

2010 Crop Recommendations Propagation

Overview:

The old concept of “achieving a balance” between the pest and the biological control, has been replaced with “prevention of establishment” due to the availability of fresh biological controls.

While the “balance” concept is still valid in many applications, and essential in outdoor, classical biological control, it was never appropriate for propagation.

A few years ago, Applied Bio-nomics Ltd. decided to reverse the industry trend of maximizing storage and shelf life by offering producers fresh products. We made the decision because of the results of striking trials in numerous facilities, where our fresh product outperformed the stored product available by as much as a factor of 20. The tests were originally done with *Encarsia*, but soon spread to our entire product line.

Research in Canada and Australia has since confirmed that, aside from healthier and more vigorous insects, the avoidance of cold storage ensures “smarter” insects. Insects exposed for even just 24 hours of refrigeration (below 10 C), were unable to make the decision to leave the plant they were on, to look for something better. This characteristic is essential for effective searching behavior.

Based on our research and the scientific communities’, Applied has decided to differentiate itself from the competition by offering only fresh products. In some cases, we offer extremely fresh products, with special attributes for the grower. These products are marketed with the “Max” identification.

Before setting out:

The timing of most commercial propagation, in the fall and winter, means that you will be confronted with hardened pests, desperately searching for a place to over winter. While the pest load is usually low, the few around are the champions of the species, the most pesticide resistant, and are usually physiologically enhanced for the over wintering experience.

Areas within your greenhouse where insects can hide must be cleaned, or inoculated with Biological Controls, such as *Hypoaspis miles*.

Spider Mites tend to the “red phase” in September, sensing the decline of sunlight. “Red phase” Spider Mites are more chemically resistant and many of the Biological Controls for them, such as *Phytoseiulus persimilis*, do not find them as attractive prey. If your house has a history of Spider Mites, control should be achieved before the fall begins. Once the Spider Mites begin over wintering, *Hypoaspis miles* should be applied to the bases of all of the support posts and along the perimeter walls and any other location where the Spider Mites could work their way into the ground.

For the flying pests, such as Whitefly, Aphids, and Thrips, a thorough cleanup of all plant material in the house is essential. Two weeks prior to setting out new plants, you should place at least one **monitoring plant** in the house to attract the surviving pests. The monitoring plant should either be an eggplant, which is attractive to all pests, or something like a dwarf Sunflower, which will be especially effective at removing Thrips, once your young plants are planted out. A daily vacuuming of these plants using a “Dustbuster” can actually eliminate the pests over a 3 to 5 day period. These **monitoring plants** can be shifted to either **banker plants**, if you are only dealing with Greenhouse Whitefly or Green Peach Aphids, or they can be shifted to **killing plants**, by applying a systemic pesticide to them. **Killing plants** are recommended if you are dealing with Bemisia, Foxglove Aphids or Thrips.

Shorefly, while not actually a pest by definition, are a true pest in your house. Not only can Shorefly move fungus spores from plant to plant, they will also transport mites. New research has shown that phoretic behavior in mites is much more widespread than previously believed. Pest mites actually “hitch a ride” by grabbing on to the legs of flying insects. Shorefly populations should be tackled by thoroughly cleaning all of the drains. Shorefly need standing water to breed. We have found that, after a good cleaning and flushing of the drain system, *Atheta coriaria*, released directly into the drains, will have a significant impact. Propagators with flood floors have a significant challenge maintaining drain sanitation.

Propagation:

The high levels of humidity during the early stages exclude many pests. The most significant pest during the germination and first stages is the Fungus Gnat. Fungus Gnats are a significant pest, as the larvae feed directly on the fine root hairs, reducing growth rates and injuring the plant, leaving it exposed to fungal disease. The adults are capable of transporting fungus of all stages, as well as mites. While the incidence of Broad Mite is low, it can cause considerable damage at this stage because they enjoy very high humidity.

Control of Fungus Gnats is best accomplished by applying *Hypoaspis miles* at 1000 mites per square meter at the beginning of the process. An additional application of nematodes may be needed if the conditions favor Fungus Gnats and do not favor *H. m.*

The nematodes will also feed the *H. m.* ensuring high levels of control.

Planting Out:

Preventative releases of fresh Biological Controls will prevent any establishment of pests. Please note that these recommendations are only intended with the use of **Applied Bio-nomics** products. These recommendations will not work using other commercially available Biological Controls.

While **monitoring** and **trapping plants** are strongly recommended, **banker plants must not be used**, as they create false targets. We have found that fresh Biological Controls are capable of tremendous searching behavior. Repeated trials with *Aphidoletes aphidimyza* show that they are capable of finding a single Aphid, 50 feet away, within 5 minutes of release. *Encarsia formosa* have even distribution on yellow sticky traps from one release point per bay (0.25 per square meter rate).

Whitefly Prevention:

Release *Encarsia* “Max” at a rate of 0.5 wasps per square meter weekly. Alternate release points. Use 2 Eggplant per hectare as **monitoring/trap plants**. If any Whitefly are seen, increase rate to 1 wasp per square meter.

