mississippi:
The first Mississippi trial was initiated on January 31, 2001 in McNeill, MS at the Miss. Agric. and Forestry Exp. Station (MAFES), with 20 mounds per treatment. Chemicals used included acephate (1 rate), fipronil (3 rates), and Talstar granular (2 rates). The air temperature on this date at the time of treatment was 65°F (18.3°C) and the soil temperature was 51°F (10.5°C). This site had a temperature datalogger
trial. Soil temperature (≈5cm depth) was recorded at the time of evaluation. This site was infested with red imported fire ants. Treatments were evaluated at 2 days after treatment, and then on a weekly basis through 8 weeks in Mississippi.

Tennessee:
The Tennessee trial was initiated on February 1, 2001 near Huntland, TN in a homeowner yard
acephate, fipronil, and Talstar
granular. Air and soil temperatures were 50°F (10.1°C) and 44°F (6.9°C). A datalogger was set at this site to record hourly air and soil temperatures (10cm depth) for the duration of the trial. Air and soil temperatures were also recorded at the time of each evaluation. This site was

infested with black imported fire ants. Treatments were evaluated at 4, 7, 14, 21, 28, 63 (9 wks), and 84 (12 wks) days after treatment in Tennessee.

Trial II: Additional evaluation of promising chemicals and new chemicals
A second trial was initiated September 7, 2001 at the Harrison Co. Farm, MS with 10 mounds per treatment. Chemicals used included fipronil (0.0125 lb ai/acre), Talstar granular (0.4 lb ai/acre), Talstar F (1 rate), DeltaGard G (1 rate) and DeltaGard SC (1 rate). Only air temperature was recorded for this trial, and at the time of treatment was 85°F (29.4°C). Rainfall was also recorded at this site. Treatments were evaluated at 3 days, then weekly thereafter.

RESULTS:

Trial I: Overwinter comparison of treatments in Mississippi and Tennessee
At the Mississippi site, Acephate and both Talstar treatments were very effective in eliminating IFA mounds from a small area. Within 2 weeks, >85% of these mounds were dead or had relocated (Figure 1). These treatments remained 90-100% effective for the duration of the trial (8 weeks). The fipronil treatments did not appear different from the untreated check, except the high rate at weeks 7 and 8.

At the Tennessee site, the Acephate treatment was slower to affect mounds and only acheived 87% control at 9 weeks after treatment (Figure 2). The Talstar treatments provided >80% control by 2 weeks after treatment and 100% control at 4 to 9 weeks. Fipronil control was similar to the Mississippi trial.

Maximum soil temperature at the Tennessee site generally remained below 50°F (Figure 3), while maximum soil temperature in Mississippi was generally above 50°F from February through the end of March. Maximum air temperature varied greatly at the Tennessee site, but generally remained below 60°F from February through the end of March, while the Mississippi site, after a cold first week of February, remained above 60°F.

Rainfall occurred at the Mississippi site ca. 10 and 20 days after treatment, while the Tennessee site did not receive rainfall until ca. 42 days after treatment. Acephate in particular, needs "watering in" to facilitate activity, which may explain the slow and less effective activity of the product in Tennessee. Neither rainfall nor temperature appeared to affect the efficacy of Talstar with similar results in both locations. Fipronil does not appear to be very effective in this use pattern.

Trial II: Additional evaluation of promising chemicals and new chemicals
Daytime temperatures throughout this trial averaged 75-80°F, ideal conditions for IFA. Rainfall (2.7") occurred within 2 days of the treatment, and occurred regularly throughout the evaluation period (12" over course of trial). In this trial, both Talstar formulations provided excellent control within 3-7 days after treatment (Figure 4), and continued to show good control through 28 days (4 weeks after treatment). The DeltaGard formulations also provided good control, with the liquid formulation numerically superior. The fipronil was not different from the untreated check.

DISCUSSION:

Talstar, acephate and DeltaGard all show good potential as individual stock treatments for field grown nursery stock. Talstar IFA colony from a specific area during the winter months in both Mississippi, with mild winter conditions, and Tennessee, with more harsh winter conditions. Treatments applied during the winter months required 4 weeks to achieve 100% colony elimination at both locations, and then provided an additional 3 weeks of 100% control in Mississippi and an additional 5 weeks of 100% control in Tennessee. Talstar granular, applied at the high rate in Mississippi in early fall, achieved 100% control in 3 days and provided control for an additional 4 weeks, as did Talstar flowable. Elimination of colonies was achieved faster in the early fall, but length of control, once effective, did not change. Acephate
various times of year, but did not show the same efficacy in Tennessee over the winter months. Fipronil does not appear to be effective in this use pattern.

While an individual stock treatment for field grown nursery stock is not economically or logistically feasible for large shipments, this type of treatment may be of use to growers who ship small quantities of stock on an irregular basis. Additional studies in Tennessee to verify over winter results with promising candidates should be undertaken. Treatments that show promise in this use pattern will also be used in a new trial evaluating band treatments to field grown nursery stock.

REFERENCES CITED:

Collins, H. L., and Anne-Marie Callcott. 1995. Effectiveness of spot insecticide treatments or red imported fire ant control. J. Entomol. Sci. 30: 489-496.

Franke, O. F. 1983. Efficacy of tests of single mound treatments for control of red imported fire ants. Southwest Entomol. 8: 42-45.

Hays, S. B., P. M. Horton, J. A. Bass and D. Stanley. 1982. Colony movement of imported fire ants. J. Georgia Entomol. Soc. 17: 266-272.

Williams, D. F. and C. S. Lofgren.
chemicals for individual mound treatments. J. Econ. Entomol. 76: 1201-1205.

Figure 1. Results of Mississippi test initiated January 31, 2001.

