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Addendum: Evaluation of Alternative Fipronil Use Scenarios: Modeling Results, Runoff Trials, and Product Efficacy

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1.0 Introduction

The report is an addendum to the initial Department of Pesticide Regulation's (DPR) Surface Water Protection Program (SWPP) fipronil data analysis report dated February 16, 2016 (Budd and Luo, 2016). The initial report highlighted 1) fipronil monitoring data from urban runoff and receiving water bodies and 2) modeling results for several alternative fipronil outdoor-use scenarios.

Early modeling results of alternative use scenarios demonstrated potential reductions in fipronil runoff concentrations compared to the baseline label-use scenario of the two outdoor-use products – Termidor® SC and Taurus® SC Termiticide/Insecticide. This addendum contains an evaluation of additional fipronil use scenarios, their model-predicted and field-trial runoff concentrations, and efficacy data on ant control.

2.0 Modeling results for proposed application scenarios

Since the previous report of DPR modeling efforts on fipronil uses (Budd and Luo, 2016), DPR has considered additional alternative fipronil application scenarios and collected more data to better characterize California urban conditions. This section summarizes modeling simulations conducted after the completion of the previous report.

After discussions with BASF and Control Solutions, Inc., Dr. Les Greenberg of UC Riverside, and two pest control operator (PCO) companies, DPR compiled potential fipronil application scenarios (Table 1) that could help guide field runoff and efficacy trails. In addition to the use practices considered previously (i.e., exclusion of applications to the garage door and driveway interface, and reduced application swath), reducing the product dilution from the current California rate of 0.06% to 0.03% is also incorporated into some of the new scenarios. In Table 1, both application swath and associated application rate are

presented in defining the scenarios. It is recognized in this addendum that a reduction of the application swath or bandwidth does not necessarily result in proportionally reduced applied mass (e.g., pin stream applications may be associated with either six times (6x) or twelve times (12x) the baseline label application rate), while this linear relationship between the application swath and mass was assumed in the full report for fipronil modeling (Budd and Luo, 2016).

The same modeling approaches as documented in the previous report are applied here to estimate the effects of application scenarios on fipronil runoff under California residential conditions. Modeling results are reported as percent reductions (Table 1) by comparing the 1-in-10-year estimated environmental concentration (EEC) predicted for each scenario to the EEC for the baseline simulation (i.e., 0.06% dilution rate, 1' by 1' perimeter treatment all around a house). Recall that EECs represent concentrations in the U.S. EPA standard 1-hectare urban watershed pond, which is also used in the DPR California urban runoff model.

Table 1. Summary of modeling results for potential fipronil application scenarios

Run ID[1]	Dilution	Application to garage door and driveway interface		Application around house (except for garage door and driveway interface)		Number of applications per year	Minimum days between applications	Predicted reduction from baseline	
		swath (up and out) @ volume	rate[2]	swath (up and out) @ volume	rate[2]			Applied mass	Estimated environmental concentration
Baseline	0.06%	1 ft @ 2 qt	1x	1 ft @ 2 qt	1x	2			
1	0.06%			1 ft @ 2 qt	1x	1		55%	31%
2	0.06%	≤1 in[3] @ 1 qt	6x	≤1 in @ 1 qt	6x	1		75%	54%
3.1	0.06%	≤1 in @ 2 qt	12x	≤1 in @ 2 qt	12x	1		50%	8%
3.2	0.06%	≤1 in @ 2 qt	12x	1 ft @ 2 qt	1x	1		50%	8%
3.3	0.06%	≤1 in @ 1 qt	6x	1 ft @ 2 qt	1x	1		52%	20%
3.4	0.06%	≤1 in @ 1 qt	6x	6 in @ 1 qt	1x	1		75%	54%
4	0.06%			≤1 in @ 1 qt	6x	2		55%	62%
5	0.06%			1 ft @ 2 qt	1x	2		10%	24%
6	0.06%			6 in @ 1 qt	1x	2		55%	62%
A	0.06%			6 in @ 2 qt	2x	2		10%	24%
C	0.06%			≤1 in @ 2 qt	12x	2		10%	24%
D	0.06%			≤1 in @ 1 qt	6x	2		55%	62%
7	0.03%			1 ft @ 2 qt	1/2x	2		55%	62%
8	0.03%			6 in @ 1 qt	1/2x	2		77%	81%
8B	0.03%			6 in @ 1 qt	1/2x	4	60	55%	83%
8B-1	0.03%			6 in @ 1 qt	1/2x	4 (Apr.1–Oct.31)	60	55%	89%
8B-2	0.03%			6 in @ 1 qt	1/2x	4 (Mar.1–Oct.31)	60	55%	87%

