End of Year Report for CDPR 2015
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January 19, 2016
Contract #13-C0031
Project partially funded by US EPA Performance Partnership Grant

Treatments around homes in the Riverside area

Most summers our Urban Entomology Program at UCR conducts trials around homes of local residents who have infestations of the Argentine ant, *Linepithema humile*. We compare the efficacy of different protocols in reducing the ant numbers around these houses. Some of the variables tested include: different active ingredients; different formulations of the insecticide; and how the insecticides are applied. Most of the active ingredients are formulations of pyrethroids, fipronil, or botanicals. Formulations include sprays, granules, and gels in bait stations. Sprays can be applied with different band widths to the house foundation. Granules are spread around bushes, trees, and lawns. Gels are usually applied in bait stations around the house and driveway. Furthermore, we collect water samples of driveway runoff so as to measure the amount of runoff due to the various treatments. These projects are supported by grants from the California Department of Pesticide Regulation.

A. Efficacy of treatments

Method. In the summer of 2015 we treated 21 homes with Termidor™, a fipronil spray. There were 3 types of treatments (Table 1). These treatments were around the entire house perimeter, not including the driveway (see below). The standard treatment used 2 quarts of 0.06% fipronil, while each of the other treatments used 1 qt, one-half of the fipronil mass of the standard. All treatments were done with a 1-gal B&G tank sprayer and 4-Way Multeejet Tip. We attached a pressure gauge to keep the tank pressure at 20 psi. The standard and the reduced swath treatments were done with a coarse fan spray setting, while the pin stream setting provided a very narrow but concentrated spray. To do the standard 1x1 ft treatment we did two passes of 8.4 secs each (7 ml of 0.006% solution/sec) to cover 10 linear ft, one pass of a 1-ft-wide band going up the home foundation and the other pass for the 1-ft wide segment away from the wall. For the 6x6 in band we did one pass at 8.4 secs (also 7 ml/sec) that treated 6 in up and 6 in out from the wall. And for the pin stream (1x1 in band) we did one pass at 11.8 secs (5 ml/sec). At the garage door/driveway interface all homes received a pin stream application (typical of many applications done by Pest Management Professionals [PMPs]).

Ant control was estimated by calculating the amount of sucrose-water consumed from vials containing 13 ml of 25% sucrose. Ten vials were placed around the exterior foundation of a house, with 2 or 3 vials at each side of the house. The vials were covered with flower pots to protect from irrigation water and pets (Fig. 1). Evaporative controls (n=5) were simultaneously run (free of ants) to correct for evaporation of the liquid. Vials were weighed before and after they were left outside a home for 24 hours. We know that an ant consumes approx 0.0003 g of sucrose water; therefore we can extrapolate the number of ant visits from the consumption figure. These ant numbers were recorded pre-treatment and at 1, 2, and 4 weeks post-treatment. On treatment days, each house was given 1 of the 3 treatments; these 3

houses were therefore treated as a block in a randomized block design and there were 7 blocks of 3 houses. Blocking the houses helps to compensate for daily weather variability.

Results. There were no significant differences in ant reductions among treatments at any of the assessment dates. However, at 4 weeks after treatment, the standard 1x1 foot treatment was trending positive (higher reductions) with respect to the others (Figure 2). We would not consider any of the ant reductions at 4 weeks (from 10 to 40%) to be satisfactory in controlling ants.

Discussion. In typical PMP applications control could be extended by supplementing the fipronil with other insecticides that could be applied at other locations around the house. These insecticides could include pyrethroids, boric acid, plant oils, and baits containing hydramethylnon or other AIs. With these additional treatments the Argentine ant control rates would be higher than those obtained here.

B. Water runoff

Method. For runoff we used the same houses and band widths described in **A.** These runoff trials were concurrent with the tests of efficacy described above. However, two of these homes had unusual arrangements of the garage and driveway and we decided not to include them in the water collection data, leaving 19 houses for data analysis. As in the above, we did a randomized block design in the analysis for differences among treatments; each group of 3 houses formed one block.

Pre-treatment and 1 and 30 days post-treatment, driveways were washed with a hose from the width of the garage door to a dam 20 feet away where a 1 L sample was collected (Figs 3 and 4). The volume of water needed to collect the 1 L sample was recorded with a Rain Wave™ gauge attached to the hose. The 1 L water samples were analyzed in Dr. Jay Gan's laboratory for fipronil, fipronil-desulfinyl, fipronil-sulfone, and fipronil-sulfide. As shown in the table above, the 6x6 in band and the pin stream (1x1 in) band each had half the fipronil mass of the standard treatment.

