Repellents Vs Non repellents

Its Not all Black And White

FMC
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"Insecticides fall into one of two families either repellent or non-repellent, that's right, isn't it?"

I wish the answer was that simple, but it isn't. Over the years chemical companies have pushed this line to the industry for many reasons. Mainly, to help our customers quickly choose the right chemistry for the job but also because chemical companies are still trying to get their heads around the subject.

Let's look at the definition of an insect repellent. A quick Google search yields the following:
"A substance applied to skin, clothing, or other surfaces which discourages insects (and arthropods in general) from landing or climbing on that surface"[1]

I agree with this definition but there's more to be said:
"Some insect repellents are insecticides (bug killers), but most simply discourage insects and send them flying or crawling away. Many might kill at a massive dose without reprieve, but classification as an insecticide implies death even at lower doses."[1]

Wait a minute. Not all repellents are insecticides? DEET (N,N-diethyl-m-toluamide) and icardin (aka picardin) are two of the most commonly used insect repellents for personal mosquito protection. These products have minimal insecticidal activity and until recently were thought to work by having volatile emissions that attack the insect's olfactory (smell) senses thereby confusing the insect. Recent studies have shown that these products may also mask human odours that the mosquito's find attractive, making humans invisible to detection.

So, if a repellent is not an insecticide, does that mean that insecticides are not repellents?

Interesting question, with not so simple answers. The first answer is it depends on many different factors. These include target pest, insecticide family and in some cases concentration.

Let's start with the first pest that initiated the repellent/non-repellent conversation. The termite.

For many years termites, like all insects were treated with repellent insecticides such as organochlorine pesticides (OCPs). They were highly effective at stopping termites attacking structures and lasted for years. They were also banned because of the human and environmental toxicity.

Synthetic pyrethroids entered the market and this family of chemicals started with first generation molecules such as permethrin. Many innovations were introduced to the market, including bifenthrin which was launched by FMC. Bifenthrin is a highly effective against a broad spectrum of pests including termites and is still the main active ingredient used for termite treatments.

Termites have a much thinner endocuticle (skin) than other insects and have very sensitive antennae. Termites being a colony insect are also very observant of the behaviours of their nest mates. They notice when their mates are distressed and they will respond. If termites detect a threat in the form of panicked or injured nest mates they will vacate the location and often wall off the area to avoid the threat.

Synthetic pyrethroids force a physical response when termites are exposed that will repel other termites from entering treated zones. That is where the repellent designation originated for Synthetic Pyrethroids.

Neonicotinoids (imidacloprid) are deemed to be non-repellent as are Phenylpyrazoles (fipronil) because at low concentrations termites will not show distress despite picking up a lethal dose. But at higher concentrations, insects will respond due to neural attack in the form of tremors, confusion and pheromone discharge. Therefore, these "non-repellents" can be repellent to termites at excess doses.

Okay, the repellent/non-repellent comparison isn't black and white for termites. What about other insects?

This is where it gets really interesting because this is where I tell you that the all of the insecticides currently in your toolkit are basically non-repellent.

It doesn't matter what you treat a surface with, once the treatment is dry, the insect will not be repelled until it is too late and they pick up a lethal dose. The concentration of the insecticide on the surface will determine how far they get and how long they last before they die. Fast acting synthetic pyrethroids like bifenthrin kill very quickly after contact and the treated zones are lethal for a long time. As are fast acting neonicotinoids and high concentrations of phenylpyrazoles.