[1]Run ID: ID's used are identical to the ID's used by party that originally proposed the application scenario and are not related to the ID's used in the previous report.
[2]Application rate is defined as: AI deposited per unit surface area. "1x" is for the current labels of Termidor® and Taurus® for general pest control outdoor perimeter treatment (i.e., 2 quarts of 0.06% dilution per 160 linear ft, or 0.38 kg/ha used in modeling). "6x" is the proposed rate at 6 times of the current rate, and so on.
[3]Applications with swaths denoted as ≤1 inch up and out are "pinstream applications."

2.1 Discussion of the Modeling Results

1) In all treatment scenarios including the baseline simulation, it is assumed that fipronil is not applied around openings of the house (windows and doors) unprotected from rainfall and irrigation although this use is allowed by the current labels.
2) For pin stream application, "≤1 inch" is modeled as 1 inch.
3) The minimum application interval (*i.e.*, the time between applications) is undefined in the current labels. For modeling purpose, the application interval is set as 30 days (same as that in the previous report). There is no application frequency data specific to fipronil, but survey results for residential applications (may or may not use fipronil) by PCO's show that about 50% of applications are made with a frequency of "every 6 weeks" or less, according to the Pyrethroid Working Group's (PWG) "Kline Survey Analysis" (Winchell, 2013). DPR surveys in Roseville, Folsom, and Laguna Niguel show that "weekly," "monthly," and "as necessary" frequencies combined to represent 30–60% of applications.
4) Model simulations are based on applied mass on each type of surfaces (i.e., impervious surfaces with or without dry-weather runoff; pervious surfaces with or without dry-weather runoff). So the modeling results are not sensitive to the application swath if the same amount of fipronil is applied. For example, the same reduction is predicted for the following three scenarios:
    a. Scenario 7: "1 foot" at "1/2x rate,",
    b. Scenario 4: "1 inch" at "6x rate," and
    c. Scenario 6: "6 inches" at "1x rate."
5) For these model simulations, the driveway width was set at 15 ft, as originally proposed in the urban pesticide evaluation by both USEPA and DPR (Luo, 2014). Please note that a driveway width of 25.5 ft was used in the previous modeling of fipronil runoff (Budd and Luo, 2016). The 15-ft driveway better represents the ratio of *[driveway width]:[house perimeter]* observed in California, based on Google Earth estimates of selected watersheds including those containing DPR urban monitoring sites. Since the *[driveway width]:[house perimeter]* ratio is the critical parameter in determining potential reductions of fipronil runoff by excluding applications to the driveway and garage door interface, the use of 25.5-ft driveway in the previous study may have over-predicted reductions. For the scenario "5" in Table 1, for example, the reduction is predicted to be 24% with the 15-ft driveway, but 43% with the 25.5-ft driveway in the previous study for the same scenario.

3.0 Field Trials Conducted at the University of California, Riverside

In order to evaluate modeling results, DPR contracted with the University of California (UC) Riverside to perform field trials. Fipronil application scenario field trials were conducted in 2015 and 2016 on

experimental units composed of a vertical wall connected to a horizontal pad (referred to as "constructed wall" hereafter) that are located on the university campus and on houses in the Riverside area. The constructed wall trials represent a more controlled environment while home trials have greater variability due to numerous factors unique to that setting (e.g., amount of water runoff, different siding types, driveway type, home location, homeowner influences).

3.1 Wall Runoff Trials

Twenty-four identical constructed wall units were employed to mimic sections of a house perimeter to simulate pesticide runoff from a hardscape surface. Fipronil runoff trials were conducted during the summer of 2015 (n=8) and 2016 (n=6). For each trial, fipronil was applied under one of four application scenarios. One liter of sample was collected during a simulated runoff event for analysis of fipronil and its degradates. Note that the discussion of runoff in this addendum will focus primarily on the parent fipronil compound even though it is recognized that fipronil degradates (sulfide, desulfinyl, and sulfone analogs) are present. The application scenarios tested in 2015 and 2016 are shown in Table 2.

