

Leading the way with biological solutions

In today's agriculture landscape, sustainability is no longer an option – it's a necessity. By Rob Elfick



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At River Bioscience, we are committed to pioneering environmentally responsible pest management solutions that support productivity and ecological balance. As global regulations on chemical pesticides become increasingly stringent, the demand for alternative, low-risk pest control methods is growing.

Biological pest control offers a sustainable and effective way to meet these evolving standards while protecting biodiversity, soil health, and export market access. By integrating biological control into an Integrated Pest Management (IPM) approach, growers can reduce chemical residues, safeguard beneficial organisms, and ensure long-term agricultural viability.

This article explores the importance of alternative pest control methods, the role of biological solutions, and how growers can successfully integrate them into their IPM strategies.

Why do we need alternative methods of pest control?

Pesticide legislation and regulatory frameworks exist around the world to govern

food safety and quality, and to ensure the protection of human health and natural ecosystems. Hence, pest management for agricultural production in both local and international markets is subject to regulation. Echoing what Paula Bester explained in "Maximum residue levels" in the *SA Fruit Journal* Feb/Mar '25, any produce due for export must meet the maximum residue limits (MRLs) imposed by the export destination. An MRL is the maximum concentration of a chemical, or pesticide residue, that can be legally permitted in or on food commodities and animal feeds. Each country has its own MRL legislation and guidelines, which poses a challenge for growers who need to navigate the different requirements in order to successfully export their crops. Many countries now make use of the European Union's MRL standards, as they tend to have the most stringent regulations. The challenge in this is that strict MRL guidelines reduce the pesticide options available to growers for pest management, as well as the amount of chemicals that they can spray. Therefore, adequate pest management requires supplementation in the form of other low-risk,

pest-specific chemical or biological control methods. This is why IPM has become a focal point in all cropping industries.

Biological control can be used to manage MRLs in agricultural production in conjunction with, or as an alternative to, chemical pesticides. There are many types of biological control products available to growers from viruses and fungi to predators and parasitoids. They typically have limited non-target effects and are environmentally friendly. Therefore, biological control reduces the negative impacts of pest management on humans, animals, and their surrounding habitats, thus helping to preserve other beneficial organisms and ecosystem services on farms. Biological control pest management programmes also facilitate greater access to international markets, because of the lack of chemical residues associated with biological control products.

How to use biological control in an IPM programme

An important aspect of the successful use of biological control products is careful integration with other farming practices.

This is especially true when considering the application of living beneficial natural enemies, such as predators and parasitoids. These organisms can be highly effective for managing pests, but they are often sensitive to agricultural environments and pesticide applications. Large-scale conventional agriculture that is characterised by monocultured crops, can impact natural enemy success and establishment through increased habitat disturbance and reduced resource availability.

Furthermore, these organisms are often more susceptible to chemicals than the pests they control. Therefore, to improve biological control efficacy using beneficial natural enemies, augmentative or inoculative releases are typically recommended to allow for population build-up. Conservation practices are also encouraged to promote predator and parasitoid survivability post release. Practices that increase on-farm biodiversity can assist with conserving both resident and applied populations of beneficial natural enemies. For example, growers can grow insectary plants to increase food and shelter for predators and parasitoids, or they can employ no-till farming methods to decrease disturbance events. However, one of the best methods to enhance conservation of biological control agents is to reduce the use of broadscale harmful pesticides.

Understanding the impact of pesticides on biological control agents

There are a few important factors to consider when trying to integrate beneficial natural enemies into an IPM programme that uses chemical pesticides.

These factors are related to the type of pesticide products being used in the IPM programme

- **The active ingredient (AI)** refers to the component of the product that provides the intended biological effect, i.e., that which is contained in the product.

- **The mode of action (MOA)** is used to describe how the product produces an effect in the body of various organisms, i.e., how the product works.
- **Acute toxicity** refers to the direct negative effect that an organism experiences from a single/short-term exposure to a product.
- **Environmental persistence** is the ability of a pesticide to remain active in the environment in its original form before it breaks down. It is often measured in half-life. The longer the half-life, the longer the pesticide is active in the environment.



Trichogrammatoidea cryptophlebiae

Biological control agents can vary greatly in their susceptibility to different AIs and MOAs, depending on the type/species of the agent being used, their life history and the non-target impacts of the pesticides. Notably, some pesticides are more species- and site-specific than others.

Certain groups of broadscale pesticides are particularly harmful. Growers should avoid using them in conjunction with predator or parasitoid applications. They can cause a high degree of mortality in biocontrol agents that will likely impair efficacy and undermine pest management efforts. Due to MRL regulations there are many more pesticides available that are selective or environmentally friendly and are thus, more compatible with biological control agents. These pesticides are typically systemic, less persistent (degrade quickly), or only impact the targeted pest species. Despite the availability of "softer"

pesticides, it is important to remember that each pesticide, crop, pest and biological control agent combination is different.

Therefore, growers are urged to seek out resources that can aid their IPM decision-making. They should always refer to product labels to understand the harmful effects of different pesticides, and so that they only use pest management tools as intended. Consultation with product suppliers (e.g., River Bioscience Chemical List Guideline for *Trichogrammatoidea cryptophlebiae*), chemical agents, researchers and industry officials can help stakeholders determine the preferred method and timing of applications when using multiple products in an IPM programme. For example, as a supplier of the tortricid parasitoid *Trichogrammatoidea cryptophlebiae*, River Bioscience can provide growers with information regarding the impact and longevity of relevant chemicals on the wasp so that they can coordinate wasp applications in a way that maximises their pest control programme.

There are multiple online resources that provide useful information on predator and parasitoid use in different cropping scenarios, including peer-reviewed articles, industry guidelines and the Insect Resistance and Action Committee (IRAC) chemical classification scheme.

Research has demonstrated that biological control products can be as effective as chemical pesticides for managing problematic agricultural pests. However, they require good stewardship and adherence to IPM principles in order to provide the best results. If used correctly, biological control products can simultaneously improve market access and enhance our agricultural sustainability in the long term. 

