UMASS EXTENSION

# Vegetable Notes

For Vegetable Farmers in Massachusetts

Volume 18, Number 4 May 31st, 2007

## Crop conditions

Field conditions have been excellent for fieldwork and crop growth. Even "wet" fields can be worked (what a contrast to late May, 2006!) Fruiting crops are in the ground for the most part, including peppers, tomatoes, eggplants and melons. Days in the 80's and nights ranging from high forties into the sixties have allowed for a good transition to the field for these heat-loving crops. Transplants have required irrigation, but for the most part seeded crops are growing well without irrigation. Rain is needed (in moderation, please). A sunny Memorial Day weekend brought customers out to roadside stands and farmers markets, completing a May with far more sunny weekends than we've had in the past several years. Perennial crops (strawberries, asparagus) may be on a schedule that is several days later than normal. However, the warmer than usual temperatures of the past week are bringing out the beetles and moths several days earlier than usual. Watch for cucumber beetles, Colorado potato beetles, and European corn borer moths – these are all active.

Mark your calendar for the next **IPM Field School: Warner Farm, Sunderland, Tuesday June 19**. Many thanks to Riverland Farm for hosting the May 22 Field School, where those who attended reported that they learned a lot!

## Early cucurbit transplant losses

The variable weather we experienced this spring seems to have wreaked havoc with many growers' early cucurbit transplants. We've seen a number of cases where the warm weather in late April pushed cucumber and squash seedlings along quickly, forcing people to bring them out of the greenhouse and put them into the ground by the middle of May. The rapid turn to cold weather – we registered 36 degrees at dawn on May 14th – and the following cold rain toward the end of that week caused transplants to collapse. It seems that the cold, combined with the somehwat leggy, tender transplants and wet weather, created an opening for whatever pathogens that are naturally present in the soil to get a foothold in the plants. We saw root rots and wilts caused by a number of different pathogens (including Pythium, Phytophthora, and Rhizoctonia), some of which thrive under cool and wet conditions. We also observed some leaf scorching that may have been a direct result of the cold weather. Another possible result of the warmer than usual days we experienced in late April may be an earlier influx of Striped Cucumber Beetles. They are active in many areas of the state, so it is a good idea to start looking for those as well.

*-Andy Cavanagh, UMass Extension*

## Evaluation of hard squash varieties for production in Massachusetts

It is important that species and cultivars of crops are evaluated for their adaptation to local growing conditions before growing them commercially. Several studies in recent years conducted by researchers at the University of Massachusetts have evaluated ethnic crops for potential production in the Northeastern U.S. These trials have evaluated calabaza, a popular type of squash in Latin America, ethnic herbs, and Asian Brassica crops, among many others. Researchers have found that the adaptation of specific pumpkin and squash cultivars vary dramatically from region to region in the U.S. Some cultivars that are adapted to the Northeastern U.S., for example, did not yield well in the much warmer and humid Southeastern U.S.

*Abóbora*, the name for "pumpkin" or "hard squash" in Portuguese, is a staple vegetable throughout most of Brazil. In the Brazilian state of Minas Gerais, the most popular kind of abóbora is a cultivar known by several names, including *abóbora moranga, abóbora japonesa, abóbora híbrida,* and *moranga híbrida*. People use it to make salads, stews, soups, and as a side dish. This hybrid cultivar is an intra-species cross of *Cucurbita maxima* and *Cucurbita moschata* and was introduced to Brazil from Japan in 1960. Since the male flowers of this intra-species cultivar are sterile, it must be grown with another cucurbit species to provide pollen for pollination. It is recommended to plant 10-20% of the field with the "pollinator" cultivar. The most common cultivar used in Brazil for pollination is called *abóbora moranga*, an open-pollinated cultivar that was the most popular type of hard squash in states such as Minas Gerais before the introduction of *abóbora híbrida.* This cultivar is still sold in the markets where it is used in a similar way to *abóbora híbrida*

*An intra-species cultivar of abóbora japonesa (left) grown with a pollinator variety (right) at the UMass Research Farm in Deerfield.*

and also to make a popular desert called *doce de abóbora*.