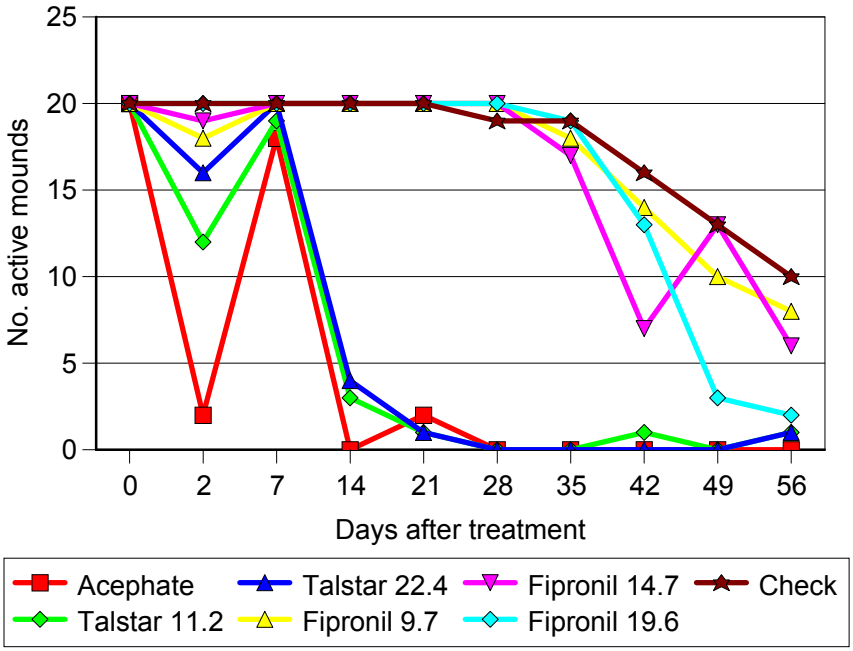


Figure 2. Results of Tennessee test initiated February 1, 2001.

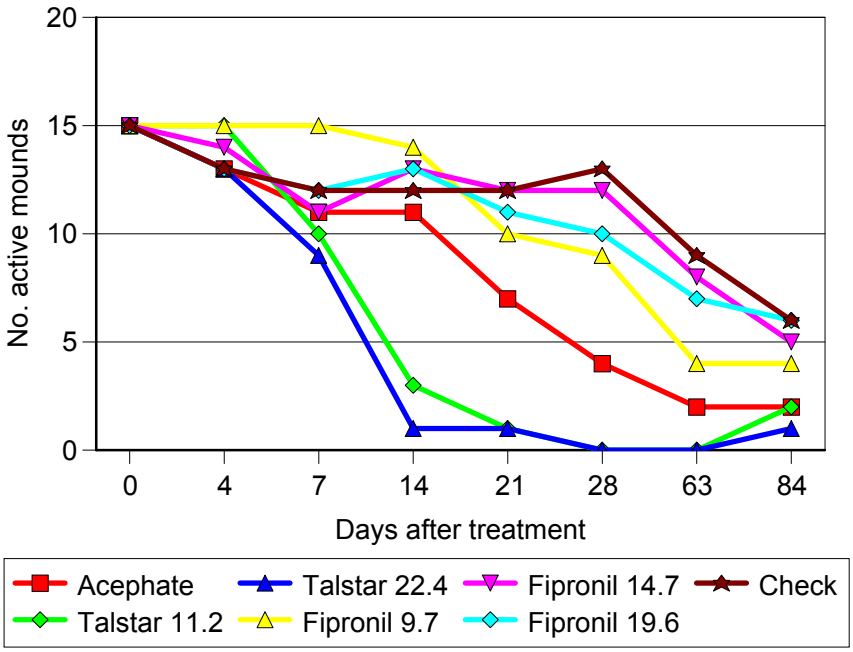
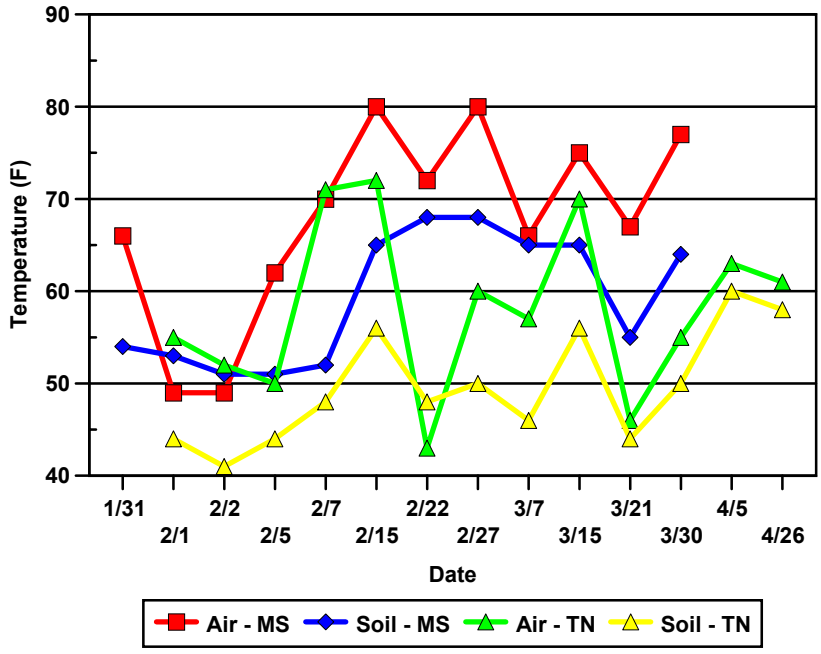
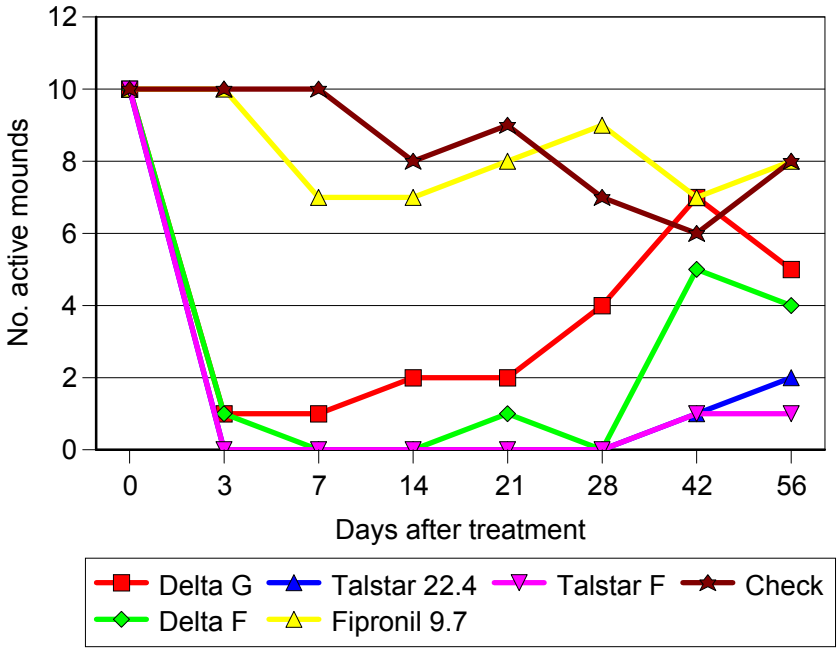


