Controlling Argentine Ants in Residential Settings (Hymenoptera: Formicidae)

by

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ABSTRACT

The efficacy of five treatments to control Argentine ants around homes was evaluated. Most effective was a combination of a perimeter spray with fipronil + broadcast application of bifenthrin granules (93% reduction of ants after 8 wks). A sweet water bait with 0.001% imidacloprid provided ≈ 80% reduction of ants for one month. All of the treatments significantly reduced ant activity, and at the end of the study 95% of the homeowners rated the treatments as "very effective." In a survey of homeowners living in a neighborhood infested with Argentine ants, > 70% were doing their own ant control using over-the-counter insecticides. However, only 10% of this group reported achieving complete or almost complete ant control. In contrast, of the 20% of homeowners that hired professional pest control services, 63% reported complete or almost complete ant control.

Key Words: Argentine ants, ant control, ant baits, insecticide spray

INTRODUCTION

The Argentine ant, *Linepithema humile* Mayr, is an invasive species of worldwide distribution, particularly in regions with mild, temperate, Mediterranean climates (Vega & Rust 2001). For example, in southern Europe there are two enormous supercolonies, the largest stretching 6,000 km from northern Italy to Portugal (Giraud *et al*. 2002). Being a unicolonial species, Argentine ant populations lack colony borders and can sometimes extend over entire habitats. They thrive in disturbed areas where there is abundant moisture and low ant diversity (Majer 1994).

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Argentine ants are significant economic pests in urban, agricultural, and natural ecosystems (Vega &Rust 2001). They create problems in agriculture by tending homopteran pests and in natural ecosystems by displacing native ant species. In urban environments they can become a serious nuisance pest in residential areas with infestations sometimes reaching astronomical proportions. In southern California, for example, Reierson *et al*. (1998) estimated as many as 176,000-538,000 ant visits to monitoring stations around homes over a 24-h period.

Controlling Argentine ants in and around homes is one of the major pest problems in California. In a survey of pest control companies in California, the Argentine ant was the most commonly encountered ant pest by Pest Management Professionals (PMPs) and the most difficult to control (Knight & Rust 1990). In the greater San Diego area, they contribute to over 90% of the ant treatments made by Lloyd Pest Control (Field *et al*. 2007), which has over 35,000 accounts in their general pest service. In addition to professional pest control services, many homeowners attempt their own ant control. For example, greater than 50% of residents surveyed in California had attempted to control ants by applying insecticides (Flint 2003).

Achieving control, however, is difficult because of the large colonies and extensive area-wide infestations. Perimeter sprays around the exterior foundation have been the most popular control measure used by PMPs. However, creating an effective barrier against Argentine ants is almost impossible because any small gaps provide an opening. Other factors that may reduce its efficacy include chemical degradation, irrigation, dense ground cover, mulch, high temperature, substrate alkalinity, and direct sunlight (Rust & Knight 1990; Rust *et al*. 1996). Despite these drawbacks, some of the new nonrepellant insecticides that exhibit horizontal transfer are proving to be very effective (Soeprano & Rust 2004a,b; Klotz *et al*. 2007).

In addition, toxic baits are available to PMPs and homeowners, but most of these commercial baits are not attractive to Argentine ants and those that are kill the ants too quickly before the bait can be dispersed through the colony (Rust *et al*. 2003). Under development, however, are some sugar-based liquid baits containing new active ingredients (AIs) that are effective at ultra-low concentrations (Rust *et al*. 2003). These sucrose-water baits capitalize on the Argentine ant's preference for honeydew (Markin 1970), and their digestive

tract and foraging behavior, which are specialized for handling liquid diets (Hölldobler & Wilson 1990).

In a previous study published in this journal (Klotz *et al.* 2007), we reported on the efficacy of six treatments to control Argentine ants in and around homes in southern California. Overall, we achieved satisfactory control for two months with over 80% of the homeowners reporting that the treatments were very effective. Some treatments, though, were more effective than others. In this study, we selected the three most effective of those treatments and compared them with two new treatments, one that is an experimental bait and the other a perimeter spray that is an industry standard. We also present information gleaned from two homeowner surveys that we conducted: one in which the participants of our efficacy study evaluated our treatments, and the other of an infested neighborhood in southern California to determine the extent of their problem with Argentine ants and the efficacy of treatments made by both PMPs and homeowners.