Results. Pre-treatment runoff values were minimal (Fig. 5). Most of these houses had received fipronil treatments 1 yr before. There were no significant differences in the amount of runoff from the different treatments at 1 and 30 days after application (Figures 6 and 7). This result was true for fipronil and its degradates.

Discussion. All of the houses had the pin stream application at the driveway, but different band widths for the rest of the house. There were no significant differences in runoff between houses with different bandwidths. The most likely explanation for these results is that the pin stream treatment, which was directly contacted by the driveway flush, masked any differences from treatments around the rest of the foundation. Most rain events are going to run down the driveway and will contact the pin stream application if it is done there. Very heavy rain may be able to wash other sides of the house and reach the driveway. At the very least we can say that even wide band treatments around the rest of the house are not easily migrating to the driveway without precipitation. The treatments done here are typical for PMPs and the results reflect real world situations.

The Office of Pesticide Programs of the US EPA has published aquatic life benchmarks for pesticides. For fipronil the acute benchmark is 0.11 µg/L, or .11 ppb = 110 ppt. The chronic benchmark is 0.011 µg/L, or 11 ppt. Most of the pretreatment runoff values were below or near the chronic benchmark (Mean= 16.5 ppt; Median = 11.1 ppt), and all were below the acute benchmark (Fig. 5). On the other hand, 1 day post-treatment values were mostly greater than the acute benchmark (Mean = 6,200.6 ppt; Median = 1,179.1 ppt), meaning that they would be lethal to aquatic organisms. The 30 day post-treatment values for fipronil were below or near the acute benchmark (Mean = 101.7 ppt; Median = 64.1 ppt), meaning that they are not likely to be lethal values. The aquatic benchmarks for some of the fipronil degradates are slightly higher than for fipronil, meaning that the results are less lethal for the degradates than for fipronil. The reduced runoff at 30 days post-treatment suggests that applications of fipronil to homes should not be done at least 1 month before the beginning of the rainy season in southern California to avoid high levels of runoff.

Table 1. Description of the 3 applied treatments. For the 1x1 ft and 6x6 in treatments n=6; for the 1x1 in pin stream treatment n=7

Treatment (Contract Treatment)	Treatment swath at base of wall	Projected treatment area	Actual amount of Termidor SC used/area
Labeled rate (standard treatment) (A)	1 foot up, 1 foot out band application	2 quarts a of 0.06% Termidor™ SC solution per 160 linear feet (320 square feet) (0.2 fl. oz/ft^2)	3.8 µg/cm^2
Pin Stream (C1)	1 inch up, 1 inch out pin stream application	1 qt. of a 0.06% Termidor SC solution per 160 linear feet (26.67 square feet) (1.2 fl. oz/ft^2)	22.9 µg/cm^2
Reduced swath (D)	6 inches up, 6 inches out band application	1 quart a 0.06% Termidor SC solution per 160 linear feet (160 square feet) (0.2 fl. oz/ft^2)	3.8 µg/cm^2

Table 2. Thirty day post-treatment home runoff medians and means in ppt. The chronic aquatic benchmark = 11 ppt; the acute aquatic benchmark = 110 ppt. Most values are below the chronic aquatic benchmark. For the 1x1 ft and 6x6 inch treatments n=6; for the 1x1 in treatment n=7.

Compound	1x1 ft	6x6 in	1x1 in
Medians			
Fipronil	88.25	64.26	64.13
Desulfinyl	81.77	21.78	22.75
Sulfide	33.11	27.67	25.95
Sulfone	3.80	3.28	0.0
Means			
Fipronil	205.33	53.05	54.62
Desulfinyl	90.90	38.99	52.37
Sulfide	40.05	28.00	27.97
Sulfone	22.55	12.63	5.22

Figure 1. (**A**) shows sucrose water vial with ants feeding on the solution. (**B**) Flower pot covers vial.