Figure 3. Air and soil temperature at evaluations in Mississippi and Tennessee. (daily max. air temp. shown for MS and TN; max. soil temp. for TN; soil temp. at time of data recording)





PROJECT NO: GPPS01-03

PROJECT TITLE: Split Granular Fipronil Treatment for Grass Sod

TYPE REPORT: Interim

LEADER/PARTICIPANTS: Anne-Marie Callcott, Lee McAnally, Tim Lockley, Shannon Wade,
Chris Doxey

INTRODUCTION:

Currently there is only one available quarantine treatments (and corresponding label) for grass sod: chlorpyrifos liquid applied at a rate of 8 lbs ai/acre. This treatment is certified for 6 weeks after a 48 hour exposure period. With the impending loss of chlorpyrifos, we have been testing for a replacement for several years. Aventis Environmental Science recently received label approval for a fipronil granular treatment of grass sod. Our original recommendation for grass sod use of fipronil was to be a 0.0185 lb ai/acre application, however, due to concerns by EPA, the approved label allows only one 0.0125 lb ai/acre treatment per year, but allows commercial sod growers the option of applying that rate up to twice a year for quarantine purposes. No one has tested the product in a split application, therefore we initiated a trial to test that application method.

MATERIALS AND METHODS:

The test site was located at the Laurel Municipal Airport in Laurel, MS. As with many airport sites, the upkeep and accessibility is superior, but ant populations tend to be somewhat low. The first granular application was was made on June 18, 2001 with a Herd™ spreader mounted on a farm tractor. Air temperature was 85-87°F and the soil temperature was 72°F. The second application was made 3 days later on June 21, 2001. Air temperature was 87°F and soil temperature was 80°F. There were three replicates per treatment, and all test plots were 1.0 acre in size. A ¼-acre circular efficacy plot was established in the center of each 1.0 acre test plot. Prior to bait application and at 1, 2, and 4 weeks after final treatment, IFA populations in each efficacy plot were evaluated using the population index system developed by Harlan et al. (1981), and later revised by Lofgren
intervals thereafter. Using this data, both colony mortality and decrease in pretreatment population indices were calculated. Experimental data were statistically analyzed using analysis of variance, and treatment means were separated using a t-test (P=0.05) for each posttreatment rating interval. Due to time constaints and a shortage of material this trial was performed without a standard, but with an untreated control.

RESULTS:

The first evaluation was at 2 weeks due to treatment obligations for other trials and bad weather. By 3 weeks after treatment, the split fipronil treatment had provided 100% mortality (Tables 1 &

2) and maintained that control through 23
significant, mortality over the summer. This affected the statistical differences that we would normally see between the treatment and the check plots (if P=0.10 then evaluations at weeks 9 and 13 are significantly different).

To date, this trial supports the language that will be included in the Federal IFA Quarantine; two applications of fipronil granular at a rate of 0.0125 lb ai/acre per application, made one week apart will provide excellent control of IFA colonies within 4 weeks (4 week exposure), and maintain that control for an additional 20 weeks after control is achieved.

References Cited:

Harlan, D. P., W. A. Banks, H. L. Collins, and C. E. Stringer. 1981. Large area tests of AC217,300 bait for control of imported fire ants in Alabama, Louisiana, and Texas. Southwest. Entomol. 8: 42-45.

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

Table 1. Split broadcast fipronil

Treatment	Mean no. colonies/acre - pretreat	% decrease in no. pretreat colonies at indicated wks. after treatment							
		-2-	-3-	-5-	-9-	-13-	-17-	-23-	
Fipronil + Fipronil	34.7	97.6a	100.0a	100.0a	100.0a	100.0a	100.0a	100.0a	
Check	38.7	22.1b	17.1b	34.6b	43.3a	51.7a	59.6b	64.2b	

t-test (P=0.05) means within a column followed by the same letter are not significantly different

Table 2. Split broadcast fipronil

Treatment	Mean pop. index/acre - pretreat	% change in pretreat population indices at indicated wks. after treatment							
		-2-	-3-	-5-	-9-	-13-	-17-	-23-	
Fipronil + Fipronil	493.3	-99.7a	-100.0a	-100.0a	-100.0a	-100.0a	-100.0a	-100.0a	
Check	500.0	4.0b	-6.3b	-9.1b	-29.8a	-42.8a	-52.4b	-59.9b	

t-test (P=0.05) means within a column followed by the same letter are not significantly different

PROJECT NO: GPPS00-06

PROJECT TITLE: Evaluation of Talstar™ and Fipronil Insecticides For Control of Imported Fire Ants in Turf Grass, 2000

TYPE REPORT: Final

LEADERS/PARTICIPANTS: Homer Collins, Anne-Marie Callcott, Lee McAnally, Tim Lockley, and Shannon Wade

INTRODUCTION:

Talstar (bifenthrin), in both granular and liquid formulations, have been evaluated by this laboratory for control of IFA in grass sod. Results with the granular formulation has been somewhat variable (FA01G063, FA01G066, FA01G028), but excellent control was obtained in two trials with the flowable formulation (FA01G065, FA01G066). Fipronil granular insecticide has been shown to be very effective against IFA in grass sod, and was used as a standard in this trial.

MATERIALS AND METHODS:

The test site was located at the Slidell Municipal airport in Slidell, LA. Test plots were one acre in size, with a ¼ acre efficacy subplot located in the center of the test plots. Originally, several rates of application were to be tested using the bifenthrin granular and liquid formulations. However, due to the amount of material received, the following rates were used. Granular formulations of 0.1G fipronil (0.025 lb ai/acre) and 0.2G bifenthrin (0.4 lb ai/acre) were applied on June 28, 2000 with a Herd® granular applicator mounted on an ATV. Two rates of liquid bifenthrin (0.2 lb ai/acre and 0.4 lb ai/acre) were applied with a roller pump boom sprayer equipped with five TKSS tips with provided a 10 ft. swath. The system was operated at 50 psi providing 25 gallons of finished spray per acre. Prior to treatment and at 6 week intervals thereafter, evaluations of IFA populations were made in each ¼ acre efficacy subplot using the procedures described by Lofgren and Williams (1982) and Collins and Callcott (1995). Differences in treatment means were separated by a LSD test (P=0.05).

