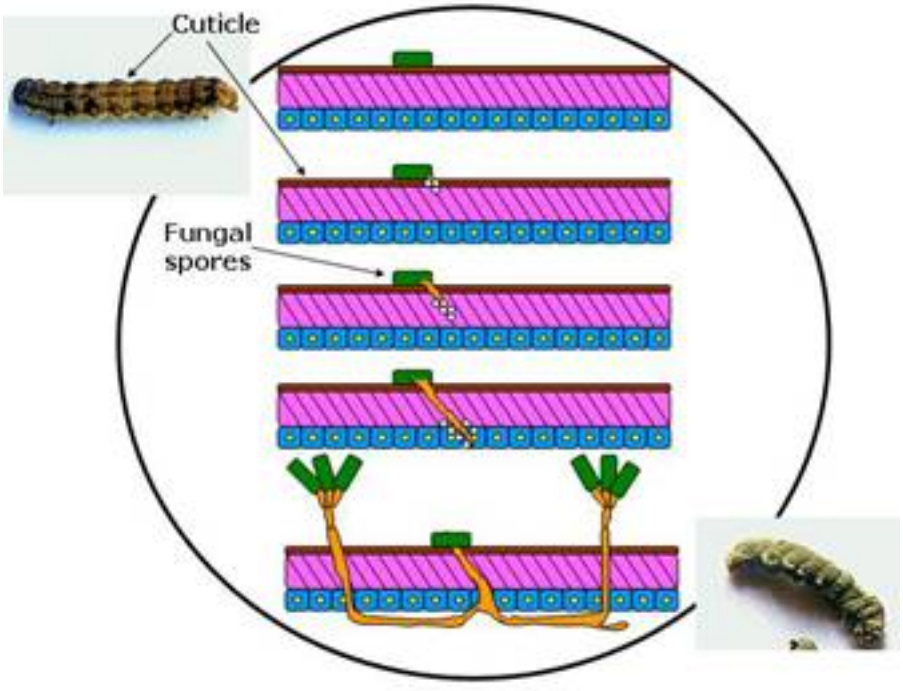
Softening insect cell walls for killer fungi

Scientists at NCL have uncovered the role of certain enzymes in “softening” the cell wall of pests. Thus, these enzymes could greatly enhance the effectiveness of a certain class of pesticides called myco-pesticides. Myco-pesticides use fungi to kill pests. While synthetic chemicals are highly effective pesticides, their excessive use is now a threat to human health and the environment. Moreover, as these have now been used for a long time, pests are developing resistance towards them. To find alternate routes to control the insect menace, scientists have been studying the role of viruses, bacteria and fungi as bio-control agents against insect pests. In particular, the mechanism by which fungal pesticides (or myco-pesticides) act is as follows: the fungi produce dry spores that stick to the body of the insect. After attachment, the fungal spores produce filaments called hyphae that penetrate the body of the insect. These filaments then multiply and poison the pest. Typically, the fungal filaments enter the insect body via wounds or through joints between segments of the insect body or via its sense organs. The main barrier in the penetration process is the hard skin (cuticle) of the insect that is composed of a hard polymer called chitin. Therefore, if the insect cuticle can softened, the pest can be killed faster by fungal filaments.

An NCL team led by Dr. M.V. Deshpande has demonstrated that certain enzymes in conjunction with these fungi can form a highly effective integrated formulation to kill pests. For example, in lab tests, use of the enzyme with *Metarhizium anisopliae*, a fungus used against a pest called the gram pod borer (*Helicoverpa armigera*) took less than three days to eliminate the pest.



The breakthrough made by Dr. Deshpande is to recognize and prove that a particular enzyme called chitin deacytylase (CDA) converts chitin, the hard insect skin polymer into a soft polymer called chitosan. Once the cuticle is softened it is easily penetrated by fungal filaments. Additionally, CDA also protects the fungi from attack by insect enzymes. CDA is now being explored as a component of integrated pest management for faster killing of the insects when used with myco-

pesticides. NCL is now working towards cost-effective production of the CDA enzyme.

This work has been featured in “News India”, a supplementary of Nature, published in India.

The extracellular constitutive production of chitin deacetylase in *Metarhizium anisopliae*: possible edge to entomopathogenic fungi in the biological control of insect pests, Pallavi Nahar, Vandana Ghormade and Mukund V. Deshpande, **Journal of Invertebrate Pathology**, Volume 85, Issue 2, February 2004, Pages 80-88.

Comparative Evaluation of Indigenous Fungal Isolates, *Metarhizium anisopliae* M34412, *Beauveria bassiana* B3301 and *Nomuraea rileyi* N812 for the Control of *Helicoverpa armigera* (Hub.) on Chickpea, Pallavi Nahar, Mahesh Kulye, Priya Yadav, Mounir Hassan, Urs Tuor, Siegfried Keller and M.V. Deshpande, **Journal of Mycology and Plant Pathology**, Volume 33, Issue 3, 2003, Pages 372-377.

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