Comparison of IPM and Baiting for Cockroach Control in Public Housing

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ABSTRACT The cost and effectiveness of a cockroach Integrated Pest Management (IPM) program compared with bait alone treatment in public housing were studied in 2004. Twelve apartment buildings were divided into two groups: bait treatment and IPM. Apartments in the bait alone group were treated with Maxforce® FC Select or Maxforce® Roach Killer Bait Gel. For the IPM group, cockroaches were flushed and vacuumed at the beginning of the study; sticky traps were placed in all apartments to monitor and reduce cockroach numbers; educational materials were delivered to the residents; and Maxforce FC Select or Maxforce Roach Killer Bait Gel were applied to kill cockroaches. The IPM (n = 12) and bait only treatment (n = 11) resulted in 100.0% and 94.6% reductions in trap catch after 16 wk. At 29 wk, only one apartment in the IPM group had a high level (>12 cockroaches) of cockroach infestation. In contrast, 5 apartments in the bait treatment group had high levels of infestation at 29 wk based on overnight trapping counts; thus, IPM is a more sustainable method of population reduction. The cumulative cost of IPM was significantly higher than that of the bait treatment. The median costs per apartment during 29 weeks were $64.8 and $35.0 for the IPM and bait treatment, respectively.

Introduction

- German cockroach, *Blattella germanica* L., is one of the most common indoor pests in low-income housing (Fig. 1).
- Cockroaches not only spoil food, but also transfer pathogens and cause allergic reactions and asthma.
- Current cockroach control is mainly by applying insecticides (sprays, dusts, and baits).
- Repeated application of insecticides causes resistance in German cockroaches. All gel baits, which are predominant cockroach control tools in the U.S., are subject to failure due to resistance development in German cockroaches.

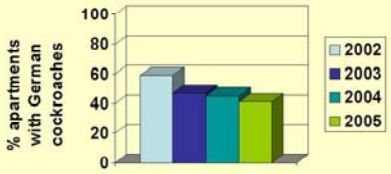

Fig. 1. Cockroach infestations in public housing (Gary, IN). *Source: Purdue University.*

Objectives

- Compare the cost and effectiveness of Integrated Pest Management (IPM) and bait treatment for German cockroach control in public housing.

Methods

- Twelve buildings were selected. Each building had 4-6 apartments (Fig. 2).
- Initial German cockroach population levels were surveyed by using 6 sticky traps per apartment (Fig. 3). The traps were placed in the cabinet above the kitchen sink, in the cabinet below the kitchen sink, beside the stove, beside the refrigerator, in the utility room, and behind the toilet in the bathroom.
- The buildings were randomly divided into two groups: baiting or IPM.
- In the baiting group, apartments were only treated with gel baits (Maxforce FC Select or Maxforce Roach Killer Gel) according to the labels.
- In the IPM group, apartments were treated with flushing and vacuuming (Fig. 4), gel baits, and sticky traps. Residents received educational materials or training on house keeping.
- The cost and effectiveness of the two treatments were monitored at 2, 4, 8, 12, 16 wk and 7 months.

Fig. 2. Exterior view of the apartment buildings.

Fig. 3. Sticky traps for monitoring cockroach populations.

Fig. 4. Flushing and vacuuming to remove cockroaches.

Table 1. Initial trap counts in the two treatment groups. Those apartments with ≥ 12 cockroaches after overnight trapping were included.

Treatment	Number of apartments	Cockroach numbers			
		Mean	Median	Min	Max
IPM	12	130.1	113.5	13	354
Bait	11	117.1	146.0	14	312

Results

Initial Infestation Level. A total of 12 buildings (66 apartments) were selected and were randomly divided into two groups (IPM and baiting). Among them, 41% and 44% of the apartments had German cockroach infestations based on overnight trap counts, respectively. Among the infested apartments, 23 had ≥ 12 cockroaches (Table 1).

Treatment Efficacy. Both treatments were highly effective in reducing the cockroach infestations. The IPM treatment resulted in a significantly greater trap catch reduction than the bait treatment (Table 2). At 7-month, 16% of the IPM group (n = 34) had cockroaches. One apartment had high cockroach numbers. In contrast, 28% of the apartments in the bait treatment group (n = 32) had cockroaches. Five apartments had ≥ 12 cockroaches.

Table 2. Effectiveness of the treatments on trap counts.

Treatment	% Trap catch reduction (Mean ± SE)*					
	2 wk	4 wk	8 wk	12 wk	16 wk	29 wk (7-month)
IPM	65.3 ± 10.2a	76.4 ± 11.1a	90.2 ± 7.2a	81.0 ± 14.0a	100.0 ± 0.0a	98.3 ± 0.0a
Bait	48.2 ± 14.1a	18.3 ± 23.5**b	96.2 ± 2.0a	94.0 ± 4.7a	94.6 ± 2.8b	85.8 ± 0.1a

* Means within each column followed by different letters were significantly different (ANOVA, P ≤ 0.05). **Two apartments had large negative values.

Effect of Non-Chemical Tools on Reduction of Cockroach Numbers. Among the 12 heavily infested apartments, the median (minimum-maximum) number of cockroaches removed by trapping during the test period was 439 (15-5,783). Nine apartments received vacuuming which removed 300 (10-3,300) cockroaches. Among them, one apartment received two services, one apartment received three services, and the others received one service. For those apartments with ≥ 113 cockroaches in traps during the initial survey, at least 300 live cockroaches were removed by vacuuming.

Effect of IPM on Reduction of Insecticide Use. Similar amount of bait (log transformed) materials were used in the two treatment groups during seven months (Table 3) ($F = 0.1$; $df = 1, 21$; $P = 0.75$). Most of the usage occurred in the first month. For the 29 wk service, the IPM and bait treatment groups used 2.0 ± 1.1 and 6.5 ± 2.5 g per apartment, respectively.

Table 3. Amount of bait usage over 7 months period.

Treatment	# of apartments	Bait used per apartment (g)		
		Median	Min	Max
IPM	12	45	10	215
Baiting	11	50	15	165

Cost of Treatments. Because a good control program for cockroaches usually requires more than one visit, we used the cumulative cost during a 7-month experimental period to compare the two treatment strategies. The median costs of the IPM and bait treatments were $64.8 (17.0-233.5) and $35.0 (10.7-81.0) per apartment, respectively. The greater cost of IPM was mainly due to the additional time needed to perform flushing and vacuuming. Because flushing and vacuuming were only used 1-3 times at the early stage, the cost of IPM decreased significantly from 16 wk. The costs of IPM and bait treatments were $39.5 ± 7.8 and $15.6 ± 1.5 per apartment for the initial treatment, respectively. The costs reduced to $2.8 ± 1.3 and $5.7 ± 2.3 per apartment for the 29 wk service, respectively. The cost for the 29 wk service in the IPM group was similar to that in the bait treatment group.

Discussions

- The goal of the pest management contract needs to be re-defined with human health, especially children's health, in mind. Quality of the service should have priority over the cost.
- Proactive monitoring of cockroach infestations and control results are needed to ensure the quality of the pest management service.
- Delivering IPM information to the residents helps the adoption of community-wide IPM program.
- There is a strong need to improve the current pest management services in public housing. Lack of proper funding, motivation, and coordination are some of the obstacles.

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