

BIOLOGICAL OPTIMIZATION OF MICROENCAPSULATED DIAZINON FOR USE AGAINST *BLATTELLA GERMANICA* (L.)

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Diazinon is a liquid insecticide with a relatively high vapour pressure (1.4×10^{-4} mm Hg at 20°C). Microencapsulation has long been known to greatly improve the residual effect of diazinon on surfaces, against household insects. CIBA has state-of-the-art facilities for microencapsulation and an in-house laboratory for testing the efficacy of household insecticides. It was therefore a small step to test a wide range of specifications for optimal biological activity against *Blattella germanica*. Physical aspects set certain limits on capsule size, stability etc. but, within this frame, a simple efficacy test led to tighter selection of optimal capsule size, wall thickness and excipients for good residual activity.

Small panels were sprayed on a conveyor belt at 50 ml aqueous suspension per m². The spray deposits were stored for various intervals at 25°C and 55% relative humidity. Sets of 10 adult male *Blattella germanica* were exposed to each panel for one hour at 22°C and 55% r.h. and held, with food, for a further 24 hours before mortality counts were made. (For bioassays with other insects the procedure was adapted as necessary.)

The first experimental CS (Capsule Suspension) formulations contained 50% w/v stabilized, microencapsulated diazinon. Over 200 variants were made and 27 were selected for bioassays which concentrated on relative efficacy of aged spray deposits, at partially effective concentrations on hardboard, glass and softboard. This led, in dialogue with formulators, to a rapid optimization process. In the final stage, the a.i. (active ingredient) content was reduced to 30% w/v stabilized diazinon, allowing more scope for excipients to improve the physical characteristics. A further five samples with key capsule specifications were bioassayed on hardboard. Excellent results were obtained with a specification containing capsules with a median diameter of 20 µ. The concentration of 0.15 g a.i. per m² was effective for at least six months.

A range of concentrations of two capsule specifications (2 µ and 20 µ diameter), on hardboard, demonstrated the superiority of the larger capsule for residual activity against *Musca domestica*.

Supplementary tests were made for activity against American cockroach, mosquitoes, ants and woodlice. The concentration of 0.15 g a.i. per m² of the chosen formulation was effective on glass and hardboard against *Periplaneta americana* for at least six months and on both wool and nylon carpets, against *Ctenocephalides felis* adults and larvae, for at least 19 weeks. This concentration aged for three months on hardboard, was effective against adult: *Aedes aegypti*, *Culex pipiens*, *Lasius niger* and *Oniscus asellus*.

The production process was scaled up and biological efficacy monitored at each stage with *Blattella germanica*. Laboratory bioassays with production samples confirmed the excellent residual efficacy. Samples were supplied to other institutions for laboratory and field testing.