Enzyme in fast-kill fungus opens the door to efficient pest control

Pune Biopesticides such as the bacterium *Bacillus thuringiensis* have several advantages over their chemical counterparts, in that they do not pollute soil or water, but they also have limitations. They need to be ingested by the pest before they are effective, and that may take a few days. In addition, there is also the possibility that resistance will build up in the insect community.

One form of biopesticide that doesn't have these drawbacks are mycoinsecticide sprays containing fungi. These generally contain fungal spores that settle on the insect's cuticle to germinate, and then penetrate and subsequently kill the insect host. There are no records of insects developing resistance to such sprays.

The main barrier to penetration is the presence of chitin, a tough naturally occurring polymer in the insect's cuticle. The effectiveness of fungal insecticides in killing the insect pests depends on how well the fungi are equipped to get past the chitin barrier.

A team led by biochemist Mukund Deshpande of the National Chemical

Figure 1 Pest mastered. Left, the insect pest *Helicoverpa armigera* damages crops of the pigeon pea. Right, larvae of *H. armigera* are killed within 3 days of treatment with spores of the fungus *Metarhizium anisopliae*.

Laboratory in Pune reports[1] that an enzyme called chitin deacetylase (CDA) helps to soften the cuticular chitin, making it easier for the fungus to enter the insect. Deshpande told *NewsIndia* that this finding can be exploited to develop mycoinsecticides that can kill insect pests on contact.

The researchers made the discovery while they were investigating the role of CDA in the armoury of a strain of *Metarhizium anisopliae* fungus. This fungus can kill larvae of *Helicoverpa armigera*, an insect pest of cotton and other crops, in just three days (Fig. 1).

M. anisopliae uses CDA to convert chitin into chitosan, a much softer polymer that can be degraded by other fungal enzymes. What's more, the CDA is effective even in the presence of melanin, a protein layer that protects the cuticle.

According to the team's report[1], CDA provides two options for pest control. One possibility is to develop mycoinsecticides containing pathogens of insects that can secrete high levels of CDA. The alternative is to use a CDA spray in conjunction with the mycopesticide formulation, to provide a faster kill.

Farmers have tested the *M. anisopliae* formulation developed in Pune on a small scale and found it to be effective against *Helicoverpa armigera* larvae. A large-scale field trial will be carried out in September 2004.

By this time the researchers will have registered the mycoinsecticide with the regulatory authorities, says Deshpande. The work has been funded since April 2000 by the Indian Department of Biotechnology in New Delhi and the Swiss Agency for Development and Cooperation in Berne, Switzerland.

1. Nahar, P. B., Ghormade, V. & Deshpande, M. V. J. *Invertebrate Pathology* **85**, 80–88 (2004).

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