RESULTS:

Six weeks after treatment, all rates provided >96% control of imported fire ants (Tables 1 & 2) and were statistically similar. Granular fipronil and bifenthrin both provided 100% control. Although all treatments were statisti nular fipronil maintained 100% control. The granular bifenthrin treatment provided ca. 80% control, with the liquid treatments providing >92% control (Tables 1 & 2). Counts were delayed due to unseasonable cool weather. At 22 weeks after treatment, all treatments were providing significantly better control than the untreated control, and were not significantly different from each. However, only the fipronil and the high rate of the flowable bifenthrin provided better than 87% control. All other treatments were becoming reinfested as evidenced by numerous

small, incipient colonies. The low rate flowable treatment was dropped at this time. At 33 weeks, after a cold winter, fipronil and the high flowable bifenthrin rate were back at 100% efficacy and remained at very effective through 46 weeks. The granular bifenthrin was back to >85% efficacy at 33 weeks, but 2 of these plots had a lot of standing water on them at the time of the count. By 40 weeks, the granular bifenthrin plots were becoming reinfested with IFA, as evidenced by the decrease in efficacy to >70%.

As seen in other trials, granular bifenthrin only provides a short term activity against IFA in situations where consistent irrigation is not present. Flowable bifenthrin is more effective and long lived, especially at the 0.4 lb ai/acre rate of application. Granular fipronil, applied at 0.025 lb ai/acre provides season long control of IFA in grass sod.

REFERENCES CITED

Collins, H. L. and A.-M. A. Callcott. d
imported fire ant (Hymenoptera: Formicidae) control. J. Entomol. Sci. 30: 489-496.

Lofgren, C. S. and D. F. Williams. 1982. Avermectin B_1a, a highly potent inhibitor of
Econ. Entomol. 75: 798-803.

Table 1. Efficacy of Talstar grass sod treatments - Decrease in colony numbers.

Treatment	Mean no. colonies/acre - pretreat	% decrease in no. pretreat colonies at indicated wks. after treatment						
		-6-	-12-	-22-	-33-	-40-	-46-	-55-
Talstar G - 0.4 lb ai/acre	32.0	100.0a	80.0a	63.9a	87.8a	66.9a	--	--
Talstar F - 0.2 lb ai/acre	36.0	96.3a	92.2a	49.9ab	--	--	--	--
Talstar F - 0.4 lb ai/acre	34.7	97.4a	95.2a	87.9a	100.0b	100.0b	97.4a	75.8a
Fipronil	41.3	100.0a	100.0a	91.7a	100.0b	100.0b	100.0a	100.0a
Check	38.7	23.7b	23.7b	6.7b	0.0c	3.3c	10.4b	68.5a

LSD test (P=0.05) means within a column followed by the same letter are not significantly different

Table 2. Efficacy of Talstar grass sod treatments - Change in population indices.

Treatment	Mean pop. index/acre - pretreat	% decrease in pretreat population indices at indicated wks. after treatment						
		-6-	-12-	-22-	-33-	-40-	-46-	-55-
Talstar G - 0.4 lb ai/acre	450.7	-100.0a	-82.8a	-59.6a	-85.3a	-67.0a	--	--
Talstar F - 0.2 lb ai/acre	473.3	-97.1a	-97.0a	-48.8a	--	--	--	--
Talstar F - 0.4 lb ai/acre	533.3	-99.7a	-95.5a	-90.7a	-100.0a	-100.0a	-97.4a	-79.7a
Fipronil	586.7	-100.0a	-100.0a	-98.6a	-100.0a	-100.0a	-100.0a	-100.0a
Check	580.0	-20.1b	-7.5b	24.6b	6.3b	29.8b	3.2b	-72.9a

LSD test (P=0.05) means within a column followed by the same letter are not significantly different

PROJECT NO: GPPS01-04

PROJECT TITLE: Evaluation of Talstar™ For Control of Imported Fire Ants in Turf Grass, 2001

TYPE REPORT: Interim

LEADERS/PARTICIPANTS: Anne-Marie Callcott, Lee McAnally, Tim Lockley, Shannon Wade and Chris Doxey

INTRODUCTION:

Talstar (bifenthrin), in both granular and liquid formulations, have been evaluated by this laboratory for control of IFA in grass sod. Results with the granular formulation has been somewhat variable (FA01G063, FA01G066, FA01G028), but excellent control was obtained in several trials with the flowable formulation (FA01G065, FA01G066, GPPS00-06).

MATERIALS AND METHODS:

The test site was located at the Slidell Municipal airport in Slidell, LA. Test plots were one acre in size, with a ¼ acre efficacy subplot located in the center of the test plots. Liquid bifenthrin were applied with a roller pump boom sprayer equipped with five TKSS tips with provided a 10 ft. swath. The system was operated at 50 psi providing 38 gallons of finished spray per acre. Rates of application included a 0.1 lb ai/acre dual application (0.1 lb ai/acre applied twice, one week apart), and single applications of 0.2 and 0.4 lb ai/acre. The first of the dual applications was made on May 17, 2001. The second dual application and the single applications were made on May 21 and 22, 2001. Prior to treatment and at 1, 2, and 4 weeks after treatment evaluations of IFA populations were made in each ¼ acre efficacy subplot using the procedures described by Lofgren and Williams (1982) and Collins and Callcott (1995). Evaluations were made at 4 week intervals thereafter. Differences in treatment means were separated by a LSD test (P=0.05).

RESULTS:

In the 6-8 weeks prior to our treatment and continuing into the first evaluation, the treatment site had not received much rainfall (if any). At one week after treatment, there were decreases in colony numbers and population indi
than the untreated check (Table 1 and 2).

Due to the rains of Tropical Storm Allison June 6-11, 2001, we were not able to perform a 2 or 3 week evaluation. During this time the treatment site received more than 18 inches of rainfall.

At 4 weeks after treatment, all treatments provided >90% control, with the split application and the high single application providing the best numerical control. By 8 weeks, the split application and the high single rate still provided the best numerical control with 97-100% control of IFA in grass sod. High control mortality was noted at 8 weeks. This is not unusual

for south Mississippi during late July and August, which are usually very hot and dry. Prior to the 13 week evaluation, the site had +15.0 inches of rainfall, mostly during the 2 weeks prior to the evaluation. At that time, all treatments were significantly better than the check. However, only the 0.4 lb/acre rate provided 100% control. The two lower rates provided similar numerical control at ca. 90%. At 17 weeks, some reinfestation was noted on the two lower rates of application, while the 0.4 lb ai/acre rate maintained 100% control. At 20 weeks, reinfestation of the two low rates continued and evaluations of these plots was discontinued. The 0.4 lb ai/acre rate continued to provide good control through 33 weeks. Evaluation of this treatment will continue.