MATERIALS AND METHODS

The efficacy study was conducted around homes in Riverside, California, that were infested with Argentine ants. At the end of the study the homeowners who participated were given a survey to evaluate the treatments. Another survey was conducted in Bloomingon and Fontana, California, where some 290 homes had been built with defects in construction that allowed Argentine ants to enter the homes through cracks in the slab foundations. This survey was conducted to determine how the neighborhood was dealing with a long-term and persistent infestation of Argentine ants.

Efficacy Study.

Five different chemical treatments to control Argentine ants were evaluated:

(1) Peimeter spray with 0.06% fipronil: 3-4 gallons of Termidor SC (BASF, Florham Park, NJ) applied with a 15-liter backpack sprayer (Birchmeier Co., Switzerland) along the foundation (one foot up and one foot out), and to ant trails on the edges of sidewalks, driveway, and any other location where they were observed in the yard.

(2) Perimeter spray with 0.06% bifenthrin: 3-4 gallons of Talstar One (FMC Corp., Philadelphia, PA) applied in the same manner as (1).

(3) Combination of treatment (1) and 0.2% bifenthrin granules: Talstar EZ Granules (FMC Corp., Philadelphia, PA) broadcasted at 2.3 lbs./1000 sq. ft. on foliage outside the spray zone.

(4) Spot treatment with 0.06% fipronil: 1-gal. Termidor applied with a backpack sprayer to active ant trails in the yard and around the outside perimeter of the house.

(5) Liquid bait delivery system with 0.001% imidacloprid: 6-7 AntPro bait stations (KM AntPro, Nokomis, FL), each containing 16-ounces of Vitis (Bayer Corporation) were placed around the outside perimeter of the house and in the yard.

A sixth treatment consisted of five untreated control sites, which included a house in Riverside and four office buildings located on the campus of the University of California, Riverside. The offices were used in place of homes because it is difficult to find homeowners that are willing to cooperate in a study like this without receiving some kind of ant control. Unlike the treated homes described above, the control sites had lighter infestations with far less numbers of Argentine ants. These sites lacked outdoor pets, vegetation with hemipteran pests, and conditions conducive to Argentine ants.

Monitoring of treatments.

An estimate of the number of foraging ants at each site was used to evaluate efficacy. The estimates were based on the amount of 50% sucrose-water (wt/vol) consumed by the ants over a 24-h period. On each monitoring date, 20 polypropylene monitoring tubes (15 ml Falcon Brand Blue Max Jr. conical tubes, Fisher Scientific, Pittsburgh, PA), each containing 13 ml of sucrose-water were placed outside, 10 evenly spaced around the house next to the foundation, and 10 around the outside perimeter of the yard. The tubes were numbered and laid on the ground with the open end propped up in the notch of a small Lincoln Log™ in order to maximize the surface area of liquid available to the ants and reduce the risk of their drowning. The tubes were covered with clay flower pots (15.5 cm diam. x 11.5 cm high) to protect them from sprinkler irrigation, pets, and sunlight. The amount of sucrose-water consumed by the ants was determined by measuring the weight

loss from the tubes over 24 h, and then correcting for evaporation. The correction for evaporative water loss was based on the weight loss from another set of tubes containing sucrose-water placed outside for 24 h without access to ants. Based on laboratory studies conducted by Reierson *et al.* (1998), Argentine ants consume on average 0.3 mg of sucrose-water per visit. This average consumption was used to calculate the number of ant visits to each tube over 24 hours. Using this procedure, each site was monitored before treatment and 1, 2, 4, and 8 wks after treatment.

Surveys.

Two surveys of homeowners in southern California were conducted:

At the end of our efficacy study in Riverside, participating homeowners were given a short three question survey, which asked them to rate the degree of infestation, the incidence of ants inside their home both before and after treatment, and the overall efficacy of the treatments.

