ABQ PROPERTY MANAGEMENT

A Green Approach to Pest Control

A recommendation report that explores eco-friendly alternatives for pest controls used in apartment complexes, especially those used for cockroaches.

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I. Introduction

The purpose of this document is to examine how apartment complexes currently deal with pests in their buildings and to examine green alternative methods. Finding eco-friendly alternatives is important because they allow for less harm to the environment, pose less of a threat to our residents and their pets than the chemicals currently used, and can draw in new eco-conscious residents. The best alternative found was diatomaceous earth, for reasons I'll discuss below. The following sections outline my methodology, provide an account of the results gathered from my research, analyze the results, and state my conclusions and recommendations.

II. Methodology

My overall approach for finding information regarding cockroach infestations was by using Google's search engine. I started by using key terms such as "cockroach insecticides" and "green alternatives to killing cockroaches" to find reputable documentation regarding infestations, how they start, and ways to eliminate them. I then looked through the credited sources of these documents to further research the topic. Aside from Google, I also went to YouTube and searched phrases like "how to exterminate cockroaches" and "eco-friendly insecticides" to find educational videos regarding alternative insecticides for cockroaches. These videos allowed me to visually gauge how these alternatives worked and how effective they truly were. I also looked through the descriptions of these videos and examined the page profiles they came from to ensure that the videos were factual and reputable.

My research methodology can be divided into the following sections:

I. How current, non-eco-friendly insecticides work
II. Green alternatives for current insecticides
III. Effectiveness of found alternative and current insecticides
IV. Cost of each method

Section I: *How current, non-eco-friendly* insecticides *work*

It was important to start out my research by learning how current insecticides work. Really knowing how they work at a fundamental level would allow me to understand how alternatives needed to behave in order to be effective.

Section II: *Green alternatives for current* insecticides

After learning what chemicals/ treatments were effective currently and how they worked, I researched a variety of alternatives. In particular, I looked for green methods that worked similarly to the current standard methods.

Section III: *Effectiveness of found alternative and current* insecticides

Since I explicitly examined alternatives that worked similarly in principle to current methods of exterminating cockroaches, I was able to make direct comparisons between the currently used methods and the alternatives and determine just how effective they are.

Section IV: *Cost of each method*

I ended my research by finding the costs involved with each alternative method as well as the current method.

Despite being thorough, my research does have limitations. Firstly, I am not an expert in pest control, nor am I an exterminator. The recommendations made are rooted solely in the research conducted for this report and not influenced by any prior knowledge. Secondly, research was conducted via the internet. No specific people/ companies were interviewed or surveyed. Lastly, no hands-on experiments were performed. Results of tests and experiments are taken directly from my research and have not been personally verified.

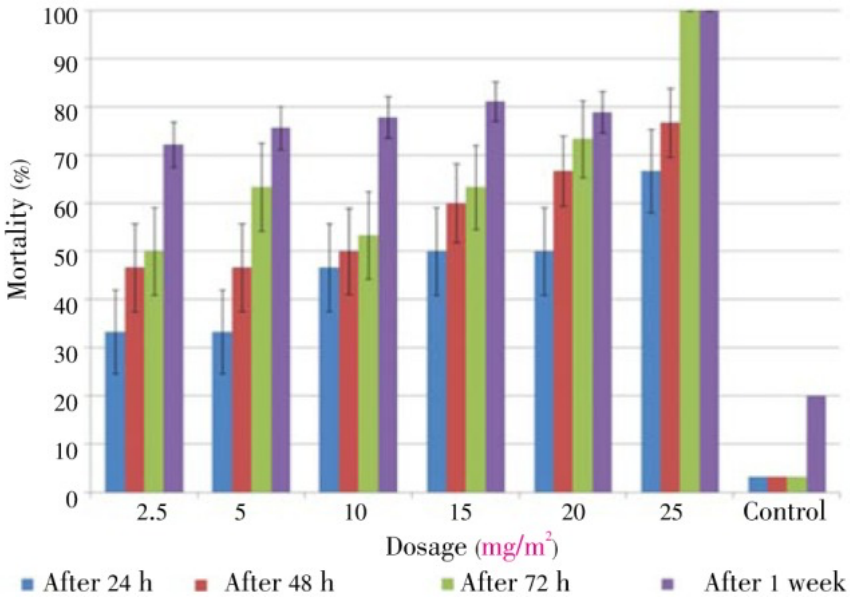
III. Results

The major findings of my research on environmentally friendly alternative insecticides for cockroaches are diatomaceous earth, baking soda, and soap mixed with water.

