

To make the cuticle of insects soft for killing fungi

It is often found that insects, mites, pests infect our food, crops, seeds and fibre. Efforts from various researchers for finding out methods to eradicate them are being sought. One such effort for pests found on agricultural crops is being researched by scientists of CSIR-NCL.

CSIR-NCL Scientists have found out that certain enzymes have the potential to soften the cell walls (also known as cuticle) of pests. These enzymes could help in softening the cell walls of a certain class of pesticides called the mycopesticides. Any pesticide that contains live fungi is called Mycopesticides.

Synthetic chemicals are highly effective pesticides, but excessive use of these has made pests develop resistance towards the pesticides and the synthetic pesticides are also a threat to human health and the environment. Hence it has become important to find alternate routes to control the insect menace especially in open fields for agricultural crops.

Chitin deacetylase (CDA) 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. CSIR-NCL is now working towards cost-effective production of the CDA enzyme.

An NCL team led by Dr. M. V. Deshpande has demonstrated that certain enzymes in conjunction with the fungi 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 fungi produce dry spores. These stick to the body of the insect. Once it gets attached to the body of the insect, the fungal spores are found to 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 through wounds or joints which lie 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 be softened, the pest can be killed faster by fungal filaments.

The breakthrough made by CSIR-NCL Scientist, Dr Deshpande was to recognize and prove that a particular enzyme called chitin deacetylase (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.

References:

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