SCIENTIFIC NOTE

Preliminary Field Tests on the Suitability of Amdro™ and Distance™ in Ant Bait Container for Control of the Big-Headed Ant, *Pheidole megacephala* (Hymenoptera: Formicidae)

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Abstract. Studies were conducted to (1) select a suitable brand of bait container for use in the control of big-headed ant in an agricultural situations, (2) determine the short-term effects environmental conditions on the potency of Amdro™ in a suitable bait container, and (3) to compare the effectiveness under field conditions of various spacings of bait containers using Distance™ and Amdro™ in sequence. Perimeter Patrol System bait container was selected as the most suitable for field use based on the capacity to contain sufficient amounts of Amdro™, lower cost, smaller size, low profile shape, and ease of handling. Potency of Amdro™ was retained in the Perimeter Patrol System container for a period of twelve weeks. Bait containers spaced at 15.24 m apart in a field plot had the best control compared with 7.62 and 30.48 m spacings.

Introduction

The big-headed ant, *Pheidole megacephala* (Fabricius) was known to occur in the Hawaii Islands before 1900 (Forel 1899). This native of Africa is the dominant ant in the Hawaiian Islands (Huddleston and Fluker 1968). The big-headed ant is found up to 1200 m elevation under dry, mesic, and wet conditions (Riemer 1993). Big-headed ant commonly is the dominant ant species in pineapple fields (Phillips 1934) and facilitates the spread of pineapple mealybug wilt disease. Pineapple mealybug wilt disease is caused by a virus and transmitted by the vectors *Dysmicoccus brevipes* (Kuwana) and *D. neobrevipes* (Beardsley) (Carter 1931, Zimmerman 1948, Beardsley 1959, Beardsley et al. 1982, Gunashighe & German 1986). Carter (1973) demonstrated that elimination of the big-headed ant from pineapple fields resulted in the reduction of mealybug wilt disease to below the economic threshold.

Beginning in 1945, DDT, heptaclor, and Mirex were available for control of the big-headed ant (McEwen et al. 1979) until they were later banned. Amdro™ is currently approved for use in pineapple fields for the control of the big-headed ant under the 24-C emergency section label 18. The active ingredient in Amdro™, hydramethylnon, is sensitive to light and moisture. The half-life of dry Amdro™ is about 12 hrs in sunlight (Vander Meer et al. 1982), and about 42 min in water (Mallipudi et al. 1986). Distance™ is approved for use on non-crops and pastures. The half-life of Distance™ is 7 to 9 days in sunlight and 4 to 6 days in water (Anonymous). Bait containers are primarily used in urban situations for the control of ants (Forschler and Evans 1994a, Forshler and Evans 1994b, Oi et al. 1994,

Blachly and Forschler 1996, Schwartz 1996, Gooch 1999). The authors are unaware of its use previously in agricultural fields.

The objectives of this study were to 1) select a suitable brand of bait container for use in the control of big-headed ant in an agricultural situations, 2) determine the short-term effects environmental conditions on the potency of Amdro‰ in a suitable bait container, and 3) to compare the effectiveness under field conditions of various spacings of bait containers using Distance‰ and Amdro‰ in sequence.

Materials and Methods

Trap selection. A study with various bait containers was conducted in the laboratory at the University of Hawaii. Bait containers were obtained from different manufacturers: Drax Liquidator (Waterbury Co., Waterbury, CT, $8.50 per trap), A. C. E. Station (Whitmire Micro-Gen Co., St. Louis, MO, $6.45 per trap), Perimeter Patrol System (B & G equipment Co., Plumsteadville, PA, $1.30 per trap), Ant Café (Colonial Products Inc., Boca Raton FL, $.25), and Ants No More (Kness MFG. C. Inc., Albia, IO, $4.50 per trap). Ten grams of corn grit were added to each brand of bait container, except for the Ant Café bait container, which had a limited capacity (5 g). Each container, filled with corn grit bait, was placed in a 50 x 39 x 12 cm open box (Gray Bus Boy Tray, Cambro, Huntington Beach, CA) with a colony of 4,000 to 5,000 big-headed ants and adequate food and water for 7 days. The inner sides of each container were coated with Fluon AD-1 (Northern Products, Inc., Woonsocket, RI) to prevent ant egress. Observations of foraging behavior were made for 5 days. The study was conducted on 4 May and repeated on 1 June 1999. The attractiveness of the bait containers to foraging ants, and the cost, size, shape, and ease of handling of the traps were used to select the best bait container for field use.

