Development of controlled release formulations for agricultural use in Australia

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Two formulation techniques which permit the sustained and controlled release of biologically active substances are being developed by Consolidated Fertilizers Ltd (CFL), Brisbane.

One of these techniques involves the incorporation of the active constituent in a thermoplastic matrix which is extruded as a 1-3 mm strand and chopped to the desired length. Experimental formulations containing insecticides, herbicides and micronutrients have been produced. Release of the active constituent involves a leaching mechanism dependent on creation of a micropore structure within the matrix.

Controlled release insecticide formulations are being evaluated by the Bureau of Sugar Experiment Stations (BSES), who initiated a research program in 1979 (1) to determine whether this type of product could replace currently-used persistent soil insecticides. CFL subsequently became involved with formulation development aspects and has widened its scope of interest to investigations of a number of other insecticide applications. BSES have reported control of the cane grub Lepidiota frenchii in bioassays with formulations of chlorpyrifos two years after the insecticide was placed in the soil (Hitchcock, unpublished data). The insecticides carbofuran and phorate are also being tested in this program.

Controlled-release granular formulations of the herbicides 2,4-D and diuron are being tested by CFL and zinc, manganese and copper formulations are being evaluated by several research organisations.

CFL has installed a pilot extrusion plant to permit research to be undertaken on a larger scale and with a wider range of products.

The second technique, described as 'In-Flight' encapsulation, involves the formation of microcapsules from a liquid spray. The microcapsules consist of a core of active constituent surrounded by a polymeric coating or wall. The formulation is prepared as a liquid dispersion which is sprayed on the target area. A coacervation-phase separation process, which results in the formation of a microcapsule, takes place during droplet formation, transport and impingement (2). Release of the active constituent is by permeation through the polymer. 'In-Flight' formulations of foliar insecticides, soil-applied volatile herbicides and insect pheromones are now being evaluated. These are produced at CFL's agricultural chemicals formulation development laboratory, Strathpine.

1. Anon. 1981. Bureau of Sugar Experiment Stations, Queensland, Australia, 81st Annual Report, 1981. p. 34.

2. Himel, C.M., Neil, D., Howitt, A.J., Hogmire, H. and Cardarelli, N.F. 1978. Proc. 5th International Symposium on Controlled Release of Bioactive Materials. August 14-16.