Recommendation:

Current labelled rates for treatment of IFA on sod farms is 0.2 lb ai/acre. Unfortunately, this rate of application does not provide consistent rates of mortality or effective residual activity adequate for regulatory/quarantine use. The 0.4 lb ai/acre rate is much more consistent, faster acting and provides an effective residual activity. In discussions with the company, they are reluctant to increase the label rate of application, but are interesting in developing an acceptable quarantine treatment for IFA on grass sod. In the past, this laboratory did one trial in which Talstar liquid was applied at a rate of 0.2 lb ai/acre per application, with two applications one week apart. In that trial (FA01G066), 100% control was achieved by 12 weeks after treatment, and maintained through 28 weeks (trial terminated due to harvest). Therefore, in 2002, we propose to initiate trials at two to three locations in the southern Mississippi area, that re-evaluate the efficacy of the multiple treatments of Talstar liquid applied at 0.2 lb ai/acre per application, with two applications being made approximately one week apart.

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Econ. Entomol. 75: 798-803.

Table 1. Efficacy of Talstar grass sod treatments - Decrease in colony numbers.

Treatment: lb ai/ acre	Mean no. col./acre - pretreat	% decrease in no. pretreat colonies at indicated wks. after treatment								
		-1-	-4-	-8-	-13-	-17-	-20-	-24*-	-33-	-39-
Talstar F: 0.1+0.1	54.7	53.0a	94.3a	100.0a	90.0a	84.3a	64.3ab	--	--	
Talstar F: 0.2	57.3	36.4a	90.7a	87.2a	90.3a	86.1a	47.3ab	--	--	
Talstar F: 0.4	57.3	59.7a	97.2a	97.2a	100.0a	100.0a	97.2a	92.8a	95.0a	
Check	34.7	33.3a	45.0b	65.0b	52.5b	41.7b	12.5b	8.3b	53.3b	

LSD test (P=0.05); means within a column followed by the same letter are not significantly different

* t-test (P=0.05) from this point on

Table 2. Efficacy of Talstar grass sod treatments - Change in population indices.

Treatment: lb ai/ acre	Mean pop. index/ acre - pretreat	% decrease in pretreat population indices at indicated wks. after treatment								
		-1-	-4-	-8-	-13-	-17-	-21-	-24*-	-33-	-39-
Talstar F: 0.1+0.1	960.0	-62.8a	-99.2a	-100.0a	-91.4a	-86.4a	-71.4ab	--	--	
Talstar F: 0.2	946.7	-43.5a	-99.5a	-90.3a	-91.6a	-86.1a	-64.2ab	--	--	
Talstar F: 0.4	966.7	-63.6a	-96.2a	-97.3a	-100.0a	-100.0a	-97.6a	-95.0a	-95.0a	
Check	593.3	-43.1a	-52.3b	-67.9b	-58.8b	-44.2b	-27.6b	-20.9b	-61.1b	

LSD test (P=0.05); means within a column followed by the same letter are not significantly different

* t-test (P=0.05) from this point on

PROJECT NO: GPPS01-05

PROJECT TITLE: Evaluation of Various Chemical and Physical Barriers to Preclude Invasion of
Rolled Hay Bales Stored in the Field

TYPE REPORT: Interim

LEADER/PARTICIPANTS: Timothy C. Lockley

INTRODUCTION:

One of the products currently listed under federal quarantine as a possible vector for shipment of imported fire ants is baled hay and straw. No economically viable methods exist to treat bales exposed to fire ant invasion and currently only baled hay and straw not stored in direct contact with the ground may be moved.

MATERIALS AND METHODS:

Evaluations of potential barriers to fire ant movement into rolled hay bales were made at the White Sands farm of the Mississippi Agriculture and Forestry Experiment Station in Pearl River County. Experiment 1 began on 21 May, 2001 and continued through September of that year. Rolled bales of hay were placed ca. 7 m apart on a grid pattern in a 2.25 ha field actively infested with monogyne colonies of the red imported fire ant, *Solenopsis invicta* Buren. Materials tested consisted of :

- an impermeable 4 mil black plastic ground cover
- a permeable black ground cover
- a permeable white ground cover
- Amdro fire ant bait (hydramethylon)
- Distance fire ant bait (pyriproxyfen)
- Fipronil 0.1G
- Bifenthrin 0.2G

Three replicates of each candidate plus a check were set up in a randomized block. Ground covers were cut into ca. 5 m squares and secured to the ground with anchoring staples. Bales were placed in the center of each ground cover. Chemical and bait treatments were broadcast in a ca. 2 m band around the base of each bale. Examinations of each bale for the presence of fire ant colonies was made each month.

A second experiment was begun on 18 September, 2001. Chemical and bait treatments followed the protocol described in Experiment 1. Ground covers were cut into rectangles ca. 10 m x 5 m. Two bales were placed in the center of the cloth and the edges of the permeable ground cloth were folded upward and stapled to the sides of the bales to form a “diaper”. The impermeable plastic ground cloth was fastened to the ground as described in Experiment 1.

RESULTS:

The outcomes of both experiments are inconclusive (Tables 1 & 2). In experiment 1, the remnants of a tropical storm brought over 7 inches of rain to the site within 36 hours of the beginning of the trial. It is likely that the fipronil and bifinthrin applications were washed out and that flooding of the field could have "floated" colonies over the ground cloth barriers. In experiment 2, bifenthrin and the impermeable ground cover showed complete exclusion of fire ant colonies. However, it must be noted that no colonies were found in any of the untreated checks.

Table 1. Efficacy of various physical and chemical barriers to exclude imported fire ant colonies from rolled hay bales.

	No. infested bales/reps at indicated mths PT			
Candidate	(2)	(3)	(4)	(5)
Plastic impermeable	3	3	3	2
Black porous	2	3	2	2
White porous	2	3	2	1
Amdro	2	2	2	3
Distance	1	1	0	1
Fipronil	2	2	2	2
Bifenthrin	1	1	1	1
Check	3	3	3	2

Note: within 36 hours of initiation of experiment 1, 7.2 inches of precipitation occurred at the site.

Table 2: Efficacy of various physical and chemical barriers to exclude imported fire ant colonies from rolled hay bales.