Table 2. UC Riverside wall trial application scenarios

Application scenario ID	Year tested	Scenario description
[A] [1]	2015	Label bandwidth and rate[2]
[D]	2015	6-inch bandwidth at label rate
[C1]	2015	Pin stream[3] bandwidth at 6X[4] label rate
[A1]	2016	Label bandwidth and rate
[C2]	2016	Pin stream bandwidth at 12X label rate
[B]	2016	Pin stream bandwidth at label rate

[1]Scenario ID's used in the field trials are not related to the modeling run ID's used earlier in this report.
[2]Label application based on a rate of 2 quarts of 0.06% product applied 1 foot up and 1 foot out from the foundation over 160 linear feet (320 ft^2)
[3]Pin stream indicates ≤1 inch application up and out from the foundation
[4]Application comparisons are based on volume applied per square foot. For example, 2 quarts of product applied in a 6-inch band would be equivalent to 2X application rate compared to the label rate.

The use of the pin stream application resulted in large variability in runoff concentrations. This is highlighted in Table 3 below, which shows the reductions in fipronil and degradate concentrations using the mean and median concentration value. There were no differences in runoff concentrations for the 6-inch application compared to the label rate. At day 30, concentrations of fipronil in runoff were much lower compared to day 1 and there were no significant differences in runoff concentrations among the treatments, with the exception of the pin stream applied at the label rate (54%).

Table 3. Percent reductions in fipronil and degradate concentrations of 6"x 6" and pin stream application scenarios 1-day post treatment[2] compared to 1'x1' label rate application.

		% Reduction			
		2015 (n=8)		2016 (n=6)	
Test	Analyte	D [6"x6", Label]	C1 [Pin, 6X]	C2 [Pin, 12X]	B [Pin, Label]
Mean Concentration	Fipronil	-28	80	-2	78
	Fipronil+Degradates	-8	81	41	93
Median Concentration	Fipronil	-1	93	94	84
	Fipronil+Degradates	19	93	98	97

3.2 House Runoff and Efficacy Trials

House runoff and efficacy trials were also conducted during the summer months of 2015 and 2016. Volunteer houses located in residential neighborhoods surrounding the UC Riverside campus were subjected to selected alternative fipronil application scenarios. At 1 and 30 days post application, the garage door and driveway interface areas were washed and samples were collected and analyzed for fipronil and its degradates. Runoff was also evaluated for residual fipronil concentrations at a subset of locations prior to application. Efficacy was measured by ant population estimates using a sucrose-water consumption method (developed by Dr. Les Greenberg) throughout the duration of the studies.

In the 2015 house trials (Table 4), there were no significant differences in fipronil concentrations in runoff among the three treatments. This result was not surprising considering that fipronil applications, and therefore the deposited mass of fipronil, were essentially identical within the wash-off simulation areas (i.e., pin stream bandwidth at 6X rate in front of garage door) and other perimeter areas around the house were not subjected to washing. There were also no significant differences in the observed efficacy among the three treatments up to four weeks post application.

Table 4. UC Riverside 2015 house runoff and efficacy trial application scenarios

Application scenario ID	Year tested	Scenario description
[A]	2015	Label bandwidth and rate around perimeter, with pin stream bandwidth at 6X rate at garage door and driveway interface
[D]	2015	6-inch bandwidth at label rate around perimeter, with pin stream bandwidth at 6X rate at garage door and driveway interface
[C1]	2015	Pin stream bandwidth at 6X label rate around entire perimeter
[A1]	2016	Label bandwidth and rate around entire perimeter
[A3]	2016	Label bandwidth and rate around perimeter, with pin stream bandwidth at 12X label rate at garage door and driveway interface
[C2]	2016	Pin stream bandwidth at 12X label rate around entire perimeter
[G]	2016	Label bandwidth and rate application around perimeter, no applications made at garage door and driveway interface

In the 2016 house trials, applying a pin stream bandwidth at 12X label rate at the garage door and driveway interface resulted in high variability in fipronil concentrations in the runoff (Table 5). As a result, there were no observed reductions in median concentrations for either 2016 pin stream treatments compared to the label rate application. Restricting fipronil applications to the garage door and driveway interface resulted in a significant decrease in runoff concentrations. All application scenarios in the 2016 house trials maintained efficacy throughout the 8-week test period with no observable differences in reductions in ant populations among the treatments.

