

**Research Note**

**Field evaluation of a hydramethylnon gel bait against German cockroaches (Dictyoptera: Blattellidae) in Bangkok, Thailand**

Duangkhae SITTHICHAROENCHAI<sup>1)</sup>, Chatchawan CHAISUEKUL<sup>1)</sup>  
and Chow-Yang LEE<sup>2), 3)</sup>

<sup>1)</sup> Department of Biology, Faculty of Science, Chulalongkorn University,  
Bangkok, 10330 Thailand

<sup>2)</sup> Urban Entomology Laboratory, Vector Control Research Unit, School of Biological Sciences,  
Universiti Sains Malaysia, 11800 Penang, Malaysia

<sup>3)</sup> Corresponding author. E-mail: chowyang@usm.my

(Received: 22 June 2006; Accepted: 13 September 2006)

**Abstract:** A 2% hydramethylnon gel bait formulation was evaluated against German cockroaches, *Blattella germanica* (Linnaeus) in two university cafeterias in Bangkok, Thailand. With only single treatment, the bait reduced more than 90% of cockroach trap counts in both sites after 1 week post-treatment. In one test site, the reduction rate was further sustained up to 3 months post-treatment. The implication of this study on managing German cockroach populations is discussed.

Key words: hydramethylnon, bait, *Blattella germanica*, cockroaches, Thailand

INTRODUCTION

Cockroaches are one of the important groups of insect pests in the urban environment. They are potential mechanical vectors of human diseases (Brenner, 1995; Lee, 1997). In addition, inhalants and allergens produced by domiciliary cockroaches have also received much attention with increasing allergy and asthma problems (Kang and Chang, 1985; Brenner et al., 1991; Lee, 1997). In Southeast Asia, the German cockroach, *Blattella germanica* (Linnaeus) is an important insect pest in hotels and food preparative outlets (Lee et al., 1993; Lee, 1998). Current control strategies which rely heavily on the use of neurotoxic insecticides in residual formulations in this region have been found to be ineffective against multiple-resistant German cockroaches (Lee et al., 1996; Lee

et al. 2000; Lee and Lee, 2004).

Baiting is becoming a popular method of control against German cockroaches in Thailand, and no longer plays complimentary role to residual sprays. The use of baits can also lessen the likelihood of pesticide misapplication (Robinson, 1988), and managed insecticide-resistant German cockroaches (Lee, 1998; Lee et al., 1999). In this study, we evaluated a hydramethylnon-based gel bait formulation against German cockroaches in two university cafeterias in Bangkok, Thailand.

MATERIALS AND METHODS

Two sites were chosen for this field evaluation, namely the Faculty Club Science cafeteria (2nd Floor; ca. 200 m<sup>2</sup>) and Arts cafeteria (ca. 700 m<sup>2</sup>) at Chulalongkorn University, Bangkok, Thailand. The Faculty Club Science cafeteria, moderate

in size, consisted of a dining area, a food selling counter, and a kitchen for food preparation. On the other hand, the Arts cafeteria is a large size student canteen with large dining area and eight stores selling different kinds of foods. Each store has its own food-selling counter and food preparation area. Both sites have moderate level infestation of German cockroaches. A gel bait formulation containing 2% hydramethylnon (Infiniti<sup>®</sup>, WellTech Healthcare Pte Ltd, Thailand) was used in this study. Prior to the treatment, plastic cups (7 cm diameter × 10 cm height) (0.4 l) with its inner upper surface smeared with Vaseline<sup>®</sup> and baited with 10 g of moistened cat food) were left for 24 hours in each site. One to two cups were placed inside a rat trap cage to prevent disturbances by rats and other vertebrate pests. A total of 10 rat trap cages were placed in each test site. The number of German cockroaches trapped were counted and sorted into adults and nymphs, and the number caught served as the basis for comparison at post-treatment count.