	No. infested bales/reps at indicated mths PT		
Candidate	(2)	(3)	(4)
Plastic impermeable	0	0	0
Black porous	2	1	2
White porous	2	1	2
Amdro	1	1	1
Fipronil	1	1	1
Bifenthrin	0	0	0
Check	0	0	0

PROJECT NO: GPPS01-06

PROJECT TITLE: Control of Fire Ants with Baits Formulated on Tast-E-Bait™ Carrier

TYPE REPORT: Final

LEADER/PARTICIPANTS: Anne-Marie Callcott, Lee McAnally, Tim Lockley, Shannon Wade,
Chris Doxey and David St. Louis (MAFES)

INTRODUCTION:

At the current time most commercial fire ant baits are formulated on the same inert carrier. This carrier is a corn based product known as pregelled corn and is produced by a sole source (Illinois Cereals Mills, Paris, IL). If for any reason that source is eliminated, alternate bait carriers are not available. The first successful bait toxicant for use against fire ants was mirex, which was formulated with corn cob grit as the inert carrier (Lofgren et al. 1963). Banks et al. (1981) reported that efficacy of hydramethylnon
superior to baits formulated with corncob grit carrier. Superior performance of hydramethylnon formulated on the more friable and absorbent extruded corn pellets led to registration of Amdro® in 1980. Almost all other baits that have been commercialized are formulated on the pregelled corn carrier.

Tast-E-Bait™ (Advanced Organics, Upper Sandusky, OH) is under development as a potential
Tast-E-Bait is derived from bakery waste and contains ca. 11.3% protein, 10.4% fat, and 62.7% sugars and starches (Source: Advanced Organics).

Collins and Callcott (2000) conducted a series of laboratory tests with Tast-E-Bait and concluded that it could potentially be used as an inert carrier for fire ant bait toxicants and insect growth regulators.

MATERIALS AND METHODS:

Aventis Crop Science (RTP, NC) provided us with fipronil formulated at 1.5 ppm on Tast-E-Bait. Invicta Ltd. (Ridgeland, SC) submitted two bait formulations on Tast-E-Bait designated as Fire Ant Bait #496-1 and Fire Ant Bait #496-2 . The ai for 491 and 492 was not specified. FMC (Philadelphia, PA) provided a 0.2% ai bifenthrin bait (SPG01-027) on Tast-E-Bait.

The test site was located at the Mississippi Agricultural and Forestry Experiment Station (MAFES) near Poplarville, Mississippi. Invicta and FMC baits were applied on May 15, 2001 with air temperature at 87°F and soil temperature at 80°F. The Aventis baits were applied on May 23, 2001 with air temperature at 75°F and soil temperature at 70°F. All bait formulations were applied with a shop-built granular applicator mounted on a farm tractor. The equipment provided a 21' swath and was operated at 4 mph. Each time a different formulation was applied

the equipment was re-calibrated to deliver 1.5 lbs of bait per acre or 15 lbs of bait per acre (only the fipronil was applied at this rate). There were three replicates per treatment, and all test plots were 1.0 acre in size. A ¼-acre circular efficacy plot was established in the center of each 1.0 acre test plot. Prior to bait application and at 4 week intervals, IFA populations in each efficacy plot were evaluated using the population index system developed by Harlan et al. (1981), and later revised by Lofgren and Williams (1982). Using this data, both colony mortality and decrease in pretreatment population indices were calculated. Experimental data were statistically analyzed using analysis of variance, and treatment means were separated using the LSD test (P=0.05) for each posttreatment rating interval.

RESULTS:

The Invicta baits produced some bridging problems in application, and thus applications were less than the expected 1.5 lb/acre. ion was shared with Invicta). Despite accurate calibration, the 15 lb/acre rate of the Aventis bait flowed faster as it was applied, resulting in a slight overapplication. South Mississippi experienced drought conditions during the spring of 2001. The Poplarville site did receive some rainfall prior to the trial, but was still under very dry conditions. Significant rainfall did not occur until just prior to the first evaluation during which time Tropical Storm Allison produced heavy rains exceeding 8 inches of rainfall (June 9-11).

The fipronil 15.0 lb/acre rate provided excellent control less than 4 weeks after application (Tables 1 & 2). By 8 weeks after treatment, both fipronil treatments and the Invicta 496-1 provided >82% colony mortality and >90% decrease in population indices. Invicta 496-2 had also reduced population indices by >90%, but colony mortality was only 64%. However, the large decrease in population indices indicated that the remaining colonies in this treatment group were not healthy. At 12 weeks, the fipronil baits and the Invicta 496-2 were still providing >85% decrease in both colony numbers and population indices. The bifenthrin bait was not significantly different than the untreated control at any evaluation period. By 17 weeks after treatment, all treatments were becoming reinfested with small incipient colonies and the trial was terminated.

The results with the fipronil baits were similar to results of baits formulated on the traditional pregelled corn grit carrier. Most commerically available baits require 4-8 weeks to achieve maximum efficacy of 80-90% control and reinfestation is usually noted within 16-20 weeks after treatment. The Invicta baits were fairly effective but not as consistent as last year's formulation on Tast-E-Bait, possibly due to the application problems we had noted earlier.

Acknowledgments: We thank David I. B. Vander Hooven (Advanced Organics) for his many helpful suggestions and comments.

Treatment	Mean no. colonies/acre - pretreat	% decrease in no. pretreat colonies at indicated wks. after treatment			
		-4-	-8-	-12-	-17-
Fipronil 1.5 lb/acre	101.3	4.8a	85.3ab	87.0ab	63.5ab
Fipronil 15 lb/acre	134.7	90.9b	94.9a	98.4a	86.9a
Invicta 496-1	48.0	11.9a	82.2ab	61.4ab	59.2ab
Invicta 496-2	48.0	11.3a	64.7abc	56.2bc	62.0ab
Bifenthrin	44.0	8.4a	52.7bc	11.9d	8.4b
Check	60.0	9.4a	43.6c	20.6cd	57.5ab

LSD test (P=0.05) means within a column followed by the same letter are not significantly different

Table 2. Taste-Bait treatments - Change in population indices.