*The Brazilian squash 'Truinfo' grown at the Umass Research Farm in Deerfield.*

There are several cultivars of *Cucurbita moschata* that are important hard squashes in many parts of the Americas where they are known by many different names, including *calabaza* (Puerto Rico), *auyama* (Dominican Republic and Venezuela), *ayote* (parts of Central America), *zapallo* (parts of South America), and West Indian pumpkin in parts of the English-speaking Caribbean. The fruit of *C. moschata* vary in size, shape, and color due to outcrossing and strain selection. Tropical lines of *C. moschata* can vine extensively, up to 50 feet long, and also produce fruit in excess of 50 pounds. These tropical lines are not well suited to production in the Northeast due to their vining nature and long time between planting and maturity. The majority of growers in Latin America save seed from harvest of these open-pollinated lines for the next planting.

The rind color of commercial cultivars of *C. moschata* ranges from green to light-orange. A mature fruit will lose the shine of an immature fruit and develop a yellow under-coloring as the fruit matures. The most important factor affecting consumer selection is the color of the flesh. It should be dark yellow to deep orange in color. The dark orange color is a sign of full maturity and consumers prefer it to the lighter colored pulp of young fruit. Because the color of the flesh is considered of primary importance, the fruits are often halved at the market, enabling the consumer to see the color of the flesh clearly.

Kabocha squash cultivars (*C. maxima*) have a very hard, dark-green rind and yellow to bright-orange flesh. The flavor is very sweet, tasting like a cross between sweet potato and pumpkin.


*Kabocha variety 'Dekica' grown at the UMass Research Farm in Deerfield.*

Kabocha is a popular vegetable in Japan, used in soups, sushi, and tempura dishes. Kabocha was originally introduced to Japan by Portuguese traders in the mid 16th century. The word *kabocha* is thought to have originated from a Portuguese word for pumpkin, *calabasa*. Kabocha is a generic term for squash in Japan, whereas in North America, Kabocha is a specific type of winter squash. Japan has the highest consumption of Kabocha in the world.

Pipián (*C. mixta*) is originally from the Southern U.S. and Mexico and is very popular in El Salvador and other parts of Central America and Southern Mexico. There are two cultivars found in the main terminal market in San Salvador (La Tiendona), 'Criollo' and 'Zimbrillo.' The cultivar 'Criollo' is the most popular and was the variety used in this study. The fruit is harvested and used when immature, and the mature larger fruit is used for seed, both for propagation and for consumption. The seed is open-pollinated, and thus, there is tremendous variation in phenotypes.

*Pipián grown at the UMass Research Farm in Deerfield.*

In 1998, the government of El Salvador estimated that there were about 1,000 acres gown in El Salvador.

**MATERIALS AND METHODS**

Twelve tropical pumpkin cultivars in the Cucurbita genus were grown from seeds in transplant cells at the Harvest Farm greenhouse facilities based in Whatley, MA. Table 1 lists the cultivar names and seed sources. Each transplant cell was thinned to two plants. The 'Abóbora Moranga' was seeded on 27 April, the 'Tetsukabuto' and 'Triunfo' on 8 May, and the remaining 9 cultivars were seeded on 5 May. 'Abóbora Moranga' was seeded two weeks earlier than 'Tetsukabuto' and 'Triunfo' in order to synchronize flowering of the three cultivars and ensure cross pollination.

The experiment was implemented at the UMass Research Farm in South Deerfield, Massachusetts, on an Occum fine sandy loam (coarse-loamy, mixed, mesic Fluventic Dystrochrept) with a pH of 6.5 and a soil organic matter content of 2.4 %. Lime and preplant fertilizer were applied according to soil test results (*New England Vegetable Management Guide 2006-2007*). One thousand pounds/acre of calcitic lime were applied on 4 May. Muriate of potash (60% K) was applied on 4 May at a rate of 100 pounds/acre. Available phosphorus in the soil was high, so no preplant application was made. The soil was covered with a black polyethylene mulch to control weeds and conserve moisture.

