Using Biocontrols with TRADITIONAL PESTICIDES

Integrating biocontrols with synthetic chemical controls can add versatility to your program.

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Biological-based pest control methods (biocontrols) have become increasingly popular due to their unique mode of action which is not only safe and non-toxic by nature, but also results in a significantly lowered risk of pest resistance, making it an extremely attractive prospect for many growers. This lowered resistance can aid in achieving optimal results in conditions such as high pest pressure where certain conventional methods may fail or are restricted from use. Biocontrols can be integrated with biochemicals or synthetic chemical control programs, which adds to their versatility and ease of use for growers on a multitude of crops.

As the use of biological-based products and biocontrols increase across integrated pest management (IPM) programs, it can be easy to become confused as to the do's and don'ts when it comes to tank mixing, usage rotation, or using them in conjunction with other chemistries. Developing an understanding of each product and its compatibility is paramount in developing a workable treatment program that takes advantage of all the benefits of each chemistry involved.

As the name suggests, biocontrols include or are comprised of living organisms that are either microbial based (primarily bacteria, fungi or virus based) or insect based, which include natural enemies that act as direct predators or parasitoids of/on other insects. These types of biocontrols are typically a preventative solution and for best results should be applied very early in the growing season. Incompatible bactericides, fungicides or pesticides applied to soon before or after application can adversely impact their performance and in a worst-case scenario completely negate the usefulness of the biocontrol product altogether.

MICROBIAL-BASED BIOCONTROLS

When it comes to microbial-based biocontrols, it is important that the microbes remain viable to maintain efficacy. Selecting chemicals that mix well with biological products mitigate negative effects from the active ingredients of the tank mix partner. Indirect factors such as tank solution pH and water quality can also influence the effectiveness of the biocontrol agents once mixed.

Reading a product's label is the first step in ensuring that you are understanding and following the specific recommendations and procedures outlined for that specific chemistry. It is important to keep this on hand for any products being used. Look carefully for language on labels provided by manufacturers or on the container itself for specific mixing instructions and warnings regarding non-compatible or harmful combinations with other chemicals.

Onsite testing for compatibility with biocontrols may not be simple due to specific lab methods that may be required to assess their viability. Manufacturers of biocontrol products typically maintain a list of compatible and incompatible chemistries based on pertinent testing.

The nature of the active ingredient in the biocontrol and the tank mixing partners can provide basic clues about whether to tank mix them or not. An example would be a biocontrol product based on a fungus such as *Beauveria bassiana* or *Trichoderma spp*. which are in the form of spores (conidia). In this case, any tank mix partner that is considered a fungicide should be avoided or used with caution after consulting the manufacturer.

Depending on the mode of action, such chemistries may have direct impact on the biocontrol in the tank (Ex. oxidizers such as hydrogen peroxide and peracetic acid which are sporicidal in nature; see Figure 1) or through residual action after spraying on crops or applied to planting media. Insecticides on the other hand, that are synthetic or botanical in nature, are generally safe on fungal spores and can be safely mixed. Examples in this case would be synthetics such as Abamectin, Spinosad, and botanical extracts such as Azadirachtin and low rates of Pyrethrin are generally found to be safe when tank mixed with *Beauveria bassiana*-based biocontrols (See Figure 2).

Insecticidal soaps, however, were found to be incompatible and not recommended to be tank mixed with fungus-based biocontrols. Regarding bacterial based biocontrols such as *Bacillus*, tank mixing with bactericides that have direct bactericidal or sporicidal activity need to be avoided to maintain the usability of the active ingredient.

Some biocontrol products in the market may have similar active ingredients but could differ in strain type and/or inert package. A compatibility chart developed for a particular product may not apply for another product with a similar ingredient. The same rule applies with the tank mix partners, which may have the same active ingredient but with a different inert package. It is highly recommended to obtain and understand the specific compatibility information on individual combinations before mixing.

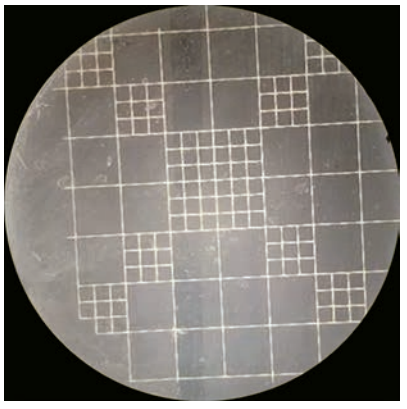

Figure 1. Plate picture showing impact on *B. bassiana* spore germination when tested as a tank mix with a commercial formulation of peracetic acid.

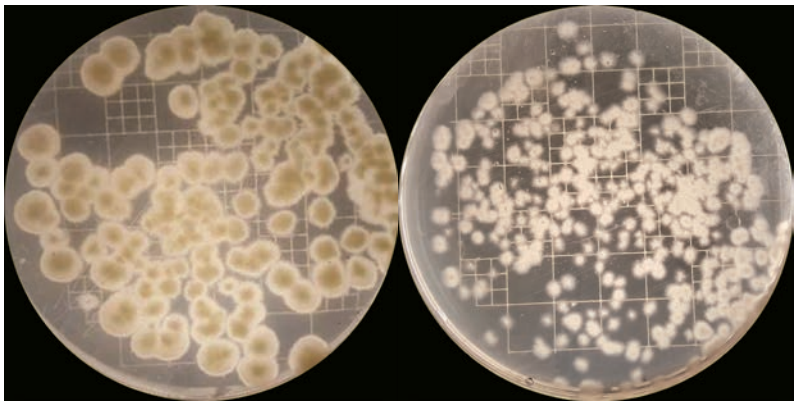

Figure 2. Plate Pictures showing no impact on *B. bassiana* spore germination when tested as a tank mix with a commercial formulation of Azadirachtin and Pyrethrin.

When tank mixing is not an option it doesn't mean the chemistry or biocontrol product cannot be used at all. Rotating the products in a timeline to avoid incompatibilities is a simple method to continue use without tank mixing. It is important to understand the period of when a biocontrol product can be safely applied. This window will typically follow the residual activity duration of the rotation partner.

INSECT-BASED BIOCONTROLS

Insect-based biocontrols are generally predators or parasitoids of other insects. To achieve the best control of insect pests, they are generally released early in the growing season when insect pressure is low and easier to maintain. Pesticide applications during same timeframe will likely have a negative impact on these predators or parasitoids.

Extreme caution should be observed when considering certain insecticide chemical classes such as organophosphates, pyrethroids, etc. that can persist in a greenhouse environment for a long period of time and can have a residual impact on the natural enemies that are released. If required, chemistries with relatively short residual effects such as Abamectin could be considered prior to release of predators or parasitoids.

Once natural enemies are released, growers have limited options with use of insecticides. Certain botanical extracts such as Azadirachtin-based insect growth regulators (IGR) are reported to be safe when used alongside predatory insects and spore based biocontrol products. If the compatibility still isn't clear, the suppliers of insect biocontrols should be consulted for more information about use of specific pesticides before, during, or after release of natural enemies.

BUILD A PLAN

A functioning IPM plan considers a long timeline of both preventative and curative solutions to effectively decrease disease and pests before, during, and after each growing season. There will never be one solution that can be applied once per season and perpetuate for the entire length, so it is imperative that growers build a plan with multiple types of chemistries included. The use of traditional chemicals shouldn't cease when adding biocontrols, a well-rounded plan should thrive using a powerful combination of chemistry and education on how certain products function together yielding a more robust pest management plan overall. gpn

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