Treatments were made by applying the gel bait at the rate between 0.5 and 1.0 g per m<sup>2</sup>. Baiting was carried out on October 13, 2005 for the Arts cafeteria, and on October 27, 2005 for the Faculty Club Science cafeteria. Maximum number of placement of gel baits was made by treating as many spots as possible with more

droplets or more baits being applied in heavily infested locations. For the Arts cafeteria, a total of 10 tubes were used, while four tubes were applied in the Faculty Club Science cafeteria. Each tube consisted of 35 g of gel bait. Post-treatment samplings were made at selected week intervals by means of the same procedure as reported in the pre-treatment. Percentage reduction (PR) in cockroach trap count was calculated using the formula:  $PR = 100 [(T_0 - T_i) / T_0]$ , where  $T_0$  = number of cockroaches trapped at pre-treatment, and  $T_i$  = number of cockroaches trapped at  $i^{\text{th}}$  week at post-treatment.

## RESULTS AND DISCUSSION

Results indicated that the hydramethylnon gel bait showed high performance against German cockroaches in the Faculty Club Science cafeteria (second floor). The trap counts were reduced >95% within one week post-baiting (Fig. 1 and Table 1) and the reduction was further improved by the second week post-treatment. On the effects of the gel bait on age-class distribution, it was found that the formulation affected both adult and the nymphal stages in the Faculty Club Science cafeteria.

A slightly inferior result was obtained when baiting at the Arts cafeteria (Fig. 1). Cockroach trap count was initially

Table 1. German cockroach trap counts in Arts and Faculty Club Science cafeterias during the course of baiting.

Week(s) after treatment	Arts		Faculty Club Science	
	No. traps placed	No. cockroaches trapped <sup>1</sup>	No. traps placed	No. cockroaches trapped <sup>1</sup>
0 (pre)	20	23 (5)	20	46 (35)
1	20	0	20	1 (1)
2	18	1 (0)	20	0
3	—	—	20	0
4	20	8 (7)	—	—
6	—	—	19	0
8	20	6 (6)	—	—
10	—	—	20	0
12	19	6 (3)	20	0

<sup>1</sup> No. nymphs trapped is shown in parentheses.

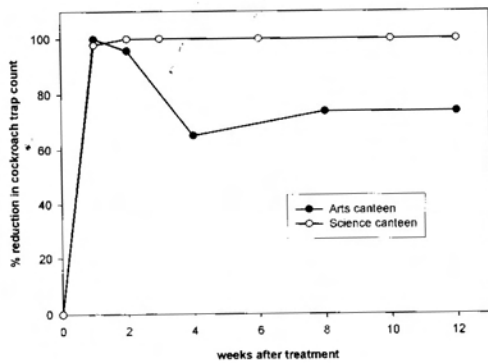


Fig. 1. Performance of a hydramethylnon gel bait against *Blattella germanica* in two university cafeterias in Bangkok, Thailand.

reduced significantly (at first and second week post-treatment), but gradually increased again at fourth week post-treatment (65.2%). Nevertheless, a reduction of >70% was sustained from 8 weeks onwards up to 12 weeks post-treatment. This could be due to the fact that we were unable to treat the bait in some food preparative areas due to refusal by some shop owners. These areas were likely serving as the reservoirs for subsequent increase in cockroach trap counts.

The information obtained from age-class distribution of adult and nymphal stages after Arts cafeteria was treated with the gel bait showed that the proportion of nymphs to adults increased at 4 weeks post-treatment, possibly indicating the new emergence of immature stages from oothecae carried by gravid females which were not affected by the treatment. Gravid females were known to reduce feeding and drinking during oviposition period (Cochran, 1983) and this lessened the chances of them getting in contact with toxicant baits.

The results obtained were comparable with that reported by Lee (1998) when baiting insecticide-resistant German cockroaches in food-outlets in Penang, Malaysia using hydramethylnon bait stations. In his study, >90% reduction in cockroach trap counts was achieved after 4-week post-treatment, and the suppression

of cockroach population remained high up to 12 weeks with >80% reduction. Relatively similar results were reported by Milio et al. (1986). Appel (1990), however, found a lower reduction rate of 50% in his studies in Tallassee and Opelika, Alabama, USA which concurs with the studies by Ogg and Gold (1993) in Nebraska, USA. The differences in these studies could be due to variation in cockroach population responses to baits, as well as treatment rates and techniques.