**Table 1. Species, seed sources, fruit length, width, weight, and number/acre for 12 *Cucurbita* varieties.**

| Cultivar | Latin name | Seed source[x] | Fruit length (in.) | Fruit width (in.) | Fruit wt (lbs) | Num. fruit/A |
|---|---|---|---|---|---|---|
| Tetsukabuto | *C. maxima* x *C. moschata* | SE | 5.2 bc[y] | 7.2 bc | 5.0 c | 4,606 ab |
| Triunfo F1 | *C. maxima* x *C. moschata* | AG | 4.0 c | 4.5 d | 4.5 cd | 4,355 abc |
| Abóbora moranga | *C. moschata* | AG | 4.3 c | 9.3 a | 6.6 b | 4,020 abc |
| Delica | *C. máxima* | AT | 4.0 c | 7.3 bc | 3.6 def | 2,931 bc |
| Hokkori | *C. máxima* | JS | 3.8 c | 6.2 c | 2.3 g | 4,606 abc |
| Sweet Mama | *C. máxima* | AT | 3.8 c | 7.5 bc | 4.2 cde | 4,690 abc |
| Thunder | *C. máxima* | RP | 3.9 c | 7.5 bc | 3.6 def | 4,857 ab |
| Eclipse | *C. máxima* | RP | 3.8 c | 6.5 c | 3.1 efg | 3,796 abc |
| T-133 | *C. máxima* | AT | 4.1 c | 7.0 c | 2.9 fg | 2,568 c |
| La Estrella | *C. moschata* | RS | 6.2 b | 8.4 ab | 9.2 a | 3,182 bc |
| Ayote | *C. moschata* | MA | -- | | -- | -- |
| Pipián | *C. mixta* | MA | 10.7 a | 4.0 d | 3.2 efg | 5,527 a |

[x]Seed source: SE = Seminis (Brasilia Brazil) AG = Agristar (Petrópolis Brazil), AT = American Takaii Seed (Salinas CA), JS = Johnny's Selected Seeds (Winslow ME), MA = Salvadoran Ministry of Agriculture, RP = Rupp Seed (Wauseon, OH).
[y]Mean separation within columns by Duncan's multiple range test at $P = 0.05$.

The experimental design consisted of four replicate blocks. Plots were 28' long by 19.5' wide and transplants were set 4' apart in the row, and three rows were 6.5' apart for a total of 42 plants/plot, equivalent to a plant population of 3,350 plants/acre. Seedlings were transplanted to the UMass field in South Deerfield on 30 May. This arrangement of plants allowed for a border of plants to surround 10 central experimental (sample plants) plants for each plot. For the plots with the 'Tetsukabuto' and 'Triunfo,' the border rows were planted with the pollinator, 'Abóbora Moranga.'

Fertilizer was applied through the drip irrigation in the form of a complete fertilizer (20%N–20%P2O5–20%K2O) and calcium nitrate (16%N-0%P2O5-20%K2O-19%Ca). The spring nitrate test was used to determine if the soil N levels were sufficient. The total amount of fertilizer applied through the drip system during the experiment was (lbs/acre): 57 N, 13 P2O5, 13 K2O, and 45 Ca.

Plants were irrigated using drip irrigation with tensiometers (Irrometer Co. Riverside CA) used to time irrigation. Weeds in-between plastic were removed by hand, and striped cucumber beetle (*Acalymma vittatum* (Fabricius)) and spotted cucumber beetle (*Diabrotica undecimpunctata howardi* Barber) were controlled by one application of Admire 2F (8 ounces/acre; ai:imidacloprid) applied through the drip system on 1 June. *Phytophthora capsici* was identified in the field and two applications were made with Prophyte (active ingredient: phosphoric acid) at a rate of one gallon/acre on 7 and 14 August.

