

## Striped Cucumber Beetle and Bacterial Wilt Management in Vine Crops – 5/16/02

Most vine crops will be planted within the next 3-4 weeks, and preparing for control of striped cucumber beetle is on everyone's mind. These beetles overwinter in plant debris in field edges and with the onset of warm days and emergence of cucurbit crops will move rapidly into the field. Densities can be very high especially in non-rotated fields or close to last year's cucurbit crops. Adult feeding on cotyledons and young leaves can cause stand reduction and delayed plant growth. More importantly, the striped cucumber beetle vectors *Erwinia tracheiphila*, the causal agent of bacterial wilt. This disease overwinters within the beetle and is transmitted by contact of beetle feces with the open wounds in leaf tissue caused by beetle feeding. Bacteria multiply and block the vascular system of the plant, causing vines to wilt. This disease can be effectively managed only by preventing feeding by the beetle.

**Which vine crops are susceptible to wilt?** We now know that most vine crops are, to varying degrees, susceptible to this disease. The major exception in watermelons - they do not show any symptoms.

Trials by Meg MacGrath (Cornell University, Long Island) compared beetle numbers and wilt severity among many different vine crops. One finding was that attractiveness to beetles was not always related to wilt susceptibility. For example, although fewer beetles per plant were observed in cucumber than in most other cucurbit crop types, and little feeding injury was observed, a higher percentage of cucumber plants developed wilt. Muskmelon had similarly low beetle densities but less wilt than cucumber. Compared to cucumber, zucchini was more attractive to beetles and less susceptible to wilt.

Meg McGrath also found that the gourd Turk's Turban (*Cucurbita maxima*) was very attractive to beetles and was severely affected by wilt, differing substantially from Pear Bicolored (*Cucurbita pepo*). In the absence of insecticide treatment, all Turk's Turban plants died before producing fruit while about 25% of the Pear Bicolored plants died by late August.

Among pumpkins, two powdery-mildew resistant varieties Merlin and Magic Lantern were highly susceptible, while other varieties such as Howden and Harvest Moon were more tolerant. Among winter squashes, buttercup, hubbard and acorn appear to be moderately susceptible, while butternut is the most tolerant (but not immune). Cucumbers are highly susceptible, except for a new wilt-resistant pickling variety called County Fair. Summer squash, zucchini, and melons are susceptible. Different vine crops also vary in the attractiveness to beetles, but this is not necessarily correlated with their susceptibility to bacterial wilt.

**Early season infection.** Pumpkins at the cotyledon and first 1-2 leaf stage are more susceptible than older plants, and disease transmission is low after about the 4-leaf stage. Not all overwintering beetles carry the *Erwinia* pathogen. Studies in by Shelby Fleischer in Pennsylvania found from 7% to 10% of overwintered beetles tested positive for the *Erwinia* bacteria. An even lower percentage of beetles were able to transmit wilt when caged individually on muskmelon plants.

Wilt development is strongly influenced by the dose of the pathogen that the plants receive. This in turn is determined by the number of beetles, how long they feed, and what proportion of them were infected. The higher beetle density during early plant growth, the more severe the incidence of wilt. Beetles that find a host plant release an aggregation pheromone that calls others to their spot. Groups of beetles feeding, wounding and defecating on a single plant are more likely to transmit disease, and to acquire the pathogen and transmit it to other plants.

**Thresholds and foliar controls.** Beetle numbers should be kept low, especially before the 5-leaf stage. Crop rotation -- to a field at a distance from last year's cucurbits -- reduces beetle numbers significantly

(and has many other benefits, also). Floating row covers are a very effective barrier to beetle colonization and can be kept on until flowering.

Control with other foliar insecticides can be accomplished by scouting frequently (at least twice per week in June) and treating after beetles colonize the field. To prevent bacterial wilt in susceptible crops, beetles should not be allowed to exceed one beetle for every 2 plants. Many states recommend 1 beetle per plant threshold, but I have also seen studies which showed a significant amount of wilt at that threshold. It should be noted that this is a lower threshold than is needed to prevent significant foliar damage. Less wilt-susceptible crops (such as butternut) will tolerate two beetles per plant without yield losses. A widely used material that gives effective control is carbaryl (Sevin XLR Plus). See *New England Vegetable Management Guide* for other choices. If possible, use a banded spray to avoid wasting material by spraying bare ground.

