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Cockroach bait avoidance explained

To the roach, those baits taste bitter

If you've been in the pest control business long enough, you'll remember when cockroach baits first became available more than 20 years ago. The baits revolutionized German cockroach control; they were magical. It wasn't long before, even in your worst accounts, cockroaches were no longer a serious problem. At first we thought we weren't going to have the same resistance problem with baits that we did with sprays. But then, after years with our fingers crossed, some of us noticed that cockroach baits weren't working so well anymore.

We learned the new term, "bait aversion." It turns out that German cockroaches were not developing true resistance to the active ingredients used in the baits. When cockroaches ate the bait, it still killed them. They just weren't interested in eating the bait. The problem seemed to be with the bait matrix or formulation itself, and testing showed that it was the glucose or sugars in the bait that the cockroaches were avoiding. Cockroaches were now "turned off" by the same food ingredients in the same bait that they had eagerly devoured before. And they were passing this bait aversion on to their offspring. German cockroach populations had quickly developed a behavioural resistance to cockroach baits.

Another well known example of behavioural resistance developing in an insect occurred with the malaria mosquito. This mosquito's habit is to rest on the inside walls of homes and huts waiting to take a blood meal. As result of years of spraying walls for mosquitoes, the malaria mosquito has changed its behaviour. It no longer rests on inside walls, preferring instead unsprayed ceilings or exterior walls. Researchers say they need to know more about the mechanism by which behavioural resistance occurs in insects so we can use that to our advantage against cockroaches, mosquitoes, and other pests.

While we've known about this behavioural resistance of German cockroaches for years, we now have an explanation as to how it occurred. North Carolina researchers Ayako Wada-Katsuma, J. Silverman, and Coby Schal (*Science* May 23, 2013) found that cockroaches evolved glucose-avoidance behaviour through a change in the bitter and sweet receptors in their mouthparts. To bait averse cockroaches, sugar tastes bitter and they want nothing to do with it. In fact, when exposed to glucose in tests, glucose-averse cockroaches close their mouths and run away from the glucose. It's not sugars in general that the cockroaches avoid; they happily eat fructose sugars...so far.

Ever since bait aversion was first noticed years ago, bait manufacturers have tried to stay one step ahead of the cockroaches. This kind of resistance was different; instead of having to change the active ingredient in a product, manufacturers had to come up with new bait formulations that cockroaches would feed on.

Developing bait aversion may have saved the German cockroach's life, but it has paid a price in exchange. Cockroaches that won't eat certain sugars are at a disadvantage in a natural environment, one without baits. They don't grow or reproduce as quickly as normal cockroaches and they have smaller egg cases. But when there are glucose baits around, the glucose-averse cockroaches out compete others and become dominant in the environment.

What can you do if you suspect bait-averse cockroaches?

Not all German cockroaches have become bait-averse. There are still plenty of normal cockroaches that are happy to eat glucose. Bait aversion is seen most often in accounts where baits (and especially the same bait) have been in continuous use over a period of years. You can do a little test if you have an account where you know you have a pocket of German cockroaches. Put out fresh gel bait all around the harbourage. If cockroaches don't come out of the harbourage to eat the bait, or if they approach the bait and move away, you may be dealing with bait aversion. If they eat the bait, you should re-evaluate your bait application technique because you can't blame bait aversion. If you're not getting control, try bait. Be sure to remove your old bait applications. The newer bait formulations tend to work more slowly though, so be patient. Don't rely solely on gel baits. Mix in some granular or flowable bait, IGRs, dusts, and maybe even some good old crack and crevice application.

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