Harvest for Pipián began on 20 July when the fruit reached 5" in length, and took place once per week until 28 August. For each harvest, fruit between approximately 5" and 8" in length were harvested, since this size was considered the most desirable in the markets (Mancia 2006). On 22 August all other cultivars were considered to be mature and were harvested. For each harvest date, the fruit from the 10 middle plants were weighed and the length and width of each fruit was recorded. 'Ayote' was not harvested, since very few fruit produced, the largest of which was less than 2" long. Data were analyzed by analysis of variance using standard software (SAS Institute, Cary NC) with the means separated using Duncan's test.

**RESULTS AND DISCUSSION**

Figure 1 lists the yield of 11 of the 12 cultivars evaluated in this trial. The cultivar 'Ayote' was not included, since the plants did not produce mature fruit. 'Pipián' yielded higher than other cultivars; however, this is mostly due to the fact that some fruit were allowed to grow larger than the desired size. As described above, the market prefers 'Pipián' fruit that is approximately 5" to 8" in length. Even though harvest occurred weekly, there were fruit harvested that was much larger than 8" in length. The average fruit length of 'Pipián' for the trial was 10.7" (Table 1). Part of this problem occurred because fruit grew rapidly between the intervals of harvests; however, it is clear that some fruit that were the desired size at harvest were missed, perhaps due to the thick

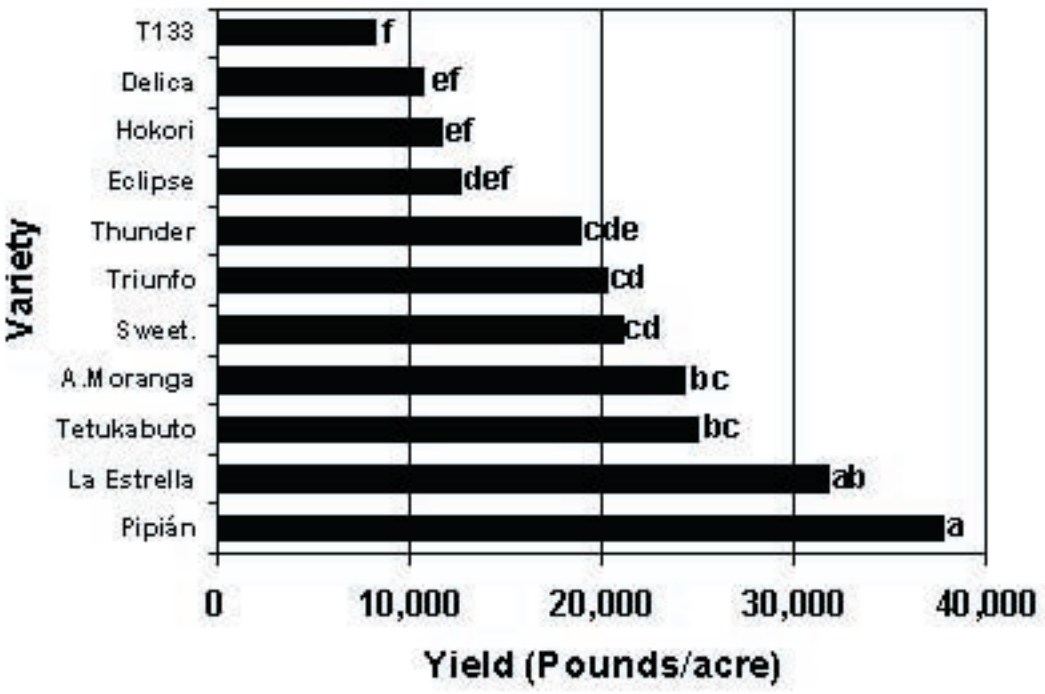


*Figure 1. Yield of 11 hard squashes varieties grown at the UMass Research Farm in 2006. (Mean separation within columns by Duncan's multiple range test at P = 0.05).*

plant foliage early in the season. Test marketing of the 'Pipián' in selected Hispanic markets in Massachusetts demonstrated that consumers would buy fruit larger than 8" long; however, the sales were slower, and the markets sold them at lower prices/pound compared to the smaller fruit (data not shown).

