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Field trial on the control effect of fipronil bait against German cockroaches

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Abstract: A field trial on the control effect of fipronil poison bait against German cockroaches (*Blatella germanica*) was carried out at different restaurant types in Sinchon, Seoul, Republic of Korea. Monitoring was performed applying food baited traps for 2 days per week. Reduction rates of German cockroaches by applying fipronil baits were 90.9% at Korean restaurants, 96.4% at Chinese restaurants, and 89.4% in beer hall kitchens after 4 weeks of the treatment. Overall average of the reduction rate was 93.9%. As the natural reduction rate at untreated restaurants was 11.5% after 4 weeks, a correction of the average reduction rate by applying the Abbot formula was 93.1%.

Key words: German cockroach, *Blatella germanica*, control, fipronil bait

Intensive control activities against domestic cockroaches either by pest control officers or by individual households have been continuously implemented throughout the country since the 1970s. Nevertheless, domestic cockroaches are still a public health and medically important pest, and continue to infest various buildings at moderate to heavy levels.

Recently poison bait application has been most widely employed for cockroach control and the incorporation of this practice into integrated pest management programs has been emphasized. Ree et al. (1995) evaluated the control effect of several poison baits (hydramethylon, chlorpyrifos and fenitrothion) against German cockroaches in apartments. Fipronil is a relatively new phenylpyrazole insecticide which was made available in 1999 in bait formations for use against domestic cockroaches and ants. Lee (2002) compared control effects of fipronil bait to hydramythylon and chloropyrifos baits in laboratory, and 100% mortality of German cockroaches was observed in 5 days. The present study is the first field trial to evaluate the efficacy of fipronil bait for German cockroach control in Korea.

A fipronyl 0.05% bait, which is packaged in a child-proof plastic container ($5 \times 5 \times 1$ cm) was used for the field trial. The monitoring of German cockroach populations was done in 50 restaurants or beer halls at Sinchon near Yonsei University, by setting 5 sticky traps per restaurant/hall for 2 days. There were 21 Korean restaurants, 4 Chinese restaurants and 9 beer halls, which were moderate to heavily infested with cockroaches. Of them, 24 units (13 Korean restaurants, 3 Chinese restaurants and 8 beer halls) constituted the treated (experimental) group, and the other 10 units (8 Korean restaurants, 1 Chinese restaurant and 1 beer hall) served for the untreated (control) group.

For pre-treatment counts of German cockroach populations, 5 sticky traps per unit were placed in kitchens, and these places were not changed for post-treatment counts. The traps were picked up after 2 days and the number of cockroaches per trap was

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Table 1. Reduction rate of German cockroaches with fipronil bait application at different restaurants at Sinchon, Seoul

Type of restaurants	No. of restaurants treated	No. of baits[a)]	Number of German cockroaches/trap/day			
			Pre-count	After 1 week	After 2 weeks	After 4 weeks
Korean restaurants	13	13.6	15.4	3.1	1.2	1.4
			-	(79.9)	(92.2)	(90.9)
Chinese restaurants	3	16.7	44.6	6.6	2.8	1.6
			-	(85.2)	(93.7)	(96.4)
Beer halls	8	13.1	14.2	2.5	1.6	1.5
				(82.4)	(88.7)	(89.4)
Total/Average (Reduction rate)	24	14.5	24.7	4.1	1.9	1.5
				(83.4)	(92.3)	(93.9)

[a)]Average number of baits per restaurant.

Table 2. Natural reduction of German cockroaches at untreated restaurants at Shinchon, Seoul

Type of restaurants	Number of German cockroaches/trap/day			
	Pre-count	After 1 week	After 2 weeks	After 4 weeks
Korean restaurants (8)[a)]	15.7	11.8	11.0	8.2
Chinese restaurant (1)[a)]	28.4	28.1	25.4	20.2
Beer hall (1)[a)]	18.6	20.0	22.7	27.2
Average	20.9	20.0	19.7	18.5
Reduction rate (%)		4.3	5.7	11.5

[a)]The number of restaurants checked.

recorded. Kitchens were 9 m^2 in size on average (range of 5.0-13.2 m^2). Basically 12 bait stations were placed in each kitchen. Some additional bait stations were placed according to kitchen size and the degree of infestation. Post-treatment counts were carried out as the same way as pre-counts, i.e., 5 sticky traps were set in the same places in each restaurant with 2 night collections per week. Evaluation was made at 1, 2, and 4 weeks post-treatment. All the counts were converted to the number of cockroaches per trap per day. Reduction rates were calculated using the formula: % reduction = [(No. of pre-count - No. of post-count)/ No. of pre-count] × 100. Because the number of German cockroaches reduced spontaneously in untreated restaurants (the control group) during the test period, reduction rates in the treated group were corrected using the Abbot formula: [(% test mortality - % control mortality) / (100 - % control mortality)] × 100.