A more extensive survey (Fig. 1) was mailed to 287 homeowners in infested neighborhoods in Bloomington and Fontana to collect information about pesticide use, methods of application, and their perceived efficacy of treatments made by both professional services and the homeowners themselves.

Statistical Analysis.

For the efficacy study, ant counts at each monitoring station before treatment were compared with counts at those same stations after treatment with a Wilcoxon-Signed Ranks Test ($P<0.05$) (StatView 1999).

RESULTS AND DISCUSSION

All of the treatments in the efficacy study significantly reduced ant activity over the course of 8 wks (see Table 1). As in our previous study, the greatest reductions were achieved at homes that were treated with fipronil, and the best overall performance was the combination treatment (fipronil spray + bifenthrin granules). The fipronil spot spray did not provide the same level of control, although it significantly reduced ant activity. The bifenthrin perimeter spray was consistently less effective than fipronil. The Vitis bait (0.001% imidacloprid) attained over 80% reduction after one month. Its subsequent loss of efficacy in week 8 was probably due to an insufficient amount of bait

Fig. 1 Survey mailed to 287 homeowners in infested neighborhoods in Bloomington and Fontana, CA.

1) Do you presently have an active ant problem?
Yes ☐ No ☐

2) How long have you had an ant problem?
1 year ☐
2-3 years ☐
4-5 years ☐
5+ years ☐

3) Who treats your home for ants?
☐ I spray/bait myself
☐ I use an exterminator (skip to question #7)
☐ No one treats my home (skip to question #10)

4) If you spray/bait yourself, what are you using?
A._____
B._____

5) Where are you treating for ants?
☐ Inside only
☐ Outside only
☐ Both inside & outside

6) If you are treating yourself, rate your success.
☐ Ants completely under control
☐ Ants almost controlled, see them only once & awhile
☐ I have to treat ants regularly because they keep coming back
☐ I have more ants than ever

7) If you use an exterminator how often do you use them?
☐ Only used them once
☐ Have tried them in the past but not now
☐ Have an exterminator come out regularly

8) If you have a contract with an exterminator, how often do they treat your home?
☐ Once per month _____$/month
☐ Every other month _____$/every other month
☐ Once a quarter (every 3 months) _____$/quarter
☐ Once per year _____$/year

9) If you have used an exterminator, rate their success.
☐ Ants completely under control
☐ Ants almost controlled, see ants only once & awhile
☐ Ants keep coming back between service
☐ I have more ants than ever

10) If you have never had your home treated, why?
☐ Afraid of pesticides
☐ Cost of pesticides
☐ Never had ant problems
☐ Other(please explain) _____

available to the ants during the month long interval from the last refilling of the bait stations.

Twenty of the twenty-five homeowners in Riverside who participated in the efficacy study responded to our survey. Of those that responded: 50% (10/20) described the ant problem in and around their home before treatment as heavy, 25% (5/20) as moderate, and 25% as light; after treatment, 50% responded that there were no ants, 45% (9/20) reported a light infestation, and 5% (1/20) a moderate infestation. Before treatment, 35% (7/20) of the homeowners responded that they had ants inside all the time, 25% often, 30% occasionally, and 10% (2/20) responded they never had ants inside. After treatment, 75% (15/20) responded that they never had ants inside, and 25% occasionally. Lastly, 95% (19/20) of the homeowners rated the treatments as very effective, and 5% somewhat effective.

In the Fontana survey (Fig. 1), 41 homeowners responded: 80% (33/41) indicated they had an active ant problem of long-standing duration (≥ 4 years). A majority of the homeowners, 73% (30/41) were attempting to control the ants with over-the-counter (OTC) insecticides, most commonly Home Defense and Raid. Only 20% (8/41) of the homeowners had hired a PMP, and 7% (3/41) were not treating for ants. In regard to control, only 10% (3/30) of the homeowners that were doing their own treatments with OTC insecticides achieved complete or almost complete ant control. In contrast, 63% (5/8) of the homeowners who hired PMPs indicated complete or almost complete ant control. This included both the homeowners who contracted with a PMP who visited their property on a regular basis and those who hired a PMP occasionally, on an as-needed basis. Thirty-nine percent (13/33) of the homeowners who did not hire a PMP indicated that the cost of pesticides was the reason they did not have their home treated. The average cost for those that did hire a PMP varied according to the type of contract: monthly = $36.00/service; every other month = $69.00/service; and quarterly = $75.00/service.

