

Applied Bio-nomics Ltd.

2014 Crop Recommendations Tomato

Overview:

No crop has seen such a significant change in Biological Control strategies as has Tomato. Aggressive cropping techniques such as severe pruning, lower temperatures and higher CO₂ levels have forced significant change in how we manage this crop. In the past few years we have completely changed how we manage this crop from a pest point of view. The re-discovery of “fresh” *Encarsia* has pushed Whitefly down the priority list. The refinement of Don Elliott’s “Bean” strategies has made Spider Mite in Tomatoes an easily managed pest. Tomato has gone from a tough crop to manage to an easy crop to manage in a period of less than 5 years.

Prior to Planting Out:

The house should be thoroughly cleaned. Walls, floors, posts, wires etc should be washed with soap or another suitable cleaning product. Whitefly and Aphids will persist in cool greenhouses for well over 1 month without any plant material available, but they can be killed by a thorough cleanup.

The Spider Mites you had last August are the ones you will be working with again, once the house begins to warm up. If the house has a history of spider mites, they will be hiding in the ground around the posts and the walls. An introduction of *Stratiolaelaps scimitus* (250 mites per square meter) at each post and along the walls will help kill the overwintering spider mites.

Discuss with the propagator the presence of pests. Ensure that your plants are clean because of good pest management practices and not because of a chemical insecticide. If an insecticide is used, get all of the details such as rate and date, as well as method of application.

A few days before the arrival of the new plants, when the heat is ramping up, place Bush Bean plants throughout the Greenhouse at minimum of 1 plant for every 1000 square meters. If any pest survived your clean-up you will see instant results in the case of Whitefly. If the Beans are placed where Spider Mites were previously, they will serve as both early indicators and also as Trapping plants, as Spider Mites greatly prefer Beans to Tomato.

At Planting Out:

Apply *Stratiolaelaps scimitus* or *Gaeolaelaps gillesspiei* (to be called *Ss* from now on) at a rate of 50 to 100 per square meter. Skipping plants can work in clean houses, as the *Ss* will disperse themselves quite well.

Apply *Encarsia Max* at a rate of 0.25 per square meter if no whitefly is detected. If Whitefly is detected, increase rate to 0.5 per square meter. See below; Whitefly Strategy Overview.

Strategically place Bush Beans throughout crop. Extra plants should be placed along perimeter walls and in areas that have a history of Spider Mite.

Early Season:

Watch for the return of the spider mites. The beans become a monitoring device first, as the damage is very quickly seen and the spider mites will prefer the beans over the Tomatoes. As soon as spider mites are detected, the bean plants should be treated with *P. persimilis* at a rate of 2 bean leaves per bean plant (if using *Pp* on bean leaves) or 100 *Pp* adults (twice the rate for vermiculite). The trapping bean plants will then become *Pp* bankers, dispersing *Pp* into the main crop as control is achieved in the beans. These beans should be left as long as possible or

replaced, as the spider mites will often return over a long period of time. Bean plants that have a good balance of *Pp* can have their leaves pulled off and distributed to other Bean plants. See below; Spider Mite Strategy Overview.

Whitefly can be easily managed with fresh *Encarsia* Max. Begin as soon as the plants are set out at a rate of 0.25 per square meter. If any Whitefly are seen, double the rate to 0.5 per square meter. Fresh *Encarsia* has a much lower effective temperature range than stored *Encarsia* and will stay ahead of Whitefly development at the lowest Tomato temperatures. See below; Whitefly Strategy Overview.

Watch for Aphids entering the house. Rates of the preventative release should be 0.3 per square meter per week. Hot spots should be directly attacked with releases of additional *Aphidoletes*. For major infestations, rates of 0.6 per square meter per week should be neutrally released until the numbers are back in manageable levels. In order to achieve quick recovery, the ratio of *Aphidoletes* to aphids must be in the order of 1 to 100.

Thrips should be dealt with when they arrive. *A.cucumeris* (at 100 mites per plant) either directly applied or by slow release packs will manage a thrip attack on Tomatoes, usually until they get bored and move on to a better tasting crop. The *Ss* in the growing media will prevent any of the soil pupating thrips from cycling. If a leaf pupating thrip establishes, such as *Echinothrips*, it is a very serious threat and should be dealt with by doubling the *cucumeris* rate (at least 200 per plant) and by using numerous blue sticky traps with Vanilla extract on them. The vanilla will attract the thrips away from the plant, onto the cards.

If the house has a history of Russet Mite, *A. fallacis* should be applied at a rate of 2 mites per square meter, about 1 month before it typically is detected.

Main Season:

Spider mites should be completely managed by the Bean system. We have seen complete control of Spider Mites without any significant damage in the crop using this system. As new infestations are encountered, simply push a Bean seed into the growing media and, within a week, the Spider Mites will move off of the Tomato and onto the Bean. See below; Spider Mite Strategy Overview.

Whitefly should be under control based on the preventative releases. Any weekly count of over 2 whitefly per card should immediately be responded to by doubling the rate of *Encarsia* to 1 per square meter. In extremely hot situations (over 30 Celsius) whitefly adults will only live for a few days (instead of months) and will not lay eggs. See below; Whitefly Strategy Overview.

