

enzymes enlisted to clean up herbicide residues

Sugarcane growers, like most Australian farmers, rely on agricultural chemicals for efficient and economic production. One of these is the widely used and extremely useful herbicide, atrazine. Unfortunately, atrazine is a mobile chemical with the potential to contaminate surface and groundwater at even the low levels that result from normal use.

Background

In a CRC for Sugar Industry Innovation through Biotechnology project, CSIRO Entomology is working with Orica Australia Ltd to develop a product that will be used to reduce the environmental effects of atrazine. This will ensure its continued availability for use in sugarcane growing. CSIRO and Orica collaborate closely on the project, with CSIRO primarily responsible for the investigative research and Orica primarily responsible for the downstream work. The end products are licensed to Orica through CSIRO.

This sugar work is one of a suite of bioremediation projects at CSIRO Entomology. These all entail the use of enzymes from bacteria to help break down hazardous substances and so remove them from the environment. These are naturally occurring bacteria in the soil which 'feed' on chemicals such as herbicides. The group plans to use enzymes from bacteria that break down atrazine as the basis for this product. Once appropriate enzymes have been found, they can be produced in bulk very cost-effectively.

The research at CSIRO has already shown how effective enzymes can be at bioremediation. The group's success in remediating organophosphate pesticides with enzymes has led to the product, LandGuard™, now being marketed by Orica.

>>> continued over page



Progress

The first step in the atrazine project was to find an enzyme that degrades it. Bacteria were the obvious starting point in the search. They multiply and evolve very quickly so in a few years of exposure to a herbicide they can 'learn' how to use it as a food source by evolving new enzymes. This initial search has been successful and the group has found a bacterial enzyme that breaks atrazine down to much less toxic compounds.

This bacterial enzyme works perfectly well for the bacteria but it wasn't efficient enough to use as an atrazine bioremediation product. The quantities of the enzyme that would be needed would make the product too expensive. So the group is working on improving the enzyme. With a more efficient enzyme, less of it would be needed to do the same amount of work and this would lower production costs and therefore costs to the farmer.

Looking ahead

Orica's experience and success with the organophosphate enzyme product means that the timeframes to commercial sales, once the CSIRO team has obtained the requisite enzyme, should be relatively short.

“With a more efficient enzyme, less of it would be needed to do the same amount of work and this would lower production costs.”

