

Biopesticides: New Pest Management Products for the Future

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As the famous Bob Dylan song goes, “*Times they are a changing...*,” fits well with new directions in pest management research. Biopesticides are emerging as one of the new reduced risk strategies for pest management in agriculture, horticulture, forestry, and urban landscapes. Synthetic, chemical pesticides are the main crop protection tool utilized since the discovery of 2, 4-D in the 1940s. However, since 2000, the sale of chemical pesticides has declined by at least 5-10%, due to a combination of factors such as adverse economic conditions, less acreage grown, the adoption of transgenic crops which use less herbicides, increasing use of bioinsecticides like *Bacillus thuringiensis* and the use of pheromones for mosquito control, banning of cosmetic pesticides in urban municipalities, and public demand for pesticide-free foods and using pesticides that are less harmful to the environment. In 2002, the federal government through the Pest Management Regulatory Agency instituted new programs to i) review all currently registered pest control products to ensure they continue to meet the stringent levels of safety and ii) encourage the registration of new reduced risk products, like biopesticides.

Presently, biopesticides have only attained about 1% of their potential market, but are predicted to grow to 10% over the next 10 years. In Canada, sales of the bioinsecticide *Bt* by the forestry industry are about \$40 million and the new vegetation management bioherbicides currently being registered are estimated to have an annual market value of \$48 million when released. There are 4 types of biopesticides recognized in Canada and the USA: i) natural products or naturally occurring chemicals (i.e. acetic acid or corn gluten meal as bioherbicides), ii) pheromones and semio-chemicals which disrupt feeding and mating, or kill insects (i.e. Cuelure as an insect sex attractant for fruit flies), iii) microbial systems which use fungi, bacteria, baculoviruses, protozoa, and nematodes as crop protectants (i.e. the fungus *Chondrostereum* as the bioherbicide Chontrol for vegetation management in forestry), and iv) insect predators and parasites sold commercially to control mites and insects in greenhouses and agriculture (i.e. lady bird beetles to control aphids).

Biopesticide availability is achieved by either obtaining Canadian registrations for products developed and registered elsewhere (such as USA or Europe) or by creating new bioproducts from research and development within Canada. The latter plan is the primary focus of the scientists at the Saskatoon Research Centre. Although the span of time is considerable for new product development and commercialization, the knowledge gained and the technology platforms developed for fermentation, formulation, and application help to bring a wider variety of new products to the market place. Some of the new biopesticides under development include a fungus for broadleaf weed control in turf grass, agriculture, and forestry; bacteria for control of grassy annual weeds in agriculture; fungus for control of scentless chamomile in agriculture and right-of-way areas; and a baculovirus for control of bertha army worm in canola. Across the country, AAFC has more than 20 biopesticide projects underway which are steadily moving us towards a new generation of bioproducts for pest management.