Treatment	Mean pop. index/acre - pretreat	% change in pretreat population indices at indicated wks. after treatment			
		-4-	-8-	-12-	-17-
Fipronil 1.5 lb/acre	1500.0	-37.3ad	-90.8a	-91.9a	-69.4a
Fipronil 15 lb/acre	2006.7	-95.1b	-99.3a	-99.2a	-90.1a
Invicta 496-1	773.3	-56.3ac	-92.9a	-71.9a	-60.2ab
Invicta 496-2	746.7	-78.5bc	-94.4a	-88.6a	-70.1a
Bifenthrin	753.3	-48.9ac	-59.0b	-9.5b	-4.0c
Check	1100.0	-16.7d	-49.1b	-9.7b	-12.8bc

LSD test (P=0.05) means within a column followed by the same letter are not significantly different

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PROJECT NO: GPPS00-11

PROJECT TITLE: Mississippi Phorid Fly Release Project - 2000

TYPE REPORT: Interim

LEADER/PARTICIPANTS: Timothy Lockley; Sanford Porter (USDA, ARS)

INTRODUCTION:

Pseudacteon species are endoparasites of *Solenopsis* species and are widely distributed throughout the fire ant range in their natural habitats. These phorid flies have a potential to suppress fire ant populations if they can become established in North America. To determine their ability to acclimatize, these phorids were released in the spring of 2000 in Harrison County, MS.

MATERIALS AND METHODS:

Harrison County Work Farm were selected for the study. The sites were ca. 20 km apart. Each site had similar habitats at the time of release; consisting of grassland with deciduous woods and large ponds adjacent. Both the release site and the control site had ca. 100 active monogyne colonies of IFA per ha. Recently emerged adult flies of *Pseudacteon tricuspis*, supplied by S. Porterm were released daily, per the protocol provided by S. Porter, at the Saucier site beginning on 11 April, 2000 with the final release occurring on 20 April. A total of 2612 phorids were released on 45 separate imported fire ant colonies.

RESULTS:

The first survey was completed in July, 2000, 3 months after release. Phorids were observed at each of five excavated mounds within the immediate confines of the release site. No flies were observed outside of the field. Another survey accomplished in October, 2000 again revealed the presence of phorids within the release field but none were found outside of the site.

In April 2001, one year after release, flies were seen ca. 200 m from the initial point of release. The release site was converted from cattle-grazed pastureland to a pine tree farm in 2001 and no successful surveys could be conducted at the survey site in the fall of 2001. A search of the phorids. In October 2001, phorids

PROJECT NO: FA02G049

PROJECT TITLE: Evaluation of Field Releases of *Thelohania solenopsae*, 1999

TYPE REPORT: Interim

LEADER/PARTICIPANTS: Anne-Marie Callcott, Homer Collins, Shannon Wade, Lee McAnally, Avel Ladner and Tim Lockley

COOPERATORS: Drs. David Williams and David Oi, USDA, ARS, CMAVE, Gainesville, FL

INTRODUCTION:

The microsporidium *Thelohania solenopsae* (Microsporidia: Thelohaniidae) was discovered in Brazil in the red imported fire ant (Knell et al. 1977). Since that time, USDA, ARS, CMAVE personnel in Argentina have also discovered the pathogen in the black imported fire ant in that country and have determined that the pathogen does decrease colonies and colony vigor and therefore may be a good candidate for use as a biological control agent in the United States (Briano et al. 1995a, 1995b, 1996). In 1998, we initiated a trial releasing the microsporidium in Harrison and Hancock counties, MS (FA02G048). We lost our polygyne site prematurely, and had poor results with the monogyne

MATERIALS AND METHODS:

In October, 1999 we assisted ARS with the initiation of a trial to evaluate field releases of the pathogen *Thelohania solenopsae*. Two sites, one polygyne in Hancock Co. and one monogyne in Harrison Co., were selected for the inoculation and four plots set up at each site. At the polygyne site, circular test plot evaluation areas were 1/16 acre in size due to the large number of mounds in the area. Two plots were used as inoculation plots and two were maintained as non-inoculated control plots. On October 19, 1999 nine mounds in each of the inoculation plots were inoculated with 3.5g of brood infected with *T. solenopsae* (field collected by ARS prior to study). At the monogyne site, circular tes
Inoculations were also made on October 19 to nine mounds in each of two test plots. Every two months we monitor the inoculated plots and corresponding non-inoculated control plots by evaluating mounds with the mound index system, geo-referencing each mound within the plots, and collecting worker samples from each mound within the plots. We also assist by microscopically examining collected workers for pathogen spores.

RESULTS:

Colony mortality
Due to the holidays, our first evaluation was done at 12 weeks after inoculation. At the 12 week evaluation, small decreases in number of colonies present in both the monogyne and polygyne site were seen (Table 1). Since decreases also occurred in the control plots, these decreases probably cannot, at this time, be attri

were more significant, particularly in the monogyne site. However, these decreases were mainly due to many colonies not hav
production slows down in the winter months). In the monogyne site, the control plots have, on
weeks (11 months), while the
inoculated plots have shown decreases in both (Tables 1 & 2). These monogyne plots were lost after this evaluation due to pasture improvements.

The polygyne site has shown fluctuations in both colony numbers and population indices over the 109 weeks (2 years) of the trial. However, at 49 weeks, both inoculated and control plots showed significant decreases in colony numbers and population indices. These changes in populations appear to be more related to climate than the pathogen. Populations the following spring, at 76 weeks, were similar to pretreatment populations. The summer of 2001 again showed decreases in both inoculated and control plots. The extremely hot, dry summers either depleted populations or we could not detect the ants due to the weather (ants down deep in the ground for cool, moist conditions). By fall 2001, 109 weeks (2 years) after inoculation, the inoculated plots showed significant numerical decreases in colony numbers and population indices compared to the control plots, possibly showing some long term effects of the pathogen. With only two replicates, statistical analysis is suspect, and therefore was not done.

Presence of pathogen
Pretreatment samples were examined and no spores were detected at either site. At 12 weeks after inoculation (January 2000), 2 mounds in one of the polygyne inoculated plots were positive for spores. At 20 weeks, 3 mounds in one polygyne inoculated plot had spores present, and a few spores were detected 2 mounds in a control plot on the polygyne site. Samples after 20 weeks have not been examined. No spores were detected in the monogyne site through 20 weeks. The monogyne site was lost to pasture improvements after the 49 week evaluation. The polygyne site will continue to be monitored.

All data generated by this trial will be compiled and reported on in full by the USDA, ARS, CMAVE cooperators in Gainesville,
geographical locations and will be responsible for data summary and publication.

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Table 1. Change in colony numbers of *Thelohania solenopsae* inoculated sites - inoculated October, 1999.

