

Field Trial on Control Effect of Poison Baits against German Cockroaches (*Blattella germanica*)

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ABSTRACT - Small scale field trials on control effect of three poison bait products against German cockroaches(*Blattella germanica*) were carried out in laboratory animal rooms and an apartment building in Seoul. The trial in the laboratory animal rooms showed that hydramethylnon 2% bait treatment gave the reduction rate of 96.6%, 99.2%, 99.0%, 99.5% and 97.8% in 2, 4, 8, 12 and 18 weeks after treatment respectively, and chlorpyrifos 0.6% bait treatment gave the reduction rate of 93.5%, 93.5%, 92.7%, 92.3% and 69.9% in 2, 4, 8, 12 and 18 weeks after treatment, respectively. The trial in the apartments showed that hydra-methylnon 2% bait treatment gave 81.4%, 88.8%, 91.5% and 95.6% of reduction rate on 2, 4, 6 and 8 weeks post-treatment respectively, chlorpyrifos 0.6% bait treatment gave 61.3%, 66.6%, 72.0% and 84.6% on 2, 4, 6 and 8 weeks post-treatment respectively, and fenitrothion MC 5% bait treatment gave 53.2%, 52.5%, 58.5% and 27.7% on 2, 4, 6 and 8 weeks post-treatment. Such differences in the reduction rate would be resulted from many factors, and the amount of the bait would be one of them, as shown that a package of the fenitrothion MC 5% bait and the chlorpyrifos 0.6% bait contained only 19.2g(3.2g×6discs) and 29g(2.9g×10discs) respectively whereas a package of the hydramethylnon 2% bait contained 66g(8.25g×8discs).

Key words: field trial, cockroach control, poison bait

INTRODUCTION

Since 1970s when rapid economic improvement was achieved in Korea, domestic cockroaches has been widely spread throughout the country, particularly in urbans and have been of great concern for public health and for control as well. Insecticide residual spraying indoors had been most widely employed for cockroach control during 1970s and early 1980s and it was shown that cockroaches were effectively

controled by an appropriate application of the residual treatment in field experiment(Mizutani *et al.*, 1961; Ree *et al.*, 1973; Grayson and Robinson, 1976; Shim and Ree, 1982). However, residual spray requires technical skills, and restricted or prohibited in sensitive areas, such as health facilities and food store/ factories. On the other hand, application of toxic baits has many advantages, such as easiness to apply, no restricted or prohibited areas, no environmental contamination, and well acceptance by residents. Discovery of new chemicals and

improvement of bait formulations also have made a contribution towards the use of poison baits. As the result, the control strategy has been changed to apply poison baits both by Pest Control Offices and residents. For evaluating the control effect of three products of the poison bait against German cockroaches, field trials were carried out in small scale at two sites in Seoul in March-August 1994.

MATERIALS AND METHODS

Chemicals: Three poison bait products were tested. The first one is Combat Super Bait, 8.25g of hydramethylnon 2% bait(165mg active ingredient), packaged in a plastic feeding disc. One box contains 8 large discs(8.25g bait×8). The second one is Roach Bait, 2.9g of chlorpyrifos 0.6% bait(17.4mg active ingredient) in a disc. One box contains 10 discs(2.9g bait×10). The third one is Roach Bait MC, 3.2g of micro-capsuled fenitrothion 5% bait(160mg active ingredient) in a disc. One box contains 6 bait discs(3.2g×6).

First trial: Nine laboratory animal rooms of a university located in Seoul were tested. Hundreds of laboratory mice, rabbits, dogs and others are reared in each room. Three rooms were selected for Combat Super Bait, three rooms for Roach Bait, and three rooms for control. The acreage of the rooms was measured and 1 disc station/4m² was placed in each room. For monitoring the density of German cockroaches(*Blattella germanica*), sticky traps manufactured by Yu-Yu Fumakilla Limited were used. Before treatment, 5 sticky traps were set in each room for 2 days and the number of cockroaches trapped were counted. Post-treatment count was carried out after two weeks of the treatment, and thereafter on every 4 weeks intervals. The post-count was done by 2 days collection with 5

sticky traps per animal room. The trial started in March 1994 and terminated in August 1994 after 18 weeks of the treatment.

Second trial: Twelve story apartment building located at south Seoul was selected for the second trial. The size of each apartment unit was 119m². The density of *B. germanica* were checked in the kitchen of all apartment units of the building by setting 5 sticky traps for 2 days. Unexpectedly, the population density of cockroaches was not high enough and/or free of cockroaches in many apartment units. Thirty-four units which were comparatively highly infested with *B. germanica* were selected for the trial. Ten units were selected for Combat Super Bait, eight units for Roach Bait, eight units for Roach Bait MC, and eight units for the control. All the discs in one package of each product was placed in the kitchen of each apartment unit, such as behind the refrigerator, under sinks, in cabinet corners, behind the oven, near garbage cans, and under the cabinet. After treatment, 5 sticky traps were set at the same places for the pre-treatment count in each apartment, and checked the cockroach catches with every 2 weeks intervals. The trial terminated after 8 weeks of the treatment.