'Tetsukabuto' and 'Triunfo', the two most popular hybrids in Brazil, yielded 24,932 and 20,277 pounds/acre, respectively. The pollinator cultivar from Brazil evaluated in this experiment, 'Abóbora Moranga,' had good size fruit (Table 1) and also yielded well with 24,245 pounds/acre. 'La Estrella,' the hybrid calabaza, had the second highest yield, after 'Pipián,' with 31,815 pounds/acre and had the largest fruit of the 12 cultivars evaluated (9.2 pounds). This large size of the fruit, typical of calabaza, requires that it is sold in wholesale markets in 50-pound bags and stored in bins instead of cases. Among the six kabocha cultivars, 'Sweet Mama' yielded the highest with 21,054 pounds/acre, followed by 'Thunder,' 'Eclipse,' 'Hokkori,' 'Delica,' and 'T-133.' 'Sweet Mama' also had the largest fruit of the six kabocha cultivars evaluated with an average fruit size of 4.2 pounds and 'Hokkori' had the smallest fruit weight with 2.3 pounds (Table 1).

Due to the smaller size of the kabocha types compared to the calabaza, these cultivars are sold in wholesale markets in the United States in 1.1-bushel boxes, which are much more convenient to store than the 50 pound sacks in which calabaza is transported. Interviews with Hispanic store owners and Hispanic consumers in these stores in Massachusetts and New York City, found a strong demand for the kabocha cultivars where it is being used as substitute for calabaza. Ten Hispanic stores in the Washington Heights section of Manhattan in New York City, which has one of the largest concentrations of Dominicans in the United States, were canvassed in researching cultivars for this trial. All 10 stores had kabocha cultivars on their shelves, and all were labeled as either *calabaza* or *auyama*, the most common name for *C. moschata* in the Dominican Republic. Only one of the ten stores visited in Washington Heights had *calabaza* (*C. moschata*). 'Kabocha' was also tested in the Boston Terminal Wholesale Market and buyers of Hispanic produce prefer counts of 6-8 fruit/1.1-bushel compared to counts of 10 per box. The larger cultivars, 'Sweet Mama,' 'Delica,' and 'Thunder,' would fit the desired size of 6-8 fruit/1.1-bushel boxes.

These observations underscore the popularity of the kabocha cultivars in Hispanic stores that traditionally would carry calabaza. In addition, buyers of kabocha at the Boston Terminal Wholesale Market pay a premium for cultivars with larger fruit. Yield results suggest that these cultivars are commercially viable for production in Massachusetts. However, a through understanding of the preferences of the marketplace for characteristics such as size and shape of the different cultivars is critical for farmers to know before planting a specific cultivar. This knowledge is part of a comprehensive marketing plan needed to sell tropical pumpkin cultivars to ethnic consumers in the Northeastern U.S.

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## COVER CROPS FOR EARLY SUMMER

Summer may seem an odd time to use cover crops, because it is the time when the "real crops" are growing. But summer may be the right opportunity to improve fields with a cover crop. If the soil is wearing out, summer is when a soil-building crop can do a lot more work. Also, if the rotation leaves an opening in the summer, a short cycle cover crop will be much better than leaving the field open, to suffer erosion from rain and have weeds to go to seed. Buckwheat sown in late May or early June, can

be used before vegetables such as pumpkins, broccoli, and late cucumbers. There is another opportunity for summer cover crops after lettuce, peas, early beans, spinach or small grains.

For planting in June, there are really only two choices. One is sudangrass, or sorghum-sudangrass, and the other is buckwheat. Both grow rapidly in the summer warmth.

The two cover crops have different properties, so the management goal and field condition will determine which is the right one.