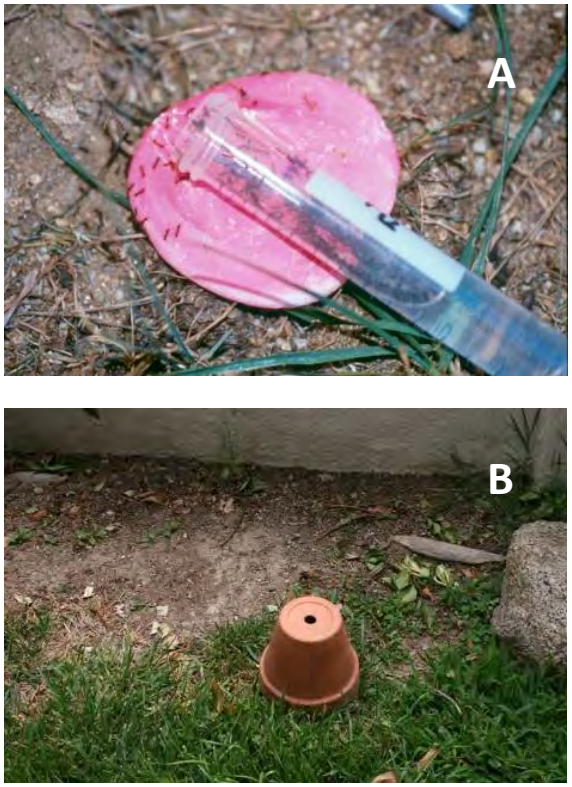

Figure 2. Efficacy of fipronil treatments against Argentine ants in Riverside.

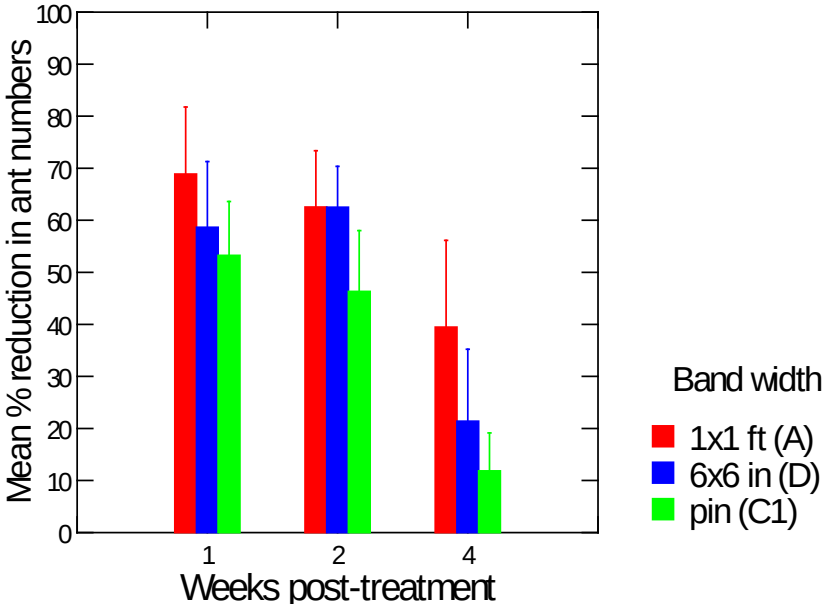

Figure 3. Dam for collecting water sample.

Figure 4. Collecting the water sample.

Figure 5. Pre-treatment values for homes used in 2015.