Before poison baiting, the average number of German cockroaches per trap per day was 15.4 (2.9-49.9) in Korean restaurants, 44.6 (18.2-60.7) in Chinese restaurants and 14.2 (4.6-30.8) in beer halls, with a total average of 24.7 cockroaches per trap per day. The total average reduction rates of 3 different types of establishments were 83.4% after 1 week, 92.3% after 2 weeks, and 93.9% after 4 weeks of treatment (Table 1).

Table 2 shows a temporal fluctuation in German cockroach numbers in untreated restaurants during the 4 week test period. Compared with the pre-count number (20.9 roaches/trap/day), the reduction rate in untreated restaurants was 11.5% after 4 weeks, which were probably resulted from 2 days of the trap collections per week for 4 weeks. This was corrected for using the Abbot formula. Thus, the corrected overall average of reduction rate for fipronil treated groups after 4 weeks was 93.1%.

Korean restaurants showed various reduction rates with a range of 62.9-100%, and these different reduction rates were neither correlated with cockroach den-

sities, nor with restaurant size. Of 3 different restaurant types, Chinese restaurants showed the highest reduction rate (96.4%) after 4 weeks. Korean restaurants and beer halls showed similar rates over this period, i.e., 90.9% and 89.4%, respectively.

The population densities of German cockroaches using sticky traps baited with food are given in precount number of Table 1, giving 15.4 roaches/trap/day at Korean restaurants, 44.6 roaches/trap/day at Chinese restaurants, and 14.2 roaches/trap/day at beer hall kitchens. Kim et al. (1995) reported that the densities of German cockroaches in Suwon, Kyonggido in September-October were 4.9/trap/day in Chinese restaurants, 0.5/trap/day in Korean restaurants, 1.1/trap/day in apartments, 1.3/trap/day in tea-rooms, 0.4/trap/day in resident houses, 0.02/trap/day in hospitals, and 0.1/trap/day in hotel rooms. German cockroach densities in Seoul in October 1976 were 7.0/trap/day in apartments, 6.8/trap/day in tea rooms and 9.7/trap/day in restaurants (Ree et al., 1976), and 9.7/trap/day in laboratory animal rooms and 4.5/trap/day in apartments in Seoul in 1994 (Ree et al., 1995).

Several field trials have been conducted to evaluate hydramethylon baits against German cockroaches, and these showed a 100% reduction rate in laboratory animal rooms (MacDonald et al., 1987), 94% in apartments (Patterson and Koehter, 1989), 84.4% in private premises, 99.2% in laboratory animal rooms, and 88.8% in apartments (Ree et al., 1995), whereas the present field trial with fipronil bait showed 93.1% of reduction rate. These different control effects were probably resulted from different environmental factors, rather than insecticide itself. Generally less furniture and food are associated with better control effects when poison baits are implemented.

REFERENCES

Appel AG (1990) Laboratory and field performance of consumer bait products for German cockroach (Dictyoptera: Blattellidae) control. *J Econ Entomol* **83:** 153-159.

Kim MS, Yu HS, Kim HC (1995) Studies on relative densities of cockroach populations in 7 different habitats by using sticky traps in Suwon. *Korean J Appl Entomol* **34:** 391-405.

Lee DK (2002) Evaluation on the lethal, choice and secondary effects of four insecticidal baits against the German cockroach (Blattaria, Blattellidae). *Korean J Entomol* **32:** 107-112.

MacDonald RS, Annette GW, Kinoslita GB (1987) Control of German cockroaches, *Blattella germanica*, using hydramethylnon baits in an animal health facility. *Proc Ent Soc Ontario* **118:** 7-12.

Patterson RS, Icaehler PG (1989) Peridomestic cockroaches suppression with hydramethylnon bait. *J Agric Entomol* **6:** 37-42.

Ree HI, Hong HK, Shim JC, Lee JS, Yoon YH (1976) Studies on Korean *Blattaria* (IV). Population density of cockroaches at different habitats in Seoul city and Kwangju city, 1976. Report NIH Korea **13:** 167-171 (in Korean).

Ree HI, Lee DH, Lee IY, Jeon SH (1995) Field trial on control effect of poison baits against German cockroaches (*Blattella germanica*). *Korean J Entomol* **25:** 219-223.