Type of Site	Treatment	Mean no. colonies/ acre - pretreat	Mean % change in number of colonies at indicated weeks after inoculation										
			-12- (Jan)	-20- (Mar)	-28- (May)	-36- (Jun/Jul)	-49- (Sept)	-76- (Apr)	-84- (May)	-92- (Jul)	-100- (Sept)	-109- (Nov)	
Monogyne	Inoculated	66	-5.5	-2.8	-2.6	-17.7	-27.4	--	--	--	--	--	
	Control	34	40.0	42.9	57.2	5.0	55.0	--	--	--	--	--	
Polygyne	Inoculated	304	-12.8	-2.5	8.1	-12.5	-66.1	10.5	-42.5	-55.3	-42.1	-47.4	
	Control	336	-17.9	-8.0	-12.9	-40.6	-43.4	5.7	-21.7	-38.1	-23.8	-9.5	

Table 2. Change in population indices of *Thelohania solenopsae* inoculated sites - inoculated October, 1999.

Type of Site	Treatment	Mean pop. index/acre - pretreat	Mean % change in population indices at indicated weeks (month of year) after inoculation										
			-12- (Jan)	-20- (Mar)	-28- (May)	-36- (Jun/Jul)	-49- (Sept)	-76- (Apr)	-84- (May)	-92- (Jul)	-100- (Sept)	-109- (Nov)	
Monogyne	Inoculated	1,160	-53.7	-7.6	0.4	-36.5	-32.5	--	--	--	--	--	
	Control	590	-13.5	50.0	65.8	-0.1	30.9	--	--	--	--	--	
Polygyne	Inoculated	4,440	-28.9	-5.9	2.3	-32.9	-76.1	-5.7	-69.4	-62.2	-56.8	-52.3	
	Control	4,800	-17.3	-10.4	-0.7	-50.7	-54.9	4.2	-30.6	-47.5	-30.8	-10.0	

APPENDIX I - LABORATORY BIOASSAY PROCEDURE

PROTOCOL FOR BIOASSAY OF INSECTICIDE TREATED POTTING MEDIA WITH ALATE IFA QUEENS

Introduction: The development of quarantine treatments to prevent artificial spread of imported fire ants (IFA) in nursery stock requires the evaluation of candidate pesticides, dose rates, formulations, etc. The use of a laboratory bioassay procedure for these evaluations provides a rapid and inexpensive means of evaluating the numerous candidates tested each year. Various bioassay procedures have been devised over the years, but the procedure currently used by the USDA, APHIS Imported Fire Ant Laboratory in Gulfport, Mississippi, is described herein. This procedure is a slight modification of the test described by Banks et al., 1964 (J. Econ. Entomol. 57: 298-299).

Collection of test insects: Field collected alate imported fire ant queens are used as the test insect. IFA colonies are opened with a spade and given a cursory examination for the presence of this life stage. Alate queens are seldom, if ever, present in all IFA colonies in a given area. Some colonies will contain only males, others may have few or no reproductive forms present, others may contain both males and queens, while some will contain only alate queens. Seasonal differences in the abundance of queens is quite evident; in the warmer months of the year 50% or more of the colonies in a given area may contain queens. However, in the cooler months, it is not uncommon to find that less that 10% of the colonies checked will contain an abundance of alate queens. Therefore, it is necessary to examine numerous colonies, selecting only those which contain large numbers of alate
cluster near the surface of the mound facing the sun. Collection during midday on bright, sunny days is highly recommended for winter; whereas the cooler time of day is recommended for hot, dry days of summer. Once a colony (or colonies) has been selected for collection, the entire nest tumulus is shovelled into a 3-5 gallon pail. Pails should be given a liberal dusting with talcum powder on the interior sides to prevent the ants from climbing up the sides of the pail and escaping. Approximately 3-6" head room should be left to prevent escape. An effort should be made to collect as many ants as possible while minimizing the collection of adjacent soil which will contain few ants. Collected colonies are then transported to the laboratory for a 3-5 day acclimation period. The addition of food or water during this short acclimation period is not necessary. Alate queens are collected with forceps after placing a 1-2 liter aliquot of the nest tumulus in a shallow laboratory pan. Again, the use of talc on the sides of containers prevents escape while talced rubber gloves minimizes the number of stings experienced by the collector. The forceps should be used to grasp the queens by the wings in order to prevent mechanical injury. An experienced collector can collect 2-300 queens per hour. It is generally advisable to place collected queens in a 500 cc beaker or other suitable vessel containing moist paper towels prior to being introduced into the test chamber.

Test chambers: Test chambers are 2.5" x 2.5" plastic flower pots which have been equipped with a labstone bottom. Labstone
Patterson Dental Co., 2323 Edenborn Ave., Metairie, Louisiana. The labstone bottom prevents the queens from escaping through the drain holes in the bottom of the pot and also serves as a

wick to absorb moisture from an underlying bed of wet peat moss (see Figure 1). Ants are susceptible to desiccation so humidity/moisture levels must be optimized. Pots should be soaked in water to moisten the labstone prior to placing potting media in the pots. Plastic petri dishes are inverted over the tops of the pots to prevent escape from the top of the test chambers. Prior to placing queens in the test chamber, 50 cc of treated potting media is placed in the bottom of each pot. Due to possible pesticide contamination, test chambers are discarded after use.

Replicates: Each treatment to be evaluated is subdivided into 4 replicates; with one test chamber per replicate. Five alate queens are then introduced into each replicate.

Test interval: All evaluations are based on a 7 day continuous exposure period. i.e., introduced queens remain in the test chambers for 7 days. At this time the contents of each chamber are expelled into a shallow laboratory pan and closely searched for the presence of live IFA alate queens.

Recording of data: Results of each bioassay are entered on the attached data form. Conclusions regarding efficacy and residual activity of the candidate treatments are drawn from this raw data.

Time estimates: The time required to conduct a bioassay will vary greatly, dependent upon a number of factors:

1) Availability of queens; supply is primarily influenced by season. More time will be

2) Number of treatments to be evaluated; e.g., if only a single treatment and an untreated check are to be evaluated only 40 queens/month are needed. Conversely, a test involving 4 insecticides at 3 rates of application (12 treatments + untreated check)

Duration of the trial: A successful preplant incorporated treatment for nursery potting soil must provide a minimum of 12-18 months residual activity in order to conform with normal agronomic practices of the nursery industry. Since some plants may be held for longer periods of time prior to sale, a 24-36 month certification period (residual activity) would be ideal. Therefore, most initial or preliminary trials with a given candidate treatment are scheduled for 18 months.