Degradation study. Degradation studies were conducted on the campus of the University of Hawaii. Perimeter Patrol System bait containers were loaded with 20 g of Amdro™, then placed on a bench outside for exposure to sunlight and rain to test degradation of Amdro™ (hydramethylnon 0.73% a.i. bait; Micro Flow Company LLC, Memphis, TN). Three replicates of each of five treatments (zero, one, three, six, and twelve weeks) and a control (without Amdro™) were repeated three times from 4 December 2001 through 5 February 2002. At the end of each time period, half a gram of Amdro™ was removed from each bait container and placed in a 25 x 150 mm Petri dish containing two hundred big-headed worker ants taken from a single colony. Adequate food and water was added to each dish, and the inside of each dish was coated with Fluon to prevent ant egress. Big-headed ant mortality was recorded weekly for a period of two weeks.

Field test. A study was conducted at the University of Hawaii's Poamoho Experiment Station, Oahu Island, from 6 April 1999 to 3 October 2000. Treatment plots consisted of a 0.6-acre mango tree orchard, a 0.8-acre mixed nut trees orchard, and 1.0-acre mango tree orchard. The control plot was a 0.2-acre guava orchard. Perimeter Patrol System bait containers were used to hold the ant baits Distance™ and Amdro™. Ant monitoring containers consisted of plastic seven-dram vials (5 x 2.5 cm; Fisher Scientific Co. LLC, Santa Clara, CA) with a 1 x 3.8 cm cotton dental wick (Henry Schein Inc., Port Washington, New York) saturated with 2–3 ml honey.

In each of the unequal sized plots, 20 ant-monitoring containers were arranged in two evenly spaced rows. Within each treatment plot, each row of ant monitoring containers was separated from each other and adjacent side of the plot by the same distance. Each row contained ten evenly spaced ant-monitoring containers. Perimeter Patrol System bait containers were arranged in two evenly spaced rows per plot separately from the ant monitoring containers. Within each treatment plot, each row of bait container was separated from

each other and adjacent side of plot by 7.62, 15.24, 30.48 m in 0.6, 0.8, and 1.0 acre plots, respectively. In the control plot, each row of bait containers was separated from each other and the adjacent side of plot by 15.24 m. Within each row, bait containers were separated by 6.1 m.

During the treatment period from 17 September 1999 to 1 May, 200, Perimeter Patrol bait containers were serviced every 21 days. Within each servicing period, bait containers held 20 g of Distance™ for 7 days then replaced with 20 g of Amdro™ for 14 days. Ant counts were taken prior to treatment and once a month during treatment. Ant monitoring containers were left in the field for 24 hr during each census. The number of ants captured per trap per day was converted to the number of ants captured per trap per meter^2 per day.

Results and Discussion

Trap selection. All of the bait containers were visited by foraging big-headed ants. No differences in ant foraging behavior were observed. Ant Cafe bait container was the smallest trap and it accommodated a lesser amount of bait and fewer ants compared with the other bait containers. Ant Café bait containers were the only ones that were translucent. The Perimeter Patrol System bait container was relatively inexpensive and possessed unique characteristics. The low, flat design made it wind resistant, baiting this container was quick and easy, and the container could be easily hidden in vegetation out of view. The Perimeter Patrol System bait container was also the most spill resistant and therefore was least likely to contaminate the environmental when overturned.