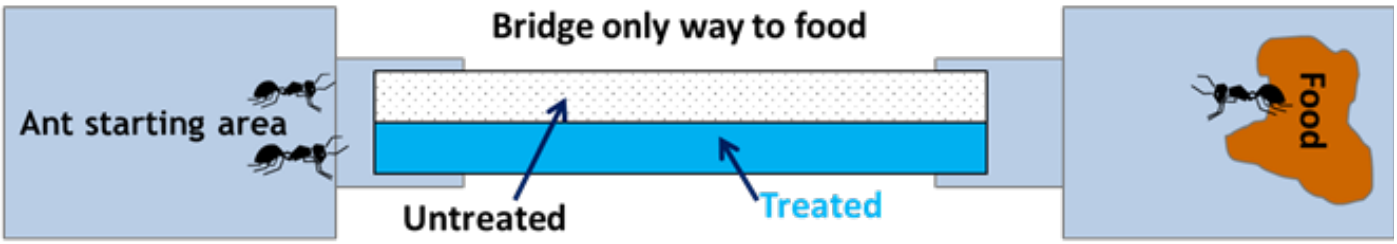
There are even reports of synthetic pyrethroids transferring from treated insects to non-treated insects delivering a lethal dose.

So, can ants be repelled?

As mentioned before, colony insects communicate with pheromones and therefore can “smell” various hazards thus detect “repellent” insecticides. This statement has been proven to be overly simplified and incorrect. A study conducted at the University of Florida by Dr. Philip Koehler and Roberto Pereira titled “Do Repellent Insecticides Repel Ants?” showed that after stepping onto treated surfaces, ants “act quite normally” following their trails and foraging for food. The conclusion of the report was that “In the end there probably is no such thing as a repellent insecticide to ants.”

therefore, a good perimeter treatment will not trap ants inside a house. They will die when they come out and cross the treated area to forage.

A field trial conducted on Argentine ants by Soeprano and Rust at UCR used untreated plywood and panels treated with bifenthrin. Both panels were then placed on the ground under orange trees in a grove. These panels connected a protein food source to attract the ants and force them walk across the treated or untreated panels. All ants died within 15 minutes of exposure when they crossed the treated panels. Additionally, ant



So why do the ants stop crossing the treated areas? The insecticide kills the foraging ants and the foraging trails are really never established. In this situation the insecticide could be considered to be a recruitment inhibitor since it does not repel

numbers crossing the treated panels remained consistent over a six-week period, demonstrating that the ants were not aware the area was treated with bifenthrin.

But what about the German cockroaches?

German cockroaches are tricky because their harbourages are hard to discover and treat. Slow acting insecticides, particularly in baits have been very effective in controlling these insects. The active ingredients have been deemed “non-repellent”. In the case of a bait formulation this is true because a very low concentration of active ingredient is incorporated in the bait. This is to ensure that the cockroach eats as much bait as possible and allows to return and die at the harbourage where the other members of the colony will eat the carcass and ingest a lethal dose of the active ingredient. This is the same for ants, but ants will transport the active ingredient throughout the nest via trophallaxis.

Synthetic pyrethroids do not work in baits

because the insects will taste the active ingredient insecticide in the bait not allowing them to ingest enough active ingredient to bring a lethal dose back to the nest. Furthermore, the fast mode of action of synthetic pyrethroids confuses the insect from returning to the harbourage and discourages other insects from approaching them until they die.

But that does not mean that synthetic pyrethroids are not effective for treating German cockroaches. To effectively use synthetic pyrethroids to control German cockroaches these basic steps must be followed: look for activity, try to find the source of the infestation, treat active areas and points of ingress. Don’t spray and pray!

Thanks for the advice. Now what do I do?

Nothing has changed, other than I’ve removed the repellent/non-repellent element from deciding which product is best for the job. The good news is if a product is approved for use as a professional pest control insecticide then it has been proven to work. Some products and formulations are more effective in certain situations. Baits are great for social insects because the slow acting ingredients are not detected while ingested and can return

to the colony. Fast killing pyrethroids have long residual activity and a broad spectrum to create a long lasting treated zone that insects will not detect until it’s too late. Neonicotinoids can improve the performance of a product by accelerating the speed of kill, widening the spectrum of activity and, introducing a different mode of action, assisting the resistance management.

Refences
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