BIO-CONTROL : BUILDING NEW OR RETROFITTING?

By Mary Harris, Dept. of Entomology, The University of Georgia

Better plan ahead for biological control

The best route to take when using biological control of pests is from the ground up. If you are planning a new greenhouse or retrofitting an old structure, pest control may be the furthest thing from your mind. But considering pest control in the design of a new greenhouse or retrofit provides a great opportunity to increase your probability of success with biological control.

Here are six areas to consider:

1. **Avoid outbreaks with exclusion:** Biological control agents are most effective at keeping pest numbers low and are generally ineffective at controlling outbreaks. So the best approach is to prevent pests from ever entering production areas.

When building a greenhouse equipped with exclusion screening, various modifications must be made to accommodate airflow. Choose appropriate mesh sizes to exclude specific pests and make modifications in the installation to accommodate any resulting airflow reductions.

All openings into a greenhouse, including vents and doorways, must be equipped for pest exclusion. Install fans at entryways to impede entrance into a greenhouse. Screened vestibules can be built to cover the entrances to multiple ranges where workers come and go.

2. **Confine your crops:** Another way to improve exclusion is compartmentalization. If an outbreak occurs it can be contained more easily within a compartmentalized range than in a vast open growing area. This can be especially useful for multiple-cropping operations.

Confining crops to separate areas simplifies the associated pest complexes and reduces problems of incompatibility of a biological control program for one pest with that of a conventional, chemical-based program necessary for a second pest. The suppression of one pest by natural enemies may be compromised when action against another pest becomes necessary.

This situation threatened the success of a study conducted by Lance Osborne and Oscar Minkenberg at the University of Florida in Apopka, using a parasitic wasp in the genus *Erelmocerus* to control sweetpotato whitefly on hibiscus. Their successful control program for whitefly was threatened when melon aphids appeared on the crop. These researchers were able to compatibly use an insect growth regulator to control the aphids without disrupting the biological control program under way for the whitefly.

3. **Reconsider chemical use:** Some commonly used chemicals leave residues that are detrimental to many beneficial organisms. These residues may persist as long as two months. Most of the predatory mites, for example, appear to be particularly sensitive to synthetic pyrethroid residues. Avoid these chemicals if you plan to use the beneficial mites.

A list of insecticides and fungicides and their respective compatibilities with specific biological control organisms has been compiled by Jim Mattioni of Westgro Sales and Don Elliott of Applied Bionomics (see address, Page 79). Biosys, a producer of insect-attacking nematodes, has a similar list of compatible chemicals for use with nematodes.

4. **Modify your environment:** Equipping a greenhouse with mist and temperature- control systems can also contribute to the ultimate success of a biological control program.

Both temperature and humidity can be manipulated to favor natural enemies over pests. These manipulations have proven useful in programs employing Encarsia for greenhouse whitefly, nematodes for leaf miners, and fungal pathogens for aphids. There are also obvious advantages to adjusting environmental conditions for your crops.

5. **Use the right biologicals:** Biological control is not limited to insect pests -- several costly phytopathogens may be suppressed with antagonistic fungi and bacteria. The range of beneficials that attack insect pests is vast and includes such diverse organisms as predatory mites, parasitic wasps, insect predators, and microbials such as fungi, nematodes, viruses and bacteria. The list of natural enemies is longer than the list of pests because of the specificity of many biocontrol organisms for a host.

It is this specificity that presents one of the stumbling blocks to a more widespread adoption of biological control. Determining exactly which species or strain of a particular natural enemy is most effective against a specific pest requires detailed study. Some biocontrol agents have wide-ranging efficacy. This is not true for all of them.

In some instances certain natural enemies have been promoted for the control of a particular pest on the basis of inadequate data. Ease of commercial production of a particular natural enemy should never be the

basis of recommending its use against a particular pest when little evidence of efficacy exists. Unfortunately, examples of the promotion of inappropriate biocontrol agents have been numerous.

6. Don't depend on a single control: The development of successful biological control programs for any pest requires thorough study. This research is usually done at universities, which depend on external funding. Registration of new pesticides for greenhouse use occurs infrequently; when it does occur the general perception is that chronic pest problems have been solved. The solution is often short-lived, however, because of the development of resistance by a pest to a new chemical. These perceptions have had detrimental effects on biocontrol research.

An example is the development of programs using *Phytoseiulus perscmilis* predatory mites for two-spotted spider mite control. Much of this work was curtailed because of the reductions in interest and funding following registration of abamectin (Avid). With very few other miticides to use in a chemical rotation program, two-spotted spider mites are now showing high levels of resistance to this chemical. So instead of having a well-developed biological control program to implement as the result of continued research, this pest once again presents a control problem with no alternative solution.

Hopefully, this scenario will not be followed with sweetpotato whitefly and the ongoing studies of parasitic wasps as biocontrol agents. The advent of imidacloprid for use against whiteflies should be welcomed as a precious tool in a control program and not as a panacea. Hopefully, support for continued biological control research for sweetpotato whitefly will not diminish as the result of the availability of an effective insecticide.

Three Reasons Biological Control Will Get Bigger.

The use of biological controls by greenhouse growers will continue to increase as the result of a number of factors most of you are aware of:

1. The primary driving force is the dwindling list of registered pesticides for greenhouse use.

2. More stringent re-entry restrictions and worker safety standards preclude the use of some chemicals in realistic production programs.

3. Environmental concerns and increasing demands by consumers for chemical residue-free products.

(Mary Harris is a Doctoral Candidate in the Department of Entomology at UGA. This article appeared in Greenhouse Manager Magazine, August, 1994. It is reprinted with permission.)