Table 5. Percent reduction in median fipronil and degradate concentrations at 1 and 30-day post application for three application scenarios compared to label rate application.

	Days Post Application	%Reduction		
		A3	C2	G
Fipronil	1	-150	-3438	88
Fipronil +Degradates	1	-173	-2881	93
Fipronil	30	1	40	35
Fipronil +Degradates	30	46	22	52

Blue = Reduction in relation to label application ; Orange = Increase in relation to label application

4.0 Comparison of House Trial Results to Model Predictions

Six different application scenarios were tested on constructed walls and/or as a house perimeter application. Table 6 summarizes DPR's model-predicted reduction in fipronil concentrations and those

observed in the UC Riverside trials. Note that predicted concentrations in Table 8 were modeled differently than those in Table 1. For Table 8, runoff generation and fipronil offsite movement were limited to testing of impervious surfaces as a constructed wall or a garage door and driveway interface to facilitate direct comparisons between the modeled and observed runoff concentrations.

Table 6. Modeled and observed percent reduction of fipronil for various application scenarios compared to label rate application (A1)

Application scenario ID	Application to vertical and horizontal impervious surfaces		Trial	Model-predicted reduction (applied mass and estimated environmental concentration)	Observed reduction fipronil concentration[1]
	swath	rate			
A1	1’	1x	All Trials	-	-
A3/C2	Pin stream	12x	2016 House	0	< -100%
C2	Pin stream	12x	2016 Wall	0	N/A[2]
C1	Pin stream	6x	2015 Wall	50%	93%
B	Pin stream	1x	2016 Wall	92%	N/A
D	6”	1x	2015 Wall	50%	-1%
G	0	0	2016 House	100%	88%

[1]Based on Day 1 runoff trial’s median concentrations.
[2]N/A = data not available

5.0 PCO Field Efficacy Trials

Two PCO companies participated in field efficacy trials in May–August, 2016. This time period corresponds to the period of highest reported argentine ant population activity in California. Both companies agreed to apply fipronil as one of three perimeter bandwidth scenarios: 1 foot, 6 inches, or pin stream (≤1 inch). All three application scenarios avoided any fipronil application to the area in front of the garage door. The applicators were, however, allowed to employ an alternative to fipronil in this area. Trials began on May 1, 2016. Applicators covering different routes were assigned one of the three scenarios and asked to maintain consistency in application techniques for the duration of the study. The effectiveness of each treatment was evaluated by the number of customer call-backs reported for each route compared to routes employing the standard label application.

Company 1, with Southern California routes, reported no noticeable change in the number of call-backs for either application scenario 2 (6") or 3 (pin stream) in comparison to application scenario 1 (1' perimeter band) (Table 7). There was also no noticeable change in call-backs in eliminating applications made to the garage door and driveway interface, as there was no observed difference in average call-backs per route before or after treatments (Table 8). Company 2, with Northern California routes, confirmed similar results (personal communications, 2016).

Table 7. Reported call-backs for Company 1 between May 1 and September 20, 2016[1].

			Reported Call-backs					
Application Scenario[2]	Houses per Route	Treatment	May	June	July	Aug	Average	Median
1	586	1'	35	40	58	76	52	52
2	334	6"	7	11	12	15	11	11
2	467	6"	18	15	26	22	20	20
3	430	Pin stream	9	13	17	11	13	13
3	469	Pin stream	9	4	4	5	6	5

[1]All routes were located in Laguna Niguel or Santa Clarita, CA.
[2]All treatments excluded fipronil application to the front of the garage door.

Table 8. Average number of call-backs experienced per treatment by Company 1 before (2015) and during (2016) scenario treatments.