Sudangrass is often chosen for improving soil organic matter. It produces a strong root system and lots of biomass. The deep root system is helpful for reducing subsurface hardness. It is also a good choice for reducing root-knot nematode pressure.

Buckwheat is best known for weed suppression and mellowing the soil.

If weed suppression is the main purpose, buckwheat is preferred. It covers the ground earlier than sudangrass, especially in early June, and outcompetes weeds that may establish in sudangrass. Sudangrass requires a higher seeding rate for effective weed suppression.

The amount of time until the fall crop is to be planted is a significant decision factor. Buckwheat is in the ground for 35 to 40 days when used as a cover crop. It can be sown as early as May 20th. Sudangrass needs 60 to 70 days to be effective, and is best planted once June has become thoroughly warm. Both of these cover crops should be mowed after about 40 days. That is the end of the season for buckwheat, but the beginning of major root growth for sudangrass. Sudangrass needs a final flail mowing and immediate incorporation to suppress nematodes.

The condition of the field will determine which crop is suitable. If the soil is hard, or the field is prone to standing water, sudangrass is a good choice, while buckwheat will do poorly. However, if the field is low in nitrogen and phosphorous, buckwheat will do well without additional fertilizer, while sudangrass needs about 40 lb of N to give satisfactory performance.

If the crop to follow needs a fine seedbed, that will be easier to produce after buckwheat. It mellows the soil for easy working, and decomposes quickly after incorporation. Sudangrass crowns take some time to break down, so the following crop needs to be one that can be sown in a somewhat lumpy field.

The main production risks with buckwheat are a failed stand and letting it go to seed. The failed stand usually follows a heavy rain around emergence. It will be obvious two weeks after planting. If the seedlings are not doing well then, till them in and plant again. To avoid volunteer buckwheat seed, kill the crop before there are filled green seeds on the plant. That takes about 40 days from a July planting or 50 days from a June planting.

The main production risk with sudangrass is that the crop gets too big to mow or to incorporate after frost has killed it. This crop grows very fast, so keep an eye on it. Mow the first time at about 3 feet and the second time while the flail mower can still chop it well. If sudangrass gets too big to control, it will be killed by frost and make a nice winter mulch. However the biofumigant effect will be lost.

Buckwheat is available from some local farm seed retailers. The variety does not matter, and many suppliers don't identify any variety. Regional suppliers include The Birkett Mills in Penn Yan, Ernst Conservation Seed in Meadville, PA, AgriCulver in Trumansburg, and Lakeview Organic Grain in Penn Yan. A short crop in 2006 has raised the seed cost for this season, with prices ranging from $15 to $25 per 50 lb bag. A bag is enough to seed an acre.

Sorghum and sorghum-sudangrass are widely available. Varieties suitable for cover crops must be selected carefully. Grain types are inappropriate and some new forage varieties, described as sweet or with brown midrib are low in dhurrin, which is the biofumigant in sudangrass. Piper sudangrass is readily available, and has a similar composition to Trudan 8, the classic sudangrass for biofumigation. Sorghum-sudangrass hybrids are more vigorous, and will produce more biomass than sudangrass, but the seed is also more expensive. Appropriate varieties that are available locally include Sordan 79, Green Grazer and Special Effort. With a modest seeding rate of 30 lb/ac, sudangrass can cost as little as $10 to $20 per acre. Weed suppression requires 50 lb/ac. Regional suppliers include Seedway in Hall, Agriculver in Trumansburg and UAP in Sodus.

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## SWEET CORN: EUROPEAN CORN BORER IS ACTIVE

European corn borer pheromone traps were set up in early to mid May in order to detect the beginning of ECB flight. Whether or not the corn seems to be 'ready' to be concerned about ECB infestations, the moth flight runs according to temperature. Borers, which overwinter in corn stubble and weeds, pupate and emerge as moths in spring – at a rate that is driven by temperature. Below 50 degrees F, no development occurs. Above that temperature growth proceeds faster as temperatures increase, up to about 90 degrees F.