One of the common ways of killing cockroaches is through the use of dusts. Dusts are effective because they cling to roaches as they walk over the powders. The abrasiveness of these powders breaks down their exoskeletons and dehydrates them, eventually killing them. The most common of these powders will also contain boric acid, that attacks a roach's nervous system in addition to the dehydration. These powders take around 72 hours to kill a roach.[1] Similarly, diatomaceous earth is a

[1] Allred, Brandi. "Boric Acid for Roaches: How Effective Is It Really?"

powdery substance, that comes from fossilized diatoms (microalgae), and shows similar effectiveness. A study from the *Asian Pacific Journal of Tropical Biomedicine* found that the mortality rate of German cockroaches that were exposed to diatomaceous earth was between 33.3 – 81.1%, shown in the table below.[2] The cost of the boric acid powders averages around $0.75 an ounce, and the price of diatomaceous earth can be as low as $0.20 an ounce (1 ounce is 28350 milligrams (mg), making it $0.00000007 per mg).

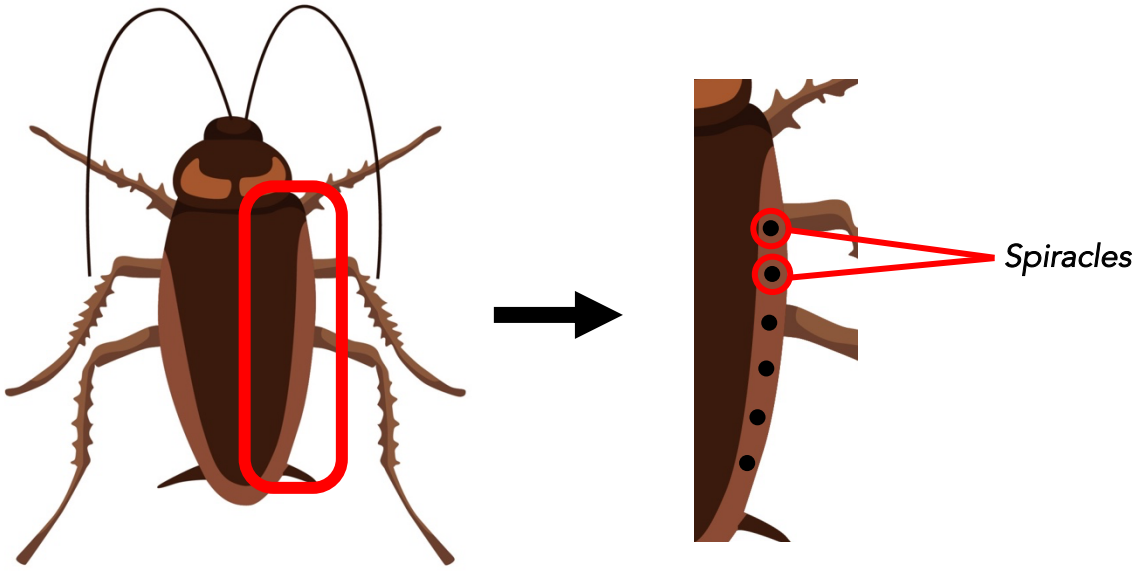


Another common way of killing cockroaches is by using baits. Baits are designed to be ingested by roaches. They work by mixing substances roaches like to eat, namely sugar, with an active chemical, such as boric acid, acetamiprid, or imidacloprid.[3] These active chemicals are toxic to cockroaches and kill them shortly after ingesting them. An alternative to these toxins is mixing baking soda with sugar. Baking soda itself is not toxic to roaches, but the chemical reaction that occurs when they drink water after consuming it is. This is because when water combines with baking soda, a gas is released. This gas expands and creates pressure within the cockroaches that will crush their organs and crack their exoskeletons.[4] A study done at the *University of Cebu* found that both the baking soda and traditional baits were effective at killing roaches. They found that roaches fed traditional baits died on average after 39.28 hours, and that roaches fed baking soda died on average after 40.32 hours.[5] Baking soda costs on average $0.06 an ounce, and cockroach baits range from $0.62 to $2.67 per trap depending on the size/brand. Despite the effectiveness of bait, cockroaches have been

[2] Hosseini, Seyyed, et al. "The Insecticidal Effect of Diatomaceous Earth"
[3] Ogg, Barbara, et al. Cockroach Control Manual
[4] Floyd, David. "Does Baking Soda Kill Roaches? – Repel Cockroaches?"
[5] Ariola, Kimberly, et al. "The Effect of Baking Soda and Sugar Mixture"

shown to develop behavioral resistance if the same bait is used for extended periods of time. It is recommended to switch baits every 3-6 months as needed.[6]

The other common roach killing method is using sprays. Cockroach killing sprays are sold pre-diluted from manufacturers, so that they are ready for use immediately after purchase. They typically contain pyrethrins and pyrethroids that are toxic to roaches and paralyze them. In minutes, the roaches are immobilized, and they die within an hour after being sprayed.[7] Water mixed with soap can also be a spray used to kill cockroaches, but without the harsh chemicals. The way soapy water works is a little different, however. Instead of having toxins and paralyzing agents, the soapy water instead drowns roaches. Cockroaches breathe through small respiratory openings, called spiracles (pictured below). Normally, the surface tension of water causes it to pass over these small holes rather than entering them. When you add soap to water though, the surface tension is lowered, and the soapy water enters these spiracles and drowns roaches. A study done at *Naval Medical Research Unit 3* in Cairo Egypt found that mortality for German cockroaches exposed to a mixture of dish soap and water was between 18-72 hours.[8] Common roach sprays average about $0.27 per ounce, and dish soap averages about $0.21 an ounce. Sprays generally only affect cockroaches that are actively sprayed however, making it more effective for spot treatments and not complete extermination of infestations.