Degradation studies. Exposure to the environment for up to 12 weeks had no affect on the potency Amdro™ in Perimeter Patrol System bait containers. All treatments caused 100% mortality of the big-headed ant. The three control replicates had mean mortalities of 2.3, 7.0, and 19.3 %. The Perimeter Patrol System bait container protected Amdro™ from the degrading effects of sunlight (Vander Meer et al. 1982) and rainwater (Mallipudi et al. 1986).

Field test. Ant counts in baited vials in a plot with Perimeter Patrol System containers spaced at 7.62 m apart collected the highest pretreatment numbers as compared with the other two treatments and control (Fig. 1). Ant counts declined from July to November reaching zero in September 1999, and rapidly increased until the end of the experiment in February. Perimeter Patrol System containers spaced at 15.24 m apart performed the best. Ants were suppressed by July with no ants occurring from July through December 1999, before the numbers slowly increased from December to February. Perimeter Patrol System containers spaced 30.48 m apart was the least effective in reducing the ant numbers during the entire treatment period. Pretreatment ants counts in the control plot was lower than in the treatment plots at the start of the experiment, but increased to higher levels during most of the treatment period. Among the treatments, the recommended spacing is 15.2 m because it provided the best control of the big-headed ant.

In conclusion, the Perimeter Patrol System bait container held sufficient amounts of baits for control of the big-headed ant, was the second least expensive container, was smaller than many of the other traps, was easily hidden under vegetation out of view from children, prevented rapid degradation of Amdro™ from sunlight, and its design made it relatively wind resistant compared with the other traps. Amdro™ retained potency for 12 weeks. Recommended spacing for bait containing Amdro™ is 15.2 m^2 for five months of control.

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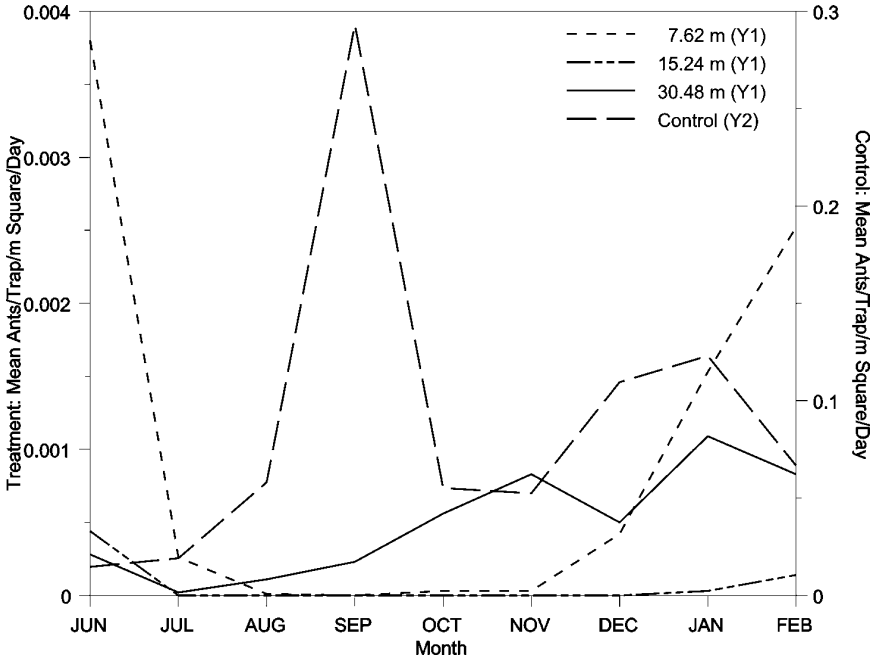

Figure 1. Control of the big-headed ant, *Pheidole megacephala* (Fabricius) with Amdro™ for a period of 7 days and subsequently replaced with Distance™ for a period of 14 days in Perimeter Control Traps in the field.

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