

2010 Crop Recommendations Tomato

Overview:

Tomatoes will continue to be a challenging crop due to the toxic nature of the plant, the cool growing temperatures during the winter and spring, and the cultural practices of deleafing, high CO₂ and daily labour.

With good monitoring practices, the cool temperatures can actually help the control of pests in that the pest is either delayed and slowed in its' introduction (in the case of spider mites) or the development time is extended beyond the deleafing schedule (in the case of whiteflies).

As always, the movement of people in the greenhouse is a major form of dispersal of the crawling pests, such as spider mites. Whenever possible, restrict the movement of people in known hot spots. Enter the hot spots last and then directly leave. Coveralls should be frozen overnight or washed each day, especially for the people that worked in a known infested area.

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 week without any plant material available, but they will be killed with a thorough cleanup.

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 *Hypoaspis miles* (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.

At Planting Out:

Apply *Hypoaspis miles* at a rate of 50 to 100 per square meter. Lower rates can be used on new rockwool or other substrates, but care must be taken to ensure that the *Hypoaspis* is thoroughly mixed. *Hypoaspis* can be diluted with sawdust or vermiculite but it is difficult to maintain an even distribution immediately after the mixing. Skipping plants can work in clean houses, as the *Hypoaspis* will disperse themselves quite well.

Apply *Encarsia Max* at a rate of 0.25 per square meter if no whitefly is detected. At one to two whitefly per yellow card per week increase rate to 1 per square meter. If using regular *Encarsia*, the rate should be doubled. See below; Whitefly Strategy Overview.

At First Flower:

Apply *Amblyseius fallacis* at a rate of 2 mites per square meter. *A. fallacis* is a general predator capable of feeding on all types of spider mites (including Russet mite), whitefly eggs and first instar, thrips larvae, etc., and pollen, which will help them persist in a clean environment. The *fallacis* will be effective until serious webbing develops in a hot spot, at which time they will leave the webbed area. See below; Spider Mite Strategy Overview.

Apply *Aphidoletes aphidimyza* at a rate of 0.2 per square meter per week. The release points must be neutral, away from any known aphids. Any aphid hot spots should be treated with a direct application of *Aphidoletes* or *Aphidius matricariae* (if green peach aphid) at a rate of 1 *Aphidoletes* to 10 aphids. Small hot spots should be treated by releasing some adults from a tray

or with *Aphidoletes* Max, a hanging vial that slowly releases *Aphidoletes* over a 1 week period. See below; Aphid Strategy Overview.

If whitefly are present at any level, increase rate of *Encarsia* Max or *Encarsia*. Any count over 2 whitefly per week is a serious infestation and should be countered by increasing the rates to 4 per square meter for *Encarsia* Max or 6 per square meter for *Encarsia*. See below; Whitefly Strategy Overview.

Early Season:

Watch for the return of the spider mites. Returning mites are frequently still “red phased” so are easy to scout unless *Phytoseiulus persimilis* are present. If the house had a problem with spider mites in the previous year, a trap/banker system should be employed. Bush beans should be planted throughout the crop in the areas of previous infestation at a rate of 1 Bush bean for every 20 plants. Supports in the infested areas should have a Pole bean planted at each base. These 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 *P. persimilis* on bean leaves) or 100 *P. persimilis* adults (twice the rate for vermiculite). The trapping bean plants will then become *P. persimilis* bankers, dispersing *persimilis* into the main crop as control is achieved in the beans. These beans should be left as long as possible as the spider mites will often return over a long period of time. Bean leaves that have a good balance of *persimilis* can be pulled off the banker plants and distributed in the crop. See below; *Spider Mite Strategy Overview*.

Watch for Whitefly development on the pruned leaves. During the colder period, the whitefly’s next generation can be effectively removed if all of the pruned leaves are removed and destroyed. This requires even and complete removal of the older leaves and complete removal of all weeds. A serious infestation can be brought back into control by being thorough. When 4th instar whitefly larvae are consistently found on the pruned leaves, the grower should consider changing the pruning practice to allow time for the *Encarsia* to develop and release. This will require a period of one week to pass with no pruning. If 80% of the scale are parasitized, the pruned leaves should be left on the floor to dry out. This will allow the in-house *Encarsia* to cycle. See below; Whitefly Strategy Overview.

Watch for Aphids entering the house. Rates of the preventative release should increase to 0.3 per square meter per week, as the crop is now much larger. Hot spots should be directly attacked with releases of adult *Aphidoletes*, but control of the Melon aphid will only occur by prevention, as the Melon aphid reproduces and disperses faster than the biocontrols can handle. 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. This could required extremely large numbers of *Aphidoletes* for a quick cure or a longer time frame for recovery. All species of aphids are controlled by *Aphidoletes*. *Aphidius matricariae* will easily control and cycle with Green Peach Aphid.