[6] Swain, Chris. "Rotational Recommendations for Cockroach Baiting."
[7] "How Long Does It Take for a Cockroach to Die after Being Sprayed?"
[8] Szumlas, Daniel E. "Behavioral Responses and Mortality in German Cockroaches"

IV. Analysis

Taking into consideration all the research mentioned above, I made 3 overall conclusions. The first being that diatomaceous earth is the best eco-friendly way to exterminate cockroaches. My second conclusion is that soapy water is an effective spot treatment. My last conclusion is that baking soda is an alright alternative but would require a decent amount of maintenance.

Of the eco-friendly cockroach eliminations found, diatomaceous earth is the best option. Not only has it been proven to kill roaches in the same amount of time as store bought dusts containing borax acid, but it has been proven to eradicate up to 81.1% of entire cockroach colonies. Clearly, it is extremely effective as a cockroach insecticide. Diatomaceous earth is also sustainable and chemical-free, making it not only a good choice for the environment but also our residents. Since there are no harsh chemicals or toxins within diatomaceous earth, it is completely safe to use and doesn't cause any harm to humans or animals. What's more, cockroaches are unable to build up a tolerance to diatomaceous earth! Diatomaceous earth is just an abrasive powder that wears down their exoskeleton and dries them up, so there isn't any active ingredient that they can evolve resistance to. While diatomaceous earth isn't the cheapest alternative I found, it is still low in cost, averaging only about $0.20 an ounce.

Although diatomaceous earth is great for dealing with colonies, sometimes only a spot treatments or preventive care is needed, which is when soap and water can be used. It has been shown that simply spraying cockroaches with a mixture of soap and water alone can kill them between 18-72 hours. So, if residents just spot a few cockroaches in their apartment but don't have an infestation, this soapy water concoction can be used to eliminate the roaches. This alternative also isn't something that roaches will be able to readily adapt to. Instead of killing them with some chemical, this method takes advantage of how their respiratory system works, to suffocate/drown them. What's especially nice of this method is that soap and water are supplies people have readily available, so this method can be employed for very little to no cost at all. The major disadvantage of this alternative though is that you have to actively spray each roach, so if they are well hidden or you can't reach them, you won't be able to kill them.

Where sprays only work on visible cockroaches, baits are designed to lure hidden ones, making baking soda a decent alternative. Mixing baking soda with something attractive to roaches, such as sugar, can effectively kill them after 40.32 hours. Meaning this method of killing roaches is the fast of the alternatives researched. Moreover, baking soda is biodegradable and doesn't have any harsh chemicals, making it

environmentally friendly – especially when compared to other manufactured cockroach baits that can contain chemicals that are toxic to fish and mammals. The downside with using baking soda as a bait though is that cockroaches can learn to avoid baits, especially if the same one is used for extended periods of time. This flaw is fixable by mixing baking soda with other appealing substances to cockroaches, such as starch. However, this leads to an increased cost. Since instead of just buying sugar and baking soda, now an assortment of other products is needed. This also complicates the extermination process as each apartment would have to be tracked along with the current appealing substance being used and for how long. Overall, this method is effective but can have a lot of overhead cost to maintain.

V. Recommendations

My best recommendation for an eco-friendly cockroach insecticide is diatomaceous earth. Diatomaceous earth is sustainable and chemical free, meaning it won't harm the environment. It is also completely safe to use around humans and animals, so it won't be a hazard to residents. It is also very cost efficient, only being $0.20 an ounce.

Another eco-friendly option is using a mixture a of baking soda and an appealing substance to roaches. This alternative is biodegradable and doesn't contain any toxins, making it safe for the environment. It too isn't harmful to current residents or pets and works faster than diatomaceous earth. Baking soda is also extremely cost effective, being only $0.06 an ounce! However, cockroaches can learn to avoid this bait, so it isn't an ideal long-term solution.

Although it can't eliminate colonies, I recommend a mixture of soap and water as a spot treatment. Soapy water is very effective at drowning roaches. Soap and water are also substances readily available making it a very convenient cockroach insecticide. This is only effective as a spot treatment though because roaches must be directly sprayed to be killed, making it ineffective against hidden roaches.

Thank you for taking the time to read this report. If you have any questions, need clarification, or have anything regarding this report you would like to discuss further, you can reach out to me at cfrost6@unm.edu.

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