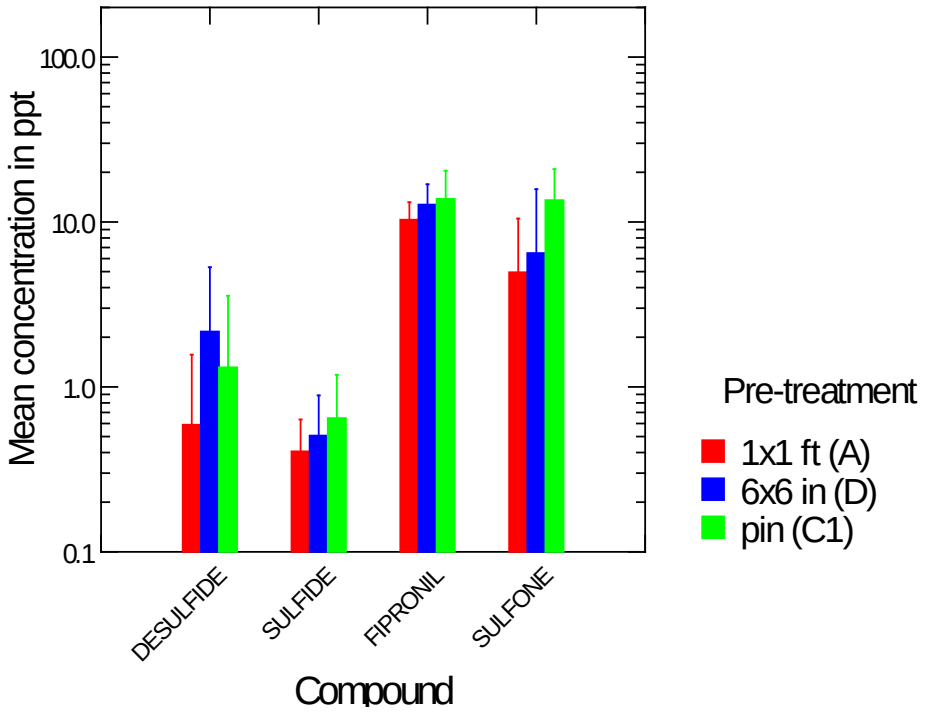

Figure 6. Day 1 post-treatment values for homes used in 2015.

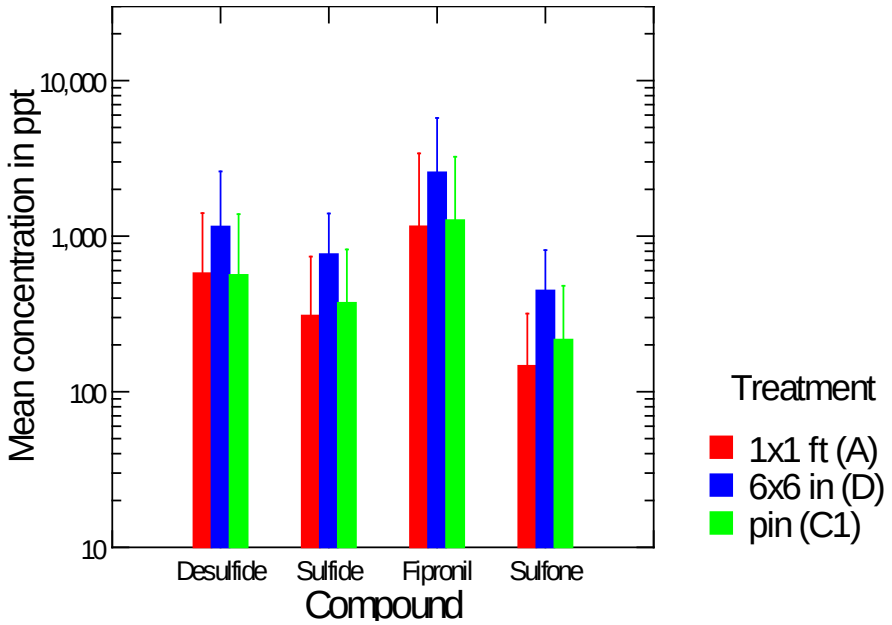
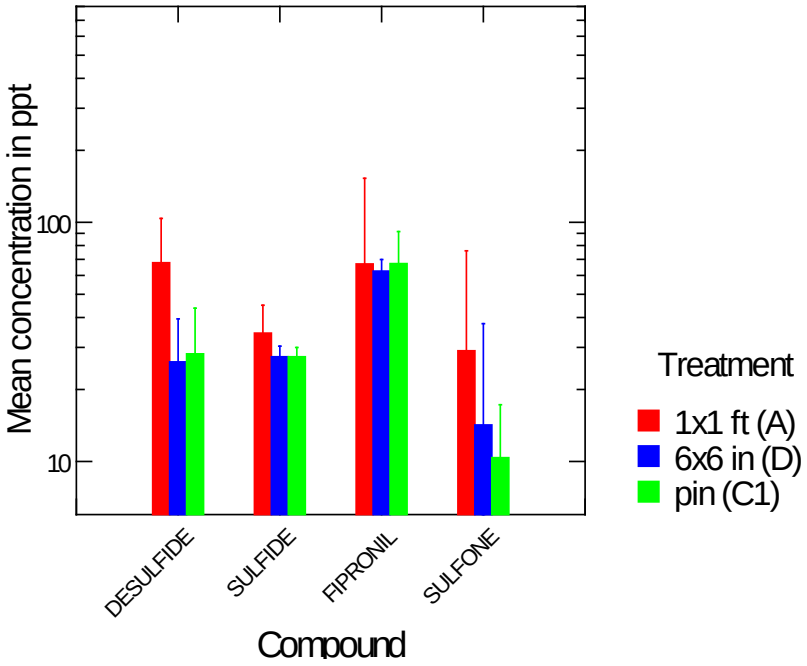
Figure 7. One month post-treatment values for homes in 2015 Riverside home trials.