If **kaolin clay** (Surround WP) is used, it should be applied before beetles arrive. This material is allowed in organic production and gives organic growers a new tool for a difficult pest. It can be applied to transplants before setting them out, or as soon as seedlings emerge. Ensure good coverage of the foliage (it will look like it was sprayed with white latex paint) and reapply after a heavy rain. It acts as a repellent and protectant -- beetles do not "recognize" the plant and so do not feed -- not a contact poison. Be sure to mix a slurry in a bucket and then add the slurry to the tank, as the dry powder could cake if added directly to the tank mix. Continuous agitation is needed. Given these precautions, it should not cause clogging of nozzles or pumps. In our pumpkin trials last summer, weekly applications of kaolin were as effective in preventing feeding damage and bacterial wilt as an Admire drench.

**Systemic controls.** Imidacloprid (Admire 2F) has the potential to improve and simplify early season control of cucumber beetles and thus wilt. In contrast with other insecticides labeled for this pest, Admire can be applied to soil before or after seeding or transplanting which enables product to be in leaf tissue when an early invasion of beetles occurs. Admire is a systemic which it is taken up by the roots, translocates to new leaf tissue and persists through the critical early plant stages. Additionally, it has a relatively safe toxicological profile. There are several ways that Admire can be applied.

**Using imdacroprid in direct seeded crops.** Admire 2 F can be applied in a narrow band within 2 weeks before planting, as an in-furrow spray or narrow surface band during planting, or as a post-seeding drench. It is important to get Admire into the soil to avoid photochemical breakdown; this can be accomplished by placing it in the furrow or irrigating it in. The best system for an in-furrow treatment is to attach an injector to the planter for placement at the seed level. Studies conducted by Meg McGrath on Long Island showed slightly better control with an in-furrow treatment compared to a band over the top.

The label gives a range of 16 - 24 oz per acre or 0.9 to 1.3 oz per 1000 feet of row. Studies have found a rate of 1.1 oz per 1,000 feet to be sufficient for controlling cucumber beetle in the critical early weeks. Given the wide range in row spacing with these crops and the fact that it is a banded application, the best way to calculate rates is based on the number of row feet per acre. For example, for 9 foot row spacing, divide 43,560 sq ft/acre by 9 feet, which equals 4,840 linear feet. Divide that by 1,000, then multiply by the Admire rate per 1,000 feet. For a rate of 1.1 oz per 1000 feet of row, that would mean 5.3 oz per acre.

**Using imdacroprid on transplants:** The best time to treat is about 1 day prior to planting in the field. The rate used per transplant is very low: 0.02 ml/plant. To treat a flat of 200 transplants with Admire at this rate, a grower would need to dilute 4 ml (0.135 oz) of Admire in a volume of water sufficient to soak to soil mix evenly. Accurate measuring of small amounts is very important! A plastic syringe, available from the local drug store, can help ensure that these small measurements are accurate! To help make other

conversions: multiply 0.02 ml per plant times the number of plants in your flat. For example, use 20 ml to treat 1000 transplants. You can convert ml to oz by dividing by 29.6 (there are 29.6 ml in one fluid oz).

Be careful of phytotoxicity (burning the plants) at higher rates. In Pennsylvania, burning of leaf margins was observed at 0.04 ml/melon plant at the 2-leaf stage, although these plants did grow out of this in about 2 weeks. The transplant treatment should be sufficient to carry the plants through the early crop stages. Scouting can determine if any foliar applications are needed. One concern is whether this treatment will last long enough on transplants set out in early May. It is possible that slightly higher rates would last longer, but there is also the risk of phytotoxicity at higher rates. Remember that the older the plants are when beetles arrive, the less serious is the damage that beetles cause.

This method of application is, obviously, less expensive than a furrow drench. Admire can also be used for Colorado potato beetle or flea beetle control on tomato, pepper and eggplant transplants. Again, be cautious not to use too high a rate, as phytotoxicity can result. The suggested rate for tomato transplants is 15 ml - or 0.5 ounce - per 1000 transplants.

**Drip application:** A drip system can be used for Admire applications to either direct seeded or transplanted crops. Apply early enough to allow root systems to take up the material before beetles arrive (which is typically between June 10 and 17, depending on the weather). The system should be primed with water first, and imidacloprid injected slowly. More emitters provide a more even distribution of product. Make sure to use enough water to soak the area between emitters. Calculate Admire rates based on 100 ft of row. For a 16 oz/acre rate, use 0.110 oz/100 ft bed (assumes a 3-ft bed, either one row or multiple rows.). If you have a drip system for transplants that go out in May, applying Admire through the drip may have an advantage a pre-plant drench, because you can wait until just before beetles arrive to make the application.

**Note:** The foliar form of imidacloprid, Provado 1.6F, is not labeled on vine crops. Imidicloprid is highly toxic to bees. Translocation into flowers from soil applications of Admire is reported to be below levels that would cause toxicity to bees.