

Cockroach IPM & Public Housing

A new study found that community-wide IPM programs can provide greater than 98 percent reduction of German cockroach populations.

Cockroaches continue to be a major pest of inner city public housing units in the U.S. High-level infestations are often associated with the sharing of common plumbing, low levels of sanitation, and a lack of funding and effective management. High turnover rates contribute to the spread of cockroaches among the apartments. Lack of cooperation from tenants interferes with the effectiveness of any insecticide treatments.

Although highly effective baits are available, effective cockroach management in public housing is a challenging task from which many pest management professionals will shy away.

A COMPARATIVE STUDY. To design and evaluate an effective cockroach management program in public housing, we conducted a comparative study on baiting and integrated pest management (IPM) strategies

in an apartment complex from May to December of 2004. The costs, insecticide use, and efficacy of the two strategies were compared. A total of 12 buildings comprising 66 apartments were treated and monitored for cockroach infestations over the seven-month period.

The initial population level was surveyed using six Trapper glue boards per apartment (see Table 1, page 80). The units were divided into two groups: bait treatment only and IPM. Apartments in the bait treatment group were treated only with gel bait (Maxforce FC Select or Maxforce Roach Killer Bait Gel). The locations and amount of bait used in each apartment were determined based on trap counts.

For the IPM group, those apartments with a total of 12 or more cockroaches from six sticky traps during overnight trapping were flushed with CB-38 Extra. This was immediately followed by vacuuming with a HEPA-filter-equipped vacuum cleaner to remove running and dead cockroaches. After vacuuming, 10 to 30 small Trapper glue boards or Victor-M327 glue boards were deployed in each apartment. Maxforce FC Select gel bait was then applied into cockroach harborages.

During subsequent visits, the old traps were replaced if they became dirty or full. More bait was applied to new harborages if cockroaches were still present as determined by monitoring trap counts. Those apartments with fewer than 12 cockroaches were treated by baiting and trapping only. In both treatment groups, Maxforce FC Select was used during the first twelve weeks, and Maxforce Roach Killer Bait Gel was used when baiting was necessary from the 16-week point to avoid resistance development.



Cockroach infestations in public housing are aggravated by such factors as shared plumbing, poor sanitation, high tenant turnover, and a lack of funding for pest control. (Photo: Changlu Wang)

by
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Table 1. Cockroach infestation in public housing units, Gary, Ind.

Cockroach numbers	Percentage of apartments		
	Year		
	2002*	2003*	2004
≥ 12 in six traps	33%	31%	31%
< 12 in six traps	26%	16%	14%
0	41%	53%	55%

Table 2. Effectiveness of trapping and vacuuming on German cockroaches.

Method	Number of apartments	Number of live cockroaches removed per apartment		
		Median	Minimum	Maximum
Trapping	12	439	15	5,783
Vacuuming	9	300	10	3,300

Table 3. Comparison of the total cost per apartment over 29 weeks. Only apartments with 12 or more cockroaches at the initial survey were included.

Treatment group	Number of apartments	Median (minimum-maximum)			
		Time (minutes)	Bait (grams)	Number of traps	Cost per apartment (\$)
IPM	12	49 (10-185)	45 (10-215)	40 (35-131)	65 (17-234)
Bait	11	22 (8-63)	50 (15-165)	0	35 (11-81)

*Figures for 2002 and 2003 are taken from historical data.
Source: Purdue University, Center for Urban & Industrial Pest Management

CLIENT EDUCATION. Since collaboration from tenants is important for successful cockroach control, cockroach IPM education materials were delivered to the tenants. This included information on cockroach biology, behavior, chemical and non-chemical control techniques, and IPM principles. During each visit, residents were asked to cooperate through proper housekeeping, sanitation and reduction of cockroach harborage. A letter was left with residents in the IPM group during each monitoring visit to update them on cockroach control results and recommendations.

Sanitation conditions of the test apartments were rated on a scale of 1 to 5 during each visit and reported to the office. Those apartments with a consistently poor sanitation rating (4 or 5) were referred to the Housing Authority's Community Program Service. The referred residents were required to attend at least 4 hours of housekeeping classes.

Treatment efficacy was monitored using the same sampling method at 2, 4, 8, 12, 16, and 29 weeks after initial treatment. Visual inspections were carried out to determine the presence of cockroaches at 29 weeks.

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During each visit, more bait was applied to new harborage if cockroaches were still present. Those apartments with fewer than 12 cockroaches during initial survey were serviced every 4 or 8 weeks.

Costs of materials and labor were calculated using the following rates: \$0.18 per gram of bait, \$0.09 per small monitoring trap (one-third of a Trapper glue board or half of a Victor-M327 trap), \$60 per labor hour, \$0.025 per gram of flushing agent, and \$1.00 per vacuum use. These rates were determined based on the market price of these materials and services.

RESULTS. Among the surveyed apartments, 42 percent of the apartments had German cockroaches based on overnight trap count. The Oriental cockroach was found in only one apartment. The average number of roaches in six traps per apartment was 42.

The IPM and bait treatments resulted in 100 percent and 95 percent trap catch reduction, respectively, at 16 weeks after initial intervention. At 29 weeks, the trap catch reduction was 98 percent and 86 percent, respectively. Only one apart-

ment in the IPM group had 12 or more cockroaches based on overnight trapping counts. In contrast, five of the apartments in the bait treatment group had 12 or more cockroaches. In the IPM group, 16 percent of the apartments still had cockroaches at 29 weeks based on trap counts and visual examination. Meanwhile, 28 percent of apartments in the bait treatment group still had cockroaches at 29 weeks.