The first captures occurred in the past week. From May 24-30 first moths were detected in traps throughout the Connecticut Valley. At some sites, captures rose rapidly over the weekend. An ECB egg mass was found in Hadley on May 30. Hadley, because of its proximity to the Connecticut River and low elevation, is one of the warmest locations in the state and provides an 'early warning' to points east, west and north. Flight has also begun in central Mass: 7 moths captured May 31 in Lancaster.

From the first emergence of moths there is a period of several days before females start laying eggs, and another period of several days before eggs hatch. The exact duration depends on temperature. Eggs require 100 degree days to hatch.

To calculate degree-days (DD), add the daily maximum temperature and the daily minimum temperature and divide by 2 to get the average temperature. Then subtract 50 (the 'base temperature' below which ECB does not develop). For example, if the maximum temperature for a day is 85 and the minimum is 60, (85+60)/2 = 72.5 - 50 = 22.5 degree-days. At that rate of

degree-day accumulation, eggs would hatch in about 5 days. At the UMass Research Farm in Deerfield, degree-days have ranged from 13 to 24 DD per day in the past week. Degree-days are reported in the Crop Weather from New England NASS (see next article).

The earliest and largest corn is the most attractive to moths laying eggs. This week the largest corn we have observed is about 18 inches tall, in the whorl stage. ECB moths will lay eggs in corn smaller than that, especially if larger corn is nearby.

If you want to know what's happening with ECB flight on your farm, the best way is to set up pheromone traps. Use two Scentry net traps, placed 50' apart in weeds at the edge of the field, with a lure for the two races of ECB (known as Iowa-Z-I and NY-E-II). Traps and lures can be obtained from Great Lakes IPM (517-268-5693) or Gempler's (800-382-8473)

Some growers around the state are using Trichogramma wasps in early corn. *Trichogramma ostriniae* lays its eggs in ECB egg masses; larvae hatch and feed, killing the egg. These tiny wasps can reduce the need for sprays, and will reproduce and attack egg masses all season. Growers are purchasing these wasps from IPM Laboratories, Inc. in New York State(PHONE 315-497-2063, FAX315-497-3129). The UMass Vegetable Program is also working with a number of growers to release wasps. First releases need to be made when moths become active and lay eggs, where the corn is at least at the 5-6 leaf stage. We recommend three successive weekly releases. We will be making the first releases on June 1 and June 5 in the Connecticut Valley.

*--Ruth Hazzard, Amanda Brown, Pam Westgate*

**• Trap Counts for May 31st, 2007**

| Location | ZI | EII | Total ECB |
|---|---|---|---|
| South Deerfield | 0 | 16 | 16 |
| Whately | 0 | 5 | 5 |
| Hadley (1) | 0 | 25 | 25 |
| Hadley (2) | 0 | 21 | 21 |
| Easthampton | 1 | 2 | 3 |
| Amherst (1) | 1 | 2 | 3 |
| Amherst (2) | 0 | 3 | 3 |
| Granby | 0 | 0 | 0 |
| Southwick | 1 | 3 | 4 |
| Lancaster | 0 | 7 | 7 |
| Swansea | 2 | 2 | 4 |

*--Thanks to our scouting network: R.Hazzard, P. Westgate, A. Brown, A. Lopez-Swetland, D. Rose, J. Golonka, S.Pepin*

## THE NEW ENGLAND WEEKLY CROP WEATHER REPORT IS AVAILABLE ONLINE

The weekly ***Crop Progress & Condition Report*** includes degree days, temperature, precipitation, crop planting progress, crop development, and harvesting progress. This is a combined publication produced in the New England Field Office of the USDA Agricultural Statistical Reporting Service, serving the states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

The weekly Crop Weather report is available on the internet, and can also be received through an e-mail subscription or by downloading from our website.