All the trap catch data were converted to the number of cockroaches per trap per day, and the reduction rate was calculated by the formula:

$$\begin{aligned} & \% \text{ reduction} \\ & = \frac{\text{no. before treatment} - \text{no. after treatment}}{\text{no. before treatment}} \times 100 \end{aligned}$$

RESULTS

The results of the trial in the laboratory animal rooms is shown in Table 1. In the hydramethylnon bait treated rooms, reduction

Table 1. Field trial on control effect of posion baits against German cockroaches in laboratory animal rooms in Seoul in March-July 1994. (Number of cockroaches/trap/day)

| Poison bait | no. of rooms | Pre-count | no. of cockroaches and reduction rate after | | | | |
|-------------------|--------------|-----------|---|---------|---------|----------|----------|
| | | | 2 weeks | 4 weeks | 8 weeks | 12 weeks | 18 weeks |
| Hydramethylnon 2% | 3 | 12.52 | 0.42 | 0.10 | 0.12 | 0.06 | 0.28 |
| | | - | 96.6% | 99.2% | 99.0% | 99.5% | 97.8% |
| Chlorpyrifos 0.6% | 3 | 9.82 | 0.64 | 0.64 | 0.72 | 0.76 | 2.96 |
| | | - | 93.5% | 93.5% | 92.7% | 92.3% | 69.9% |
| control | 3 | 6.93 | 13.77 | 7.05 | 13.0 | 10.62 | 13.14 |

Table 2. Field trial on control effect of poison baits against German cockroaches in apartments in Seoul in May-July 1994. (Number of cockroaches/trap/day)

| Poison bait | no. of apartment units | Pre-count | no. of cockroaches and reduction rate after | | | |
|--------------------|------------------------|-----------|---|-------------|---------|---------|
| | | | 2 weeks | 4 weeks | 6 weeks | 8 weeks |
| Hydramethylnon 2% | 10 | 7.26 | 1.20 | 0.74 | 0.62 | 0.32 |
| | | - | 83.5(81.4)* | 89.8(88.8)* | 91.5 | 95.6 |
| Chlorpyrifos 0.6% | 5 | 3.50 | 1.20 | 1.06 | 0.98 | 0.54 |
| | | - | 65.7(61.3)* | 69.7(66.6)* | 72.0 | 84.6 |
| Fenitrothion MC 5% | 6 | 3.76 | 1.56 | 1.62 | 1.56 | 2.72 |
| | | - | 58.5(53.2)* | 56.9(52.5)* | 58.5 | 27.7 |
| control | 5 | 3.36 | 2.98 | 3.05 | 3.56 | 3.91 |
| | | - | 11.3 | 9.2 | - | - |

*: Reduction rate in parenthesis is corrected by *Abbott formula* because of the reduction rate in control

rate of *B. germanica* population was 96.6% after 2 weeks of the treatment, 99.2% after 4 weeks, 99.0% after 8 weeks, 99.5% after 12 weeks and 97.8% after 18 weeks. In case of the chlorpyrifos bait treated rooms, reduction rate of the cockroach population was 93.5% after 2 weeks, 93.5% after 4 weeks, 92.7% after 8 weeks, 92.3% after 12 weeks and 69.9% after 18 weeks. The population density in the control rooms did not decrease but slightly increased during the test period.

The result of the second trial in the apartment building is shown in Table 2. Hydramethylnon bait treatment gave 81.4% of reduction rate after 2 weeks, 88.8% after 4 weeks, 91.5% after 6 weeks and 95.6% after 8 weeks. Chlorpyrifos bait treatment gave 61.3% of reduction rate after 2 weeks, 66.6% after 4 weeks,

72.0% after 6 weeks and 84.6% after 8 weeks. Fenitrothion MC bait treatment gave 53.2% of reduction rate after 2 weeks, 52.5% after 4 weeks, 58.5% after 6 weeks and 27.7% after 8 weeks. Some degrees of reduction rate in the control apartment units was shown (11.3% after 2 weeks and 9.2% after 4 weeks), which was not clear whether it was due to sampling error or natural reduction trend of the population. In any case, the reduction rates in the chemical treated units were corrected by *Abbott formula*.