Application scenario	Houses per route	Treatment	2015 (Before Treatment)	2016 (After Treatment)
1	586	1'	40	52
2	334	6"	8	11
2	467	6"	23	20
3	430	Pin stream	13	13
3	469	Pin stream	10	6

Company 2 made an interesting observation that the pin stream perimeter application generally took as long or longer to apply compared to standard 1' applications employing fan spray nozzles. This is possibly a result of the applicators' lack of confidence in using the pin stream method resulting in the

spraying of excess product within the reduced bandwidth. This hypothesis is verified by the comparison of recorded applied volumes (Table 9).

Table 9. Average volume applied per treatment (Company 2).

Area	Folsom Route		Roseville Route	
Treatment	6"	Pin	6"	Pin
# Applications	50	12	104	13
Ave. Volume (gal)/Application	0.95	0.83	0.4	0.54

6.0 Evaluation of Registrant-Submitted Efficacy Data

DPR's Pesticide Registration Branch staff located and reviewed efficacy studies submitted by fipronil registrants to support the registration of two liquid formulated fipronil products, Termidor® SC and Taurus® SC. The review identified the concentrations of fipronil that were determined to be efficacious in controlling ants (including argentine ant species). Based on the results of these studies, fipronil appears to be 100% effective in controlling a variety of ants at any of the following application rates: 0.01%, 0.05%, and 0.06% (active ingredient) when used as an outdoor perimeter spray treatment. The DPR memo detailing this analysis is attached in Appendix 1.

7.0 Conclusion

DPR modeling suggests that the reduction of fipronil concentrations in residential runoff could potentially be achieved by manipulation of the spray bandwidth, location of applications, frequency of application, and spray dilution rate. The magnitude of these predicted reductions appears to approach the level that is necessary to bring receiving water concentrations of fipronil to below the acute aquatic benchmark value.

Wall trial investigations additionally suggest that the use of pin stream application techniques may significantly reduce fipronil concentrations in runoff compared to fan spray techniques employing larger spray swaths such as 6"x6" or the standard 1'x1' bandwidth. However, house trial data from the same study showed highly variable results for pin stream applications with orders of magnitude in variability in observed concentrations. The observed variability in runoff concentrations detected during the controlled study would likely increase under real world conditions. Applicators may choose to apply a similar amount of material in a pin stream bandwidth as they would for the standard 1'x1' label application due to a lack of confidence that the same level of pest control would be maintained. Application volume data from the PCO field efficacy trials support this hypothesis.

Eliminating applications to the garage door and driveway interface led to significantly decreased runoff concentrations in house trials. Moreover, exclusion of fipronil from this critical impervious area did not show any noticeable adverse effect on efficacy. This conclusion is based on the observation that no change in argentine ant populations was detected during the house trials. Furthermore, the PCO field efficacy trials showed that there were no changes in the number of customer call-backs in application scenarios involving the exclusion of fipronil at garage door and driveway interface at the 0.06% dilution.

A review of registrant-submitted data for Termidor® SC and Taurus® SC suggests that the use of the 0.03 dilution (or even as low as 0.01%) should be efficacious for ant control. As important, modeling results show that an application scenario with the 0.03% dilution, when combined with specific use practices, could potentially bring fipronil concentrations in residential runoff down to a level that will mitigate current water quality concerns. Successful mitigation, in collaboration with fipronil registrants, should allow PCO's to continue to use this highly effective active ingredient for urban pest control.

References

Budd R. and Y. Luo, 2016. Fipronil monitoring and model scenarios. DPR (http://cdpr.ca.gov/docs/emon/pubs/analysmemos.htm)

Luo, Y., 2014. Methodology for evaluating pesticides for surface water protection III. Urban pesticide evaluation (http://cdpr.ca.gov/docs/emon/surfwtr/sw_models.htm)

Winchell, M.F., 2013. Pyrethroid Use Characteristics in Geographically Diverse Regions of the United States: Parameterization of Estimated Pyrethroid Treatment Extent and Frequency for Urban Exposure Modeling. PWG Number: PWG-ERA-02b; Doc. No. 378-1190; Study ID 279282

Appendix 1

DPR Memorandum:
Efficacy of Liquid Formulated Fipronil Termidor and Taurus Products against Ants
(Amir D. Omer, Ph.D. to Ann Prichard, dated July 12, 2016)