The homeowners doing their own treatments indicated that it was necessary for them to make repeated applications of OTC insecticides because the ants kept coming back. This corroborates the findings of a survey by Flint (2003) about how many homeowners initially attempt to control the ants. Unlike some of the insecticides available to PMPs, e.g. Termidor with fipronil, OTC

Table 1. The average performance of five different treatments for Argentine ants around homes in Riverside, CA (N = 5 homes/treatment). Residences treated in July 2007. Untreated controls (#6) are shown for comparison (N = 5 homes).

Treatment, % AI[a]	Avg. ant visits per tube before[b]	Monitoring Site[c]	Avg. ant visits per tube (% reduction) at week after treatment[d]			
			1	2	4	8
(1) Perimeter, 0.06 fipronil	33,147	Near	1,099 (96.7)***	1,902 (94.3)***	2,502 (92.5)***	7,601 (77.1) ***
	34,529	Away	10,930 (68.3)***	14,478 (58.1)***	10,267 (70.3)***	22,380 (35.2)ns
(2) Perimeter, 0.6 bifenthrin	24,416	Near	4,531 (81.4)***	4,179 (82.9)***	7,192 (70.5)***	7,068 (71.1) ***
	33,015	Away	16,019 (51.5)***	16,898 (48.8)***	,269 (29.5)***	25,224 (24.0) ***
(3) Perimeter, 0.6 fipronil	22,296	Near	2,211 (90.1)***	537 (97.6)***	2,780 (87.5)***	1,488 (93.3)***
Broadcast, 0.2 bifenthrin	33,070	Away	7,769 (76.5)***	8,129 (75.4)***	9,988 (69.8)***	11,728 (64.5) ***
(4) Spot, 0.06 fipronil	18,964	Near	7,691 (59.4)***	6,704 (64.6)***	7,198 (62.0)***	10,196 (46.2) ***
	24,126	Away	12,900 (46.5)***	12,928 (46.4)***	9,327 (61.3)***	17,413 (27.8) **
(5) Bait, 0.001% imidacloprid	22,547	Near	3,775 (83.3)***	4,626 (79.5)***	3,897 (82.7)***	12,938 (42.6) **
	28,749	Away	12,865 (55.3)***	13,198 (54.1)***	0,425 (63.7)***	23,133 (19.5)ns
(6) Untreated	14,296	Near	10,841 (24.2)ns	17,749 (0)ns	13,996 (2.1)ns	13,815 (3.4)ns
	17,946	Away	18,628 (0)ns	16,623 (7.4)ns	15,283 (14.8)ns	24,652 (0)ns

[a]Fipronil = Termidor; bifenthrin = Talstar; imidacloprid = Vitis. Five homes, each with 20 monitor tubes for each treatment.
[b]Based on evaporation-corrected weight removal of 50% sucrose-water from monitor tubes.
[c]10 monitor tubes were placed near the house and 10 away from the house, except untreated with only 2 monitor tubes away from the house.
[d]Wilcoxon Signed Rank Test, ** = $P<0.01$, *** = $P<0.001$, ns = nonsignificant.

products are typically fast-acting with quick knockdown but little capability of horizontal transfer of the AI from one ant to another. The AI in Termidor (fipronil), on the other hand, is passed from one ant to another by contact (Soeprano & Rust 2004a,b). If a fipronil-containing insecticide is optimally placed along foraging trails (such as in the spot treatment in the efficacy study) then enough ants will pick up the fipronil to eliminate colonies.

Homeowners confronting a pest ant problem usually choose one of three options: (1) attempt to solve the problem on their own, (2) hire a PMP, or (3) do nothing and hope the problem goes away. However, if the problem is Argentine ants, the chance of them going away is slight, and more likely they will become a chronic nuisance recurring year after year unless timely and effective control measures are initiated. If the location is southern California one can also be certain that the problem is not an isolated case, but probably a widespread infestation encompassing the entire neighborhood (Vega &Rust 2003).

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