Trapping and vacuuming removed large numbers of cockroaches (see Table 2, opposite page). Flushing and vacuuming were conducted in nine apartments. Among them, one apartment received two services, one apartment received three services, and the others received one service. While the procedure removed large numbers of both live and dead cockroaches, the percentage of cockroach reduction by flushing and vacuuming was not clear because the total numbers of cockroaches in each apartment were unknown.

Because a good control program for cockroaches usually requires more than one visit, we used the cumulative cost during a seven-month experimental period to compare the two treatment strategies.

Education efforts and necessary repairs were not factored into the cost because they were easily incorporated into the existing community service program offered by the housing authority. The median costs of the IPM and bait treatments were \$64.80 and \$35.00 per apartment, respectively (see Table 3, opposite page). The higher cost of the IPM method was due to the time needed to perform flushing and vacuuming. Because flushing and vacuuming were only



Small glue board traps were used to monitor and kill German cockroaches in the apartments. (Photo: Changlu Wang)

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done at the early stage, the cost of IPM decreased significantly after the 16-week mark. The costs of IPM and bait treatments were \$39.50 and \$15.60 per apartment for the initial treatment, respectively. The costs dropped to \$2.80 and \$5.70 per apartment for the 29-week service.

Those apartments with one to 11 cockroaches during the initial survey were



Cockroaches and a spider on a sticky trap. A group of nymphs hatched after the female adult was trapped. (Photo: Changlu Wang)

treated by trapping and baiting or baiting only. The mean costs per apartment during seven months were \$13.40 and \$14.40 for IPM and bait-only treatments, respectively.

Both IPM and bait-only treatments resulted in high levels of control to cockroach infestations. IPM provided slightly better control than the bait-only method. The difference was small; probably due to the effectiveness of the newly marketed Maxforce FC Select bait. Using monitoring traps not only assisted in removing the remaining cockroaches that were not killed by bait, but also helped indicate where the remaining cockroaches were located and the population levels present in the apartments. IPM may require significantly less bait beyond 29 weeks because of the more precise placement of bait as a result of the use of monitoring traps.

The cost of IPM was much higher than the bait treatment for the seven-month period. The higher cost was largely due to the vacuuming procedure at the beginning of the experiment. However, the costs for the services performed at the 29-week point were similar. Despite the fact that

IPM methods required more tools, its cost might continue to be similar to the bait treatment beyond 29 weeks due to greater control and less frequent treatments.

Maxforce FC Select gel bait alone caused 95 percent population reduction at eight weeks, even with generally poor sanitation conditions. This demonstrates that when carefully applied and monitored, gel bait can effectively reduce cockroach infestations to very low levels. However, clutter and inaccessibility in some apartments prevented thorough treatments, and this caused failure of cockroach elimination.

Although the tenants welcomed the free cockroach extermination service by researchers or the contractor, they did not like their sanitation conditions being reported to the office. Residents generally did not like to attend the free housekeeping classes. Some residents temporarily cleaned up or partially cleaned the apartments to meet the requirement by the management office. Thus, enforcement and close monitoring by the management staff is necessary to ensure the success of IPM.

Currently, many public housing apartments receive treatment only when resi-

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dents report cockroach infestations to the office. This claim-based cockroach control practice leaves reservoirs of infestations because some residents do not report their infestations. Furthermore, the effectiveness of insecticide applications is not typically monitored. However, effectiveness of the program should have priority over the cost. Active monitoring and enforcement seem to be the keys to the success of cockroach reduction. Coordination is needed between the housing authority, PMPs and tenants to set standards, goals and commitments.

Tenants had misconceptions regarding the risks and benefits of various insecticides. Some residents only believed in "insecticide bombs" or baits for controlling cockroaches. Some preferred using sprays or dusts. Lack of proper use was evident based on the improper placement of insecticide baits or dusts. Therefore, continuous effort in delivering IPM information to residents is helpful, as is the adoption of a community-wide IPM program.

Extension materials on community-wide cockroach IPM technology are available at [http://www.entm.purdue.edu/ento-mology/ext/targets/e-series/EseriesPDF/E-](http://www.entm.purdue.edu/ento-mology/ext/targets/e-series/EseriesPDF/E-241.htm)

241.htm. Furthermore, there are a variety of effective cockroach management tools on the market. Our experience with the Gary Housing Authority indicates that the management staff is fully aware of its chronic cockroach infestations. However, they lack the proper funding, motivation and coordination to implement more effective and more expensive IPM programs. This study provides new evidence on the severity of the cockroach infestations and on the cost and effectiveness of IPM versus baiting for cockroach management. These findings stress the need for community-wide IPM programs to protect residents' health and the environment.

CONCLUSION. Effective long-term management of cockroach infestations depends on community-wide action. It consists of continuous monitoring using traps or visual inspection, education, enforcement (focused on removing clutter and improving sanitation), and careful application of insecticides to harborages based on monitoring results. Non-chemical tools, such as vacuum cleaners and sticky traps, are also beneficial in removing large numbers of cockroaches in

heavily infested apartments. IPM methods are costlier than baiting programs because of the increased labor involved. However, the cost difference should diminish over time. The IPM strategy not only eliminates cockroaches more effectively, but may also lower insecticide use.

The main obstacles to implementing IPM programs in public housing facilities are a lack of cooperation or understanding on the part of tenants, ongoing sanitation problems, and cost constraints. If these are overcome, IPM programs can reduce cockroach infestations to acceptable levels. 

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