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 *Hypoaspis* 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.

Main Season:

Spider mites should be surrounded by *P. persimilis*. The treated area should be the hot spot and then two more unaffected plants, as the spider mites are probably on these unaffected plants. The *persimilis* should be placed low on the treated plants as they instinctively move upwards. A ratio of 1 *persimilis* to 100 spider mites will achieve control in 2 weeks. A typical attack on a single plant hot spot would be 1000 *persimilis* on the affected plant, 500 *persimilis* on the immediate adjacent plants, and 200 *persimilis* on all of the plants within the treatment circle. The hot spot should be flagged and traffic should be diverted. 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*. *Delphastus catalinae* will remove very large numbers of whitefly eggs and can be used to reduce outbreaks. If *Bemisia* are present, *Delphastus* should be released every two weeks at a rate of 0.1 to 1 per square meter, depending on level of infestation. An Eggplant should be used as a trap/banker at a rate of 4 plants per hectare. Whitefly prefer Eggplant over Tomato and will be drawn away from the main crop. The Eggplants can then be vacuumed with a “Dustbuster” or, even better, inoculated with extra *Encarsia* and *Delphastus*. 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 shift entirely to *Aphidoletes*, as *Aphidius* will now be infested with hyperparasites. Any aphid banking system should be converted to *Aphidoletes* by introducing *Aphidoletes* directly onto the bankers. Please note that we do not recommend any Aphid Banking System. See below; Aphid Strategy Overview.

If the Potato Psyllid occurs, release the Brown Lacewing, *Micromus variegatus*, at a rate of 1 per square meter, directly at the sight. Aphidoletes have also been shown to have some impact on psyllid as well.

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 daylength begins to noticeably decrease and the evening temperatures drop, the spider mites begin diapausing. In a diapause state, spider mite are more resistant to chemicals and are not as attractive to the beneficials. If chemicals should be used, it would be at this time. Hopefully the whitefly is under control so a spray of Avid will not cause a whitefly outbreak.

If the whitefly is not in good control, it will begin to runaway in the fall. Adding trap Eggplants will help if the plants are vacuumed daily. The vacuum or the bag must be frozen to kill the whitefly. Adding parasites beyond 6 per square meter will have very little effect, as there are just too many whitefly and the stickiness of the honeydew will begin to impair the movement of all of the parasitoids. *Delphastus* will continue to work at very high whitefly densities but their impact will not be quickly seen, as they will graze on the eggs and the adult whitefly will live on for months.

Aphids must be in good control going into the fall as the *Aphidoletes* will stop cycling due to diapause. Preventative releases will still work, as they are not being asked to cycle. *Aphidius* can work very well in the fall, especially if they were not used in the summer, reducing the pressure of the hyperparasites.

Spider Mite Strategy Overview:

Spider mites are extremely dangerous on Tomatoes because the Carmine variation can cause considerable tissue damage and the physical and chemical nature of the Tomato is not welcoming to the majority of beneficials.

Because of this, cleanup is essential. Physical spraying, chemical spraying, and *Hypoaspis* will all have extremely high returns on investment.

The monitor/banker system using beans works very well and should be used if the house has a history of spider mites.

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. No incidence of spider mites transferring from the *persimilis* leaves to the Tomato plant has ever been seen. In fact, the migration of some of the spider mites from the beans may provide a "bridge" of slightly intoxicated spider mites to help the *persimilis* adjust to the Tomato plant.

Applied abandoned the production of "Tomato Adapted Spider Mite" because we believe that the source of the Carmine mite was from the rearing of the Tomato adapted strain. Our production stopped one week before we were to make our first shipment.

With a successful whitefly control program, you will be able to use a product such as Avid without causing the problems usually associated with it.

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 Celcius and are never refrigerated. *Encarsia Max* is guaranteed to be no older than 48 hours from harvest.

Using Eggplant as a trap/banker can be very effective, although, in our experience, *Encarsia Max*, starting clean, will be all you need. Whitefly have a very advance sense of smell and will move onto the Eggplant in a very profound way.

If *Bemisia* have established, parasitoids are at a disadvantage because they are all reared on Greenhouse whitefly and parasitoids always work best on their established host. All parasitoids will adapt to *Bemisia* and will all host feed aggressively. The use of *Delphastus* will have a major impact on *Bemisia*, and, if started early, will eliminate the *Bemisia* before they move on to the Greenhouse whitefly. *Bemisia* are much harder to monitor because they don't evenly distribute themselves the way Greenhouse whitefly does.

If all weeds are removed and you can be thorough with the deleafing, it is possible to effectively remove all of the whitefly from your house. 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 and will require the grower to compromise to some extent. If the house is under control, with no whitefly showing on the cards, it will not be worth considering

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. Aphidoletes have been shown to feed on the Potato psyllid and may be able to prevent establishment of this pest also.