If Bemisia or any other Whitefly is seen or anticipated, release *Delphastus catalinae* at a rate of 0.1 beetle per square meter, every 2 weeks. Delphastus are excellent searchers, finding the Whitefly by smell, a single release point per hectare is all that is needed. Despite being reared on Greenhouse Whitefly, they prefer, and will go to the Bemisia sites first. Bemisia are harder to scout, as they tend to “clump” more than Greenhouse Whitefly.

Aphid Prevention:

Release *Aphidoletes aphidimyza* at a rate of 0.2 midges per square meter weekly. This rate is 2 release points of 1000 each, per hectare. It is essential to ensure that the release is neutral, in that no Aphids should be nearby. This ensures that the *Aphidoletes* will disperse and search. **Banker systems** will destroy the prevention system.

If Foxglove Aphids are present, place Petunia **killer plants** throughout.

Spider Mite Prevention:

As mentioned above, a thorough cleanup is essential before the mites begin hibernating. If Spider Mites are still present, release 0.1 *Stethorus punctillum* per square meter weekly. These beetles find all species of Spider Mite by smell and are extremely voracious.

Thrip Prevention:

Thrip prevention is attempted by offering a monitoring/trapping plant that is more preferred than the crop. Dwarf Sunflowers are excellent for this, as they are an obvious flower, and they produce high levels of pollen and nectar.

As all Thrips are tropical, a universal attractant is vanilla. Work done more than 30 years ago by Dr. Ramakers in Holland showed that by adding vanilla to your yellow (or blue) sticky cards, you can attract up to 5 times the number of Thrips.

If Thrips occur, release 1000 *Amblyseius cucumeris* per square meter to the effected site. Also, reinoculate the effected site with *Hypoaspis*, to ensure that they cannot cycle in the house.

Ultra-violet “Bug Zappers” will also help strip the adult Thrips from the house. Add a drop of vanilla to the “Bug Zapper” too.

Other pests, such as Moths and Bugs, must be dealt with, as they arrive. The monitoring/trap plants usually are more attractive to Moths and Bugs, so you should have time to react and take corrective measures. Any screen system will prevent these larger insects from getting into your house.

A continuation or a reoccurrence of Fungus Gnats should be dealt with by using nematodes, provided that there is still a detectable level of *Hypoaspis* present. If you cannot readily find *Hypoaspis* after transplanting, they should be reapplied at a rate of 10 per square meter.

Definitions:

- **Monitoring plant:** any clean plant that is more attractive to pests than your crop. The purpose is to use these plants to identify the initial influx of a pest, or pests.
- **Trap plant:** any plant that is more attractive to pests than your crop. The purpose is to remove pest from your crop by attracting them away from it.
- **Banker plant:** any plant that supports pests long enough for beneficial insects to cycle and control. The concept is to release surplus beneficial insects into the main crop. Applied Bio-nomics does not recommend the use of Banker plants in a preventative system, as they create false targets. It is our opinion that Banker plants only have a role in “pest/predator balanced systems” provided that hyperparasitism is constantly monitored.
- **Killer plant:** a Trap plant that has been laced with a systemic insecticide. This allows chemicals to be used without interfering with the Biological Control program used on the main crop. With the proper documentation, the use of Killer plants should be allowed in most “organic” definitions.
- **“Max”:** a brand used by Applied Bio-nomics to identify special attributes that would benefit growers. Our *Aphidius Max* is unique in that the adults are harvested after mating and feeding, ensuring maximum fecundity and no hyperparasites. Our *Encarsia Max* is guaranteed to be no more than 48 hours from harvest, and never stored below 10 degrees C. Our *Persimilis Max* is sold as an active, logarithmic growth culture. They are harvested on the bean leaves to ensure a correct balance of male to female, a balance of age (eggs to adult) and a balance of prey, to prevent starvation. Pest to predator ratios can be specified.

- **Neutral Release Point:** a location that is as far away from known pest populations as possible. Realistically, this means a central walkway, using the same location every week. This location forces the flying biological controls to disperse.
- **Preventative System:** a concept created by Applied Bio-nomics based on the use of fresh biological controls. The system only works if the program is started when the house is effectively clean. The fresh beneficials will go plant to plant searching for the first arrivals of pests, eliminating them before an infection occurs. If an existing population of pest is present, the preventative beneficials will be tied up unless a surplus of beneficials is present. Our Preventative release rates will accommodate up to 10 pests per square meter. Higher pest loads must be dealt with using spot treatments (for Aphids and Thrips) or higher release rates (for Greenhouse Whitefly) or alternate predators (for Bemisia). If spot treatments are used, the Preventative system can still be used, but extra care must be taken to find the Neutral Release Point.

The benefits of our Preventative System are:

1. The plants remain clean
2. No pesticide use, therefore, resistance management, 10 to 15% bigger and healthier plants, reduced costs
3. Reduced Beneficial costs, the preventative rates are considerably lower than alternate biological control release rates
4. Reduced labor cost, minimal monitoring and 1 to 4 release points per hectare