Aphid control should be “as needed”. If Aphid pressure persists, double the weekly preventative rate until the pressure abates, then fall back to the low rate.

If the Potato Psyllid occurs, release *Delphastus catalinae*, at a rate of 1 per square meter. *Dc* is capable of finding the eggs of the Psyllid and functioning as a preventative. *Aphidoletes* have also been shown to have some impact on Psyllid by preying on all of the nymph stages, but they must be released directly into the hot spots, as the adults are incapable of finding the Psyllid.

Late Season:

This is the most important time of the year for spider mites. What you do at this time will determine how bad the next year will be. Every effort should be made to eliminate all of the spider mites before the beginning of September. Once the day-length begins to noticeably decrease and the evening temperatures drop, the spider mites begin diapausing. In a diapause state, spider mites are more resistant to chemicals and are not as attractive to the beneficials.

If *Encarsia* Max has been used, Whitefly numbers should be minimal. It is very important not to get complacent with Whitefly and begin skipping *Encarsia* applications. Just because they are not causing you any problems does not mean that they are not there. Saving a few dollars by skipping a few introductions only benefits us, as we will need to sell you a lot more in order to recover. Most people tend to stop *Encarsia* too early. *Encarsia* should be maintained until the last one or two weeks. Allowing a last minute Whitefly buildup is not cost effective.

Spider Mite Strategy Overview:

The development of Don's Bean system, going from Pole Beans 20 years ago to the use of determinate Bush Beans, has seen a drastic shift in the management of the 2 Spotted Spider Mite and its evil cousin, the Carmine Mite. For the cost of a bag of Beans, Tomato growers can turn their attention to other issues.

The use of *A fallacis* was first used to prevent chronic Russet mite problems in New England on Tomatoes. We found that, not only did the *fallacis* eliminate the Russet mite, but the growers who used it had much better spider mite control in the following season. *A. fallacis* will stay in the Tomatoes at low or no spider mite densities, as they are true generalists and will feed on pollen, whitefly, and any other small eggs. Their Achilles heel is that they can't tolerate webbing, like all other *Amblyseius* species.

P. persimilis is still the main beneficial. The leaf product will work about twice as fast and with half the inoculums of the granular carrier version. Tomato growers should only use the "leaf" product, because the leaf product has a balance sex ratio and all stages of *persimilis*. This eliminates the "lag" period observed with the granular product, which is usually 7 to 10 days. In addition, there is some evidence that the few spider mites that may move from the bean leaf to the tomato will "bridge" the toxicity of the nightshade, by feeding briefly on the tomato and giving the *persimilis* a gentler introduction to the tomato.

In areas where *persimilis* has been introduced, and, is working, the pruning of the leaves can shift the balance in favor of the spider mites. If you are pruning an area where you have invested a lot of *persimilis*, rather than drop the leaves on the floor, place them on the stems, so the hatching *persimilis* can remain active on the plant.

Whitefly Strategy Overview:

Whitefly is an insidious pest. Low numbers can give the grower a false sense of security. The longevity and fecundity of the whitefly can lead to overwhelming situations very quickly. The only sure way to control whitefly is to start clean and prevent any significant buildup.

Weekly releases of preventative *Encarsia* must be considered similar to an insurance policy. *Encarsia Max* will reduce the weekly cost by allowing you to use very low rates (as low as 0.25 per meter square). *Encarsia Max* live longer, fly farther, and are actually smarter than refrigerated *Encarsia*. All of Applied's *Encarsia* are held above 11 degrees Celsius and are never refrigerated. *Encarsia Max* is guaranteed to be no older than 48 hours from harvest.

If all weeds are removed and you can be thorough with the de-leafing, it is possible, in theory, to effectively remove all of the whitefly from your house during the Early period. The important stage is when the whitefly begin to advance on the leaves. The transition from stripping the whitefly and retaining the emerging *Encarsia* can be tricky. The system of alternating the pruned leaves has proven to be very effective in bridging the transition period.

Aphid Strategy Overview:

In recent years, the range and species of pest aphids has dramatically increased. Although Tomatoes are not usual targets for aphids, we anticipate that they will continue to make inroads onto new host plants. Aphids on Tomatoes in some areas are now common.

Work in Holland with our distributor has shown that regular, low releases of Aphidoletes will prevent the establishment of all species of aphids. A rate of 0.2 per square meter per week will protect the crop from aphids.

Chemical Integration:

Over the years we have seen failures in our control strategies. In every case, the failures have been caused by interference of the Beneficial with an active, presumed “safe” chemical, or the residual of chemicals applied in the past.

There is no such thing as a “safe” or “soft” chemical insecticide for Beneficials. In almost every case, the Beneficial is impacted to a much greater extent than the pest.

We are not against chemicals, we just respect them more. Chemical insecticides are your parachute, so to speak. They should be used as a last resort. They are well suited in this role because their “economic threshold” is always greater than the Beneficial insects “threshold”. If you can get “fresh”, effective Beneficials and use them properly, you should not need to use any chemicals. This is a good goal, as chemical application usually has a significant impact on your productivity, sometimes as high as 15%.

Based on our experience, if you follow this recommendation and use our products, you should easily be able to get through the year without needing to apply a chemical insecticide.

Applied Bio-nomics LLC