TO: Ann Prichard, Chief
Environmental Program Manager II
Pesticide Registration Branch
California Department of Pesticide Regulation

FROM: Amir D. Omer, Ph.D.
Senior Environmental Scientist (Specialist)
(916) 324-3555

DATE: July 12, 2016

SUBJECT: Efficacy of Liquid Formulated Fipronil Termidor and Taurus Products Against Ants

INTRODUCTION

In response to concerns regarding runoff of the active ingredient fipronil into surface waters, the California Department of Pesticide Regulation (CDPR) is in the process of developing mitigation measures to address these concerns. To that end, the Pesticide Registration Branch's Pest and Disease Protection conducted a review of in-house efficacy data submitted to support the registration of two liquid formulated fipronil products, Termidor and Taurus, against ants. The objective of this review is to identify the concentrations of fipronil at which the efficacy studies were tested and the type of study (e.g., laboratory vs. outdoor).

SUMMARY

Data Volume # 52062-0345 contains efficacy data for the active ingredient fipronil against carpenter ant. These data were submitted by Rhone-Poulenc Ag Company and Aventis Environmental Science. The studies, conducted by University researchers and a pest control operator, consist of outdoor perimeter spray treatment on residential homes in Washington State and Missouri during 1998-2000. The application rates of fipronil tested were 0.01%, 0.05%, and 0.06% (a.i.). Treatments were randomized and replicated 3-10 times. Untreated controls and standard products (Premise SC, Dursban) were included for comparison. Treatments were made at a distance of 1-3 feet away from the structure and at a height of 1-2 feet up the structure. Visual counts of ants were made 1-5 days before treatment and one day after treatment then weekly thereafter for up to 60 days. The studies demonstrated that all three application rates resulted in 100% ant control (no ants observed about, around, or within the structure) for up to 60 days after treatment. In comparison, ant infestations increased on the untreated controls by 66%.

Data Volume # 52062-0346 contains efficacy data for the active ingredient fipronil against Argentine ant, pavement ant, odorous ant, and white-footed ant. These data were submitted by Rhone-Poulenc Ag Company and Aventis Environmental Science. The studies, conducted by University researchers and pest control operators, consist of outdoor perimeter spray treatment on residential homes in Tennessee, Indiana, Florida, and Georgia during 2000-2001. The application rate of fipronil tested was 0.06% (a.i.). Treatments were randomized and replicated 3-8 times. Untreated controls and standard products (Premise SC, Dursban) were included for comparison. Treatments were made at a distance of 1-3 feet away from the structure and at a height of 1-2 feet up the structure. Ant activity was assessed by counting ants attracted to honey-baited 3 x 5-inch index cards placed within the treated zones and cards placed on the buildings 3 feet above the treated zones. Ants were counted 1-7 days before treatment and one day after treatment then weekly thereafter for up to 20 weeks. The results of these studies demonstrated that the 0.06% application rate resulted in 100% ant control (no ants observed about, around, or within the structure) across all ant species tested for up to 20 weeks after treatment. In comparison, ant infestations increased on the untreated controls by more than 200%.

Data Volume # 52062-0392 contains efficacy data for the active ingredient fipronil against thief ant, acrobat ant, and crazy ant. These data were submitted by BASF Corporation. The studies, conducted by University researchers and pest control operators, consist of outdoor perimeter spray treatment on residential homes in Texas and Nebraska during 2003-2004. The application rates of fipronil tested were 0.01%, 0.05%, and 0.06% (a.i.). Treatments were randomized and replicated 5-10 times. Untreated controls and standard products (Bifenthrin, Phantom) were included for comparison. Treatments were made at a distance of 1-3 feet away from the structure and at a height of 1-2 feet up the structure. Ant activity was assessed by counting ants attracted to 3 x 5-inches index cards baited with jelly and Vienna sausage placed near the door of the building. Ants were counted 2-7 days before treatment and one day after treatment then weekly thereafter for up to 60 days. The results of these studies demonstrated that all three application rates resulted in 100% ant control (no ants observed about, around, or within the structure) across all ant species tested for up to 60 days after treatment. In comparison, ant infestations increased on the untreated controls by 120%.