DISCUSSION

High reduction rate in the treatment of both hydramethylnon 2% bait and chlorpyrifos 0.6% bait in the laboratory animal rooms was obser-

ved during the period of 18 weeks post-treatment. In case of chlorpyrifos bait, the reduction rate became decreased from 92.3% at 12 weeks post-treatment to 69.9% at 18 weeks post-treatment, which would be resulted from the less amount of the bait used, as the chlorpyrifos bait was treated at 0.67g/m² and the hydramethylnon bait at 1.9g/m². Similar results of the field trials carried out in laboratory animal rooms and/or in an experimental animal building were reported by previous workers.

Burden and Smittle(1975) reported that kepone 0.125% bait was evaluated against a natural infestation of German cockroaches in an experimental animal building and the reduction rate was 99% at 4 weeks post-treatment and 100% within 13 weeks. MacDonald *et al.*(1987) also reported that 3~6 hydramethylnon bait stations(1.5g of 1.65% bait/station) per 9m² provided 100% control of German cockroaches over a three month period in the laboratory animal rooms. These excellent control results would be resulted from simpler environmental factors, such as less furniture and materials and less food compared to the residential promises. Patterson and Koehler(1989) reported that *Periplaneta fuliginosa* and four other species of peridomestic cockroaches were effectively controlled for 12 weeks with average reductions of 94.0~99.8% by applying the hydramethylnon 2% gel bait formulation around the perimeter of the houses surveyed. This result is also another evidence showing that the simpler environmental conditions, the easier to control not only domestic cockroaches but peridomestic cockroaches outside houses.

There are many factors influencing the control effect of poison bait application against cockroaches, and it is known that quantity of the bait is one of the most important factors.

Milio *et al.*(1986) found that the amount of the hydramethylnon bait play an important

role for the control of German cockroaches, as demonstrated that 0.45~0.60g(a.i.) per apartment gave 94.5% reduction rate at 2 months post-treatment, whereas 0.3g(a.i.) gave 85.6% and 0.1~0.2g(a.i.) gave 49.4% reduction rate at the same period. Appel (1990) reported that hydramethylnon 1.65% bait was superior than chlorpyrifos 0.5% bait or boric acid 40% bait, demonstrating that 84.4% of reduction rate was given by the former and only 16.6% and 12.1% respectively by the later. In our second trial in an apartment building, three different formulations were compared. The result showed that hydramethylnon 2% bait gave the highest reduction rate(95.6% at 8 weeks post-treatment), chlorpyrifos 0.6% bait the next(84.6% at 8 weeks post-treatment), and fenitrothion MC 5% bait the least(58.5% at 6 weeks and 27.7% at 8 weeks post-treatment). Such differences on control effect among three formulations would be resulted from many factors, and it would be difficult to analyze each of the factors. However it is clear that the amount of the baits should be one of them. In each apartment unit, one package of each formulation was placed in the kitchen, and one package contained 8 disc stations(8.25g×8discs=66g) in case of hydramethylnon 2% bait, 10 disc stations(2.9g×10discs=29g) in case of chlorpyrifos 0.6% bait, and 6 disc stations(3.2g×6discs=19.2g) in case of fenit-rothion MC 5% bait.

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摘 要

독먹이에 의한 바퀴 방제효과 야외시험

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최근 널리 사용되고 있는 몇가지 독먹이 제제의 바퀴 방제효과를 평가하기 위하여 서울 시내 모대학의 실험 동물 사육실과 한 고층아파트 건물을 대상으로 소규모 야외시험을 실시하였다. 실험동물 사육실에서는 hydramethylnon 2% 제제 설치시 2주 후 96.6%, 4주 후 99.2%의 방제율을 보였고 이와같은 방제효과가 조사기간인 18주(97.8%) 까지 계속되었다. Chlorpyrifos 0.6% 제제의 경우는 설치 2주 후 93.5%의 방제율을 보였고 12주까지 동일한 수준으로 계속된 후 18주에는 69.9%로 감소하였다. 고층아파트의 경우, hydramethylnon 2% 제제 처리시 2, 4, 6 및 8주만에 각각 81.4%, 88.8%, 91.5% 및 95.6%의 방제율을 보였고, chlorpyrifos 0.6%의 경우, 처리 2, 4, 6, 8주에 각각 61.3%, 66.6%, 72.0% 및 84.6%의 방제율을 보였다. Fenitrothion MC 5%의 경우, 2, 4, 6, 8주에 각각 53.2%, 52.5%, 58.5% 및 27.7%의 방제율을 나타냈다. 이와같이 각 제제의 방제율이 큰 차이를 보인 원인은 여러가지가 있을 수 있겠으나, 그중 한 요인으로는 설치한 약제의 양을 들 수 있을 것이다. 즉 1 box에 들어있는 독먹이의 양을 비교한 결과 hydramethylnon 66g(8.25g×8discs), chlorpyrifos 29g(2.9×10discs)였고 fenitrothion MC는 19.2g(3.2g×6discs)이었다.