MICROCAPSULE STRUCTURE: ITS EFFECT ON THE EFFICACY AND BEHAVIOUR OF AN INSECTICIDE

M. A. HOPPÉ, P. J. WEGE, A. F. BYWATER, AND S. D. WEEKS
ZENECA Agrochemicals, Jealott's Hill Research Station, Bracknell, Berkshire, RG42 6ET UK

Insecticide treatment of surfaces is a well proven technique for the control of insect pests in the urban environment. The aim of these applications is to leave a residual deposit of insecticide which remains lethal to the target insect for an extended period.

However, the efficacy of these treatments can be reduced due to loss of the active ingredient through volatilisation, photodegradation, chemical reaction with, or movement into, the treated surface. One way of minimising these effects is to use microencapsulation technology, where the insecticide active ingredient is protected from the environment by a polymer wall.

Using two of Zeneca's microencapsulated lambda-cyhalothrin insecticide formulations, (Demand CS® and Karate Z®) evidence is presented to demonstrate how the behaviour and bioefficacy of these formulations are dependent on the microcapsule wall structure. In particular the speed of knockdown and residuality of the formulation are highly dependent on these factors.

The thicker, highly cross-linked polyurea wall of the Demand CS® microcapsules increases residuality, especially on porous surfaces by slowing the rate of diffusion of lambda-cyhalothrin onto the surface. Electron-microscopy revealed fully intact microcapsules 25 weeks after application to a cement surface. When capsules are picked up by insects, the waxy cuticle provides a sink for the lipophillic capsule contents. This facilitates the rapid diffusion and transfer of the insecticide into the insect. As a result, knockdown times are only slightly slower than for EC formulations.

In contrast, the thin, weakly cross-linked (Zeon Technology®)Karate Z® microcapsules release lambda-cyhalothrin immediately after the spray deposit dries. This results in a rapid knockdown and a flushing effect indistinguishable from that obtained with EC formulations. However, on porous surfaces, Karate Z® shows reduced residuality compared to Demand CS®. This is due to the adsorption of the released active ingredient by the substrate, in a similar manner to that encountered with EC formulations.

Proceedings of the 3rd International Conference on Urban Pests.
Wm H. Robinson, F. Rettich and G.W. Rambo (editors). 1999.