The Latest Research from California into the Resistance to Bait Insecticides in Field German Cockroach Populations

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The German cockroach is probably the most widespread and successful cockroach that coexists with humans. It Is the most prolific breeder of all the pest cockroaches taking as little as 40 days to develop from hatching to adulthood. Well known issues with German cockroach infestations range from negative social impacts to direct health consequences of allergen production and pathogen transmission. Treatment of German cockroaches is usually restricted to the interior of buildings and further to the kitchen or food handling area within the building. Due to their quick action, low cost, and availability, gel bait insecticides have been extensively used to approach cockroach management. However, after decades of continued use, issues with reduced effectiveness of such formulations are becoming increasingly common throughout the world. Although baits continue to be ubiquitous in cockroach management, multiple cases of resistance towards baits have been reported in the US throughout the past decade, also demonstrating the ineffectiveness of rotation and mixture strategies thought to pre-empt resistance development

Many Pest Managers and housing authority personnel, particularly in several Californian cities, have been reporting the reduced performance of cockroach treatments at residential sites.

The Pest Management Industry is concerned that the last survey on insecticide resistance occurred 30 years ago with limited testing of a single insecticide (chlorpyrifos) and before the widespread adoption of bait insecticides. It was therefore considered timely for an updated study to be conducted about the increasingly reported reduced effectiveness of cockroach treatments. In this study, the five researchers responded to the Pest Managers and housing authority personnel about the reduced performance of cockroach treatments at residential sites.

The study by the five eminent researchers including Chow Yan Lee (well known to many Australian Pest Managers) conducted the study which was published in the Journal of Economic Entomology in December 2021 in a paper titled. “Reduced Susceptibility Towards Commercial Bait Insecticides in Field German Cockroach (Blattodea: Ectobiidae) Populations from California.”

In the study they collected five strains of German cockroaches from the field and evaluated them against five commercial bait products. A susceptible laboratory strain of German Cockroach (coded UCR) with no previous insecticide exposure was used in this study to determine the baseline toxicity of insecticides and served as a standard for comparison. The five commercial bait products were respectively 0.05% fipronil, 1% clothianidin, 0.6% indoxacarb, 0.1% emamectin benzoate and 2% hydramethylnon. In the study, increased survivorship and incomplete mortality towards all baits were recorded in the field strains. As a follow up they conducted topical assays on each strain. All selected compounds for the topical assays were active ingredients in the baits used for the bait evaluations and in addition for abamectin (used in this study as the representative macrocyclic lactone in place of emamectin benzoate) and deltamethrin which is absent in baits, but commonly found in many residual insecticide spray products.
These findings demonstrated multiple resistance towards all tested commercial bait insecticides except abamectin, a member of the family of macrocyclic lactones suggesting the effectiveness of abamectin in resistance management programs. Abamectin performed comparatively well amongst all insecticides with the highest overall mortalities.

Australian Pest Mangers are fortunate to have access to an abamectin based cockroach gel bait from PCT in **Avert Cockroach Gel Bait** containing 0.5g/kg abamectin for use in resistance management programs.

Bait insecticides are popular due to oral exposure being the primary mode of entry. This circumvents the need for toxicants to penetrate through the cuticle, and cockroaches may acquire doses far greater than the minimum for mortality if the bait matrix is highly palatable and active ingredient concentration is sufficient.

Pest Managers need to know that consistent exposure to excessive lethal doses can increase the potential of high resistance levels, and research by scientists has demonstrated that, judicious use of cockroach insecticides can result in further overall resistance development even if populations begin with minimal resistance.

The scientists conducting this research have concluded that more research into areas such as accessible methods to screen for insecticide resistance in the field to improve product selection, the incorporation of insecticide synergists to improve the efficiency of individual insecticides, or other novel strategies to combat resistance will be vital for the continued reliance on cockroach baits.