

Need to Know

- Straight talk for professionals about pests and pest control products

Volume #3
No. 4
June 26, 2006

Setting the Record Straight on Fipronil Resistance

Baits are the most effective method for German cockroach management. Maxforce® baits have been the most successful cockroach baits for 20 years, and no other bait is as effective against all field strains of German cockroach as Maxforce FC Select with fipronil. To overcome this solid reputation, some competitors have started misusing reports of fipronil resistance in German cockroaches in an effort to mislead PMP's and generate sales of their products. This article will set the record straight about the important differences between bait aversion and insecticide resistance.

Bait aversion: Aversion occurs when populations develop a feeding aversion to one or more food ingredients in baits. Aversion is a behavioral trait that is passed on to offspring and was first documented to glucose (Silverman & Bieman 1993). Recently, the resurgence of a more complex bait aversion was reported (Harbison et al. 2003). After extensive research, Bayer Environmental Science introduced Maxforce FC Select, a new bait formula that provides 100% elimination of both bait-averse and normal cockroaches.

Insecticide resistance: The history of German cockroach resistance to insecticides dates back to the 1950s and the use of chlordane. Later, resistance was demonstrated for organophosphates (Diazinon, Dursban) and carbamates (Baygon). As pyrethroids became popular, German cockroach populations developed resistance to this important class.

Despite this history, only one well-documented case of insecticide resistance in baits has been discovered (baits containing sulfluramid; Schal 1992). While numerous studies have been conducted, to date no resistance has been confirmed with hydramethylnon, the active ingredient in several Maxforce cockroach bait formulations.

So what do we know about fipronil resistance in German cockroaches?

Holbrook et al. (2003) collected German cockroaches from homes where fipronil-based baits had not been used. Topical applications and dietary exposures were made to determine levels of resistance to fipronil.

The main findings of this North Carolina State University study were:

- The Cr-AI strain of cockroaches was resistant to topically-applied fipronil
- A German cockroach consumes at least 1 mg of food in a single feeding, which is equivalent to 50X of LD₅₀ of a susceptible strain, and 3X more fipronil than required to kill even the most resistant individual German cockroaches in the Cr-AI strain
- While recommending against spray applications of fipronil, the authors concluded that **“the concentration of fipronil [0.01%] in bait is more than adequate to kill even the most tolerant of individuals, and for this reason, resistance to fipronil may not increase in cockroach populations.”**

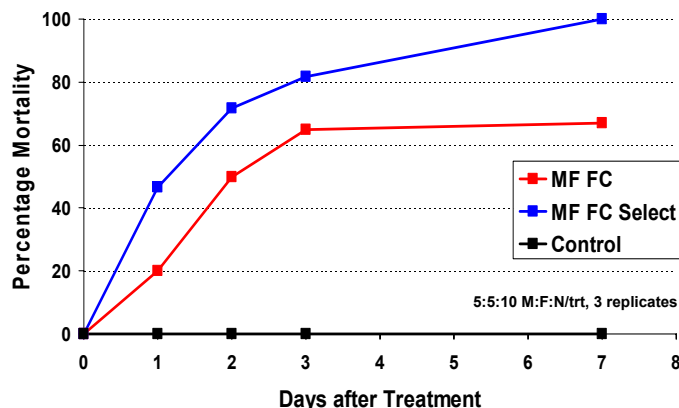


Fig.1. Efficacy of Maxforce Gel Baits against the Cr-AI strain (RR = 17) of German cockroaches.

In studies with the same cockroach strain (Cr-AI) used by Holbrook et al., scientists at Bayer compared the efficacy of Maxforce FC Select and Maxforce FC Roach Killer Bait Gel (both 0.01% fipronil). Maxforce FC Select provided 100% control at 7 days (Fig. 1), a result consistent with the conclusion made by Holbrook et al.

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In a more recent study discussing fipronil resistance in German cockroaches, Wang et al. (2004) reported on bait aversion and insecticide resistance. These Purdue researchers found a field-collected German cockroach strain (Cincy) that had experienced high-level control failure both to Avert and Maxforce FC gel baits. This research did find fipronil resistance in this field strain, but the authors conclude **“the resistance seems mainly to be behavioral [bait aversion] rather than physiological in nature.”**

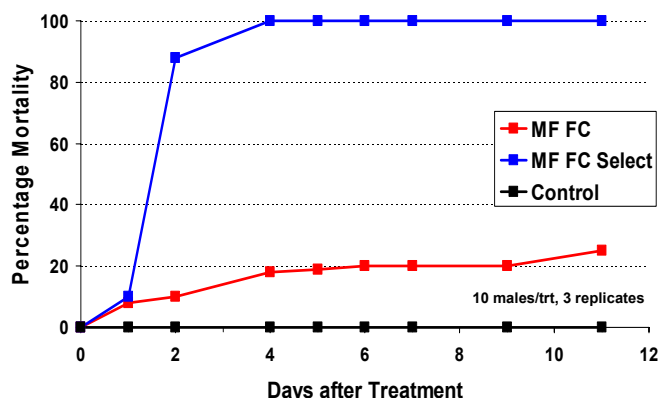


Fig.2. Efficacy of Maxforce Gel Baits against the Cincy strain (RR = 9.2) of German cockroaches.

The scientists at Purdue compared the efficacy of Maxforce FC Select and Maxforce FC Roach Killer Bait Gel (both 0.01% fipronil). Again, Maxforce FC Select provided 100% elimination of the Cincy strain while the older Maxforce formula was ineffective (Fig. 2). **This result proves that bait aversion to food ingredients is very significant and resistance to baits containing fipronil is of no consequence.**

The bottom line: a single feeding on Maxforce FC Select is sufficient to kill 100% of German cockroaches, **including field strains with independently documented levels of resistance to fipronil!**

Summary

- Bait aversion is responsible for the resurgence in German cockroach control problems.
- Maxforce FC Select (fipronil 0.01%) kills even the most finicky cockroaches with a single feeding and is the only bait proven to do so.
- Simple rotation with different baits is not effective. The only effective strategy is to rely on baits that are field-proven to control bait averse cockroaches.
- PMPs should continue to follow sound IPM principles, make thorough bait applications, and stress the importance of good sanitation to customers.

References

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