Data Volume # 52062-0392 contains efficacy data for the active ingredient fipronil against Pharaoh ant. These data were submitted by BASF Corporation. These data were developed in a laboratory using simulated barrier spray treatment by University researchers in Indiana during 2005. The application rate of fipronil tested was 0.06% (a.i.). Assays were conducted using 15 x 20-inch plastic trays contained inside 50 x 50-feet support frame. Treatments were replicated 3 times, with an average of 150-250 ants per replication. Ants were contained inside castone dishes covered with red acetate sheet to create the darkened conditions preferred by ants. Food placements of boiled egg yolk, 10% sucrose solution, peanut oil were provided and positioned on steel coil connected to the tray at a distance of 25 feet. Three 20 x 10 x 10-cm treated samples of mulch or brick were placed around the castone dishes. Untreated controls consisting of water-treated mulch and bricks were included for comparison. Ant mortality was assessed 60 days after treatment. The results of this study demonstrated that the 0.06% application rate resulted in 100% ant mortality for up to 60 days after treatment. In comparison, ant infestations increased on the untreated controls by 50%.

Data Volume # 52062-0500 contains efficacy data for the active ingredient fipronil against Argentine ant, acrobat ant, and carpenter ant. These data were submitted by BASF Corporation. These data were developed in a laboratory using direct spray or foam treatment by researchers in Georgia and California during 2011-2013. The application rate of fipronil tested was 0.005% (a.i.). Assays for Argentine ant and acrobat ant were conducted using 9- and 16-ounce cups with filter paper and a snap on lid. Assays for carpenter ant were conducted using wooden boards contained inside 31 x 23 x 10-cm plastic boxes. Treatments were replicated 4-5 times with 10-20 ants per replication. Ants were provided with moist paper towel saturated with a 10% sucrose solution as food. Untreated controls were included for comparison. Ant mortality was assessed within 24-48 hours after treatment. The results of these studies demonstrated that the 0.005% application rate resulted in 100% ant mortality within 30 minutes after treatment for the direct spray treatment and 97-100% mortality within 48 hours after treatment for foam treatment. In comparison, ant mortality on the untreated controls ranged from 0 to 7%.

CONCLUSION

The efficacy studies reported herein were conducted under sound scientific principles. Treatments were randomized and replicated at least three times. Untreated controls and standard products were included. Pre-treatment and post-treatment counts of ants were performed and compared statistically to determine efficacy. Various species of pest ants commonly found in residential homes were tested with adequate numbers of ants - an average of up to 335 ants was counted on a single baited 3 x 5-inch index card. Based on the results of these studies, it appears that fipronil is 100% effective in controlling a variety of ants at any of the following application rates: 0.01%, 0.05%, and 0.06% (a.i.) when used as an outdoor perimeter spray treatment.

Enclosure

Summary of Efficacy Data for Liquid Formulated Fipronil Termidor & Taurus Products Against Ants

Data package number	Ant pests tested	Type of study	Application rates tested (% a.i.)	% Control achieved
52062-0345	Carpenter ant	Outdoor perimeter spray treatment on residential homes	0.01, 0.05, and 0.06	All three application rates resulted in 100% control (no ants observed about, aroun or within the structure) for up t 60 days after treatment
52062-0346	Argentine ant, Pavement ant, Odorous ant, and Whit-footed ant	Outdoor perimeter spray treatment on residential homes	0.06	100% control (no ants observed about, around, or within the structure) for up t 20 weeks after treatment across all ant species tested
52062-0392	Thief ant, Acrobat ant, Crazy ant	Outdoor perimeter spray treatment on residential homes	0.01, 0.05, and 0.06	All three application rates resulted in 100% control (no ants observed about, aroun or within the structure) for up t 60 days after treatment across all ant species tested
52062-0392	Pharaoh ant	Laboratory simulated barrier spray treatment	0.06	100% ant mortality for the entire 60-day study duration
52062-0500	Argentine ant, Acrobat ant, Carpenter ant	Laboratory direct spray and foam treatments	0.005	100% ant mortality for direct spray within 30 minutes after treatment; and 97-100% ant mortality for foam within 48 hours after treatment