Undoubtedly, the cockroach gel bait evaluated is a highly attractive formulation to the German cockroach. From our observation, the cockroaches were attracted to feed on the bait almost immediately upon detecting the bait over a short distance (e.g. 10–20 cm).

In conclusion, the hydramethylnon gel bait tested in this study demonstrated high performance and is an effective method to manage German cockroaches in food-outlets in Thailand. More studies should be undertaken to further substantiate current findings.

#### ACKNOWLEDGEMENTS

The authors thank Wichai Chivakanit (WellTech Healthcare Pte Ltd., Thailand) for the supply of the hydramethylnon gel bait and partial funding of this study, and Siriwat Wongsiri (Chulalongkorn University) for his encouragement on this project.

#### REFERENCES

- Appel, A. G. 1990. Laboratory and field performance of consumer bait products for German cockroach (Dictyoptera: Blattellidae) control. *J. Econ. Entomol.*, 83: 153–159.
- Brenner, R. J. 1995. Economics and medical importance of German cockroaches. *In: Understanding and Controlling German Cockroaches.* (ed. Rust, M. K., Owens, J. M. and Reiersen, D. A.), pp. 77–92. Oxford University Press, New York.
- Brenner, R. J., Barnes, K. C., Helm, R. M. and Williams, L. W. 1991. Modernized society and allergies to

- arthropods: risks and challenges to entomologists. *Am. Entomol.*, 37: 143-155.
- Cochran, D. G. 1983. Food and water consumption during the reproductive cycle of female German cockroaches. *Entomol. Exp. Appl.*, 34: 51-57.
- Kang, B. and Chang, J. L. 1985. Allergenic impact of inhaled arthropod material. *Clin. Rev. Allerg.*, 3: 363-375.
- Lee, C. Y. 1997. Medical importance of domicilliary cockroaches. *Sing. Microbiol.*, 11: 14-17.
- Lee, C. Y. 1998. Control of insecticide-resistant German cockroaches, *Blattella germanica* (L.) (Dictyoptera: Blattellidae) in food-outlets with hydramethylnon-based bait stations. *Trop. Biomed.*, 15: 45-51.
- Lee, C. Y., Chong, N. L. and Yap, H. H. 1993. A study on domicilliary cockroach infestation in Penang, Malaysia. *J. Biosci.*, 4: 95-98.
- Lee, C. Y., Hemingway, J., Yap, H. H. and Chong, N. L. 2000. Biochemical characterization of insecticide resistance in the German cockroach, *Blattella germanica*, from Malaysia. *Med. Vet. Entomol.*, 14: 11-18.
- Lee, C. Y., Lee, L. C., Ang, B. H. and Chong, N. L. 1999. Insecticide resistance in the German cockroach from hotels and restaurants in Malaysia. In: Proceedings of the 3rd International Conference on Urban Pests. (ed. Robinson, W. H. Rettich, F. and Rambo, G.W.), pp. 171-182, Graficke zavody Hronov, Czech Republic.
- Lee, C. Y., Yap, H. H., Chong, N. L. and Lee, R. S. T. 1996. Insecticide resistance and synergism in field collected German cockroaches (Dictyoptera: Blattellidae) in Peninsular Malaysia. *Bull. Entomol. Res.*, 86: 675-682.
- Lee, L. C. and Lee, C. Y. 2004. Insecticide resistance profiles and possible underlying mechanisms in German cockroaches, *Blattella germanica* (Linnaeus) (Dictyoptera: Blattellidae) from Peninsular Malaysia. *Med. Entomol. Zool.*, 55: 77-93.
- Milio, J. F., Koehler, P. G. and Patterson, R. S. 1986. Laboratory and field evaluations of hydramethylnon bait formulations for the control of American and German cockroaches (Orthoptera: Blattellidae). *J. Econ. Entomol.*, 79: 1280-1286.
- Ogg, C. L. and Gold, R. E. 1993. Inclusion of insecticidal bait stations in a German cockroach (Orthoptera: Blattellidae) control program. *J. Econ. Entomol.*, 86: 61-65.
- Robinson, W. H. 1988. Roach control with bait stations. *Pest Control*, 56: 56-60.