You can access the Crop Weather release from the NASS website on Monday afternoons after four o'clock by doing the following:

- Open your internet browser and go to the address: **http://www.nass.usda.gov/nh**
- About halfway down the middle of the main page, look for the header "New England Publications".
- Click on the box marked "GO" next to the words "Publications and Press Releases".
- Click on the words "Crop Progress and Condition".
- Click on the words, "Click here for the current Crop Progress & Condition Report".

If you would like to receive the Crop Weather release by email, contact Gerald D. Tillman via email (gerald_tillman@nass.usda.gov ) or contact the NASS New England office at 1-800-642-9571.

## MANAGING STRIPED CUCUMBER BEETLE IN VINE CROPS: UPDATES FOR 2007

Striped cucumber beetle is our most serious early-season pest in vine crops. These beetles spend the winter in plant debris in field edges, and with the onset of warm days and emergence of cucurbit crops, 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.

**Avoid early season infection with wilt**. Cucurbit plants at the cotyledon and first 1-2 leaf stage are more susceptible to infection with bacterial wilt than older plants, and disease transmission is lower after about the 4-leaf stage. The higher the beetle density during early plant growth, the more severe the incidence of wilt. Male beetles that discover a host plant will 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.

**Cultural Controls: Crop rotation.** Because beetles spend the winter in field borders close to last year's crop, planting into the same field encourages rapid invasion by high numbers of beetles. Rotating to a field at a distance from last year's cucurbits reduces beetle numbers significantly. Of course, crop rotation has many other benefits as well – in vine crops, it is critical for disease management. Any barriers between the fields – woods, buildings, fallow fields or other crops, roadways and waterways – help delay the arrival of beetles.

**Cultural Controls: Using Transplants**. Several studies in the Northeast have shown that three-week-old transplants, set out in the field at the same time as a direct-seeded crop, will produce not only earlier but higher yields. These studies were done with both summer and winter squashes. Transplants have multiple benefits. Germination of untreated seeds in cool soils can be spotty, while transplanting usually ensures a good stand. Transplants provide a jump on the weeds. Plants are bigger when cucumber beetles arrive so that they are less vulnerable to both feeding damage and to wilt. An insecticide or repellent can be applied to flats before plants are set out, making it less costly. Planting dates are more flexible – for some crops, it may be possible to delay planting until late June and avoid the worst of the beetles. Plants can be held inside to avoid late frost or wait until fields are dry (or wet) enough to plant. Of course, it is not advisable to hold transplants too long. If they are already flowering or have been stressed when they are set out, they tend to develop into small plants with early but small fruit. Standard seedling production methods work well for vine crops, but large cell sizes (72, 36 or 24) or peat pots are recommended as roots should not be disturbed when transplanting.

**Cultural Controls: Floating, or spun-bonded, row covers** are very effective barriers that keep beetles off the crop during the critical early growth stage. They have the added benefit of enhancing growth and reducing wind damage in the early season, for an earlier yield. Studies have also shown an increase in yield with row covers. Covers must be removed at flowering to allow for pollination. Wire hoops are very helpful, to prevent damage from abrasion; these are usually used on single rows, but can also be used under wide sheets of 15 or 25 or 50 feet. Black plastic adds warmth and solves the problem of weed management under the covers.

**Thresholds and foliar controls.** Beetle numbers should be kept low, especially before the 5-leaf stage. Scout frequently (at least twice per week for two weeks after crop emergence) and treat after beetles colonize the field. The threshold depends on the crop. To prevent bacterial wilt in highly susceptible crops, we recommend that beetles should not be allowed to exceed one beetle for every 2 plants. Less wilt-susceptible crops (butternut, most pumpkins) will tolerate 1 or two beetles per plant without yield losses. Spray within 24 hours after the threshold is reached. Proper timing is key. There are a number of broad spectrum insecticides which can be used for foliar control (including Capture 2EC, Decis 1.5EC, Thoinex 50W, Asana, and Sevin). See *2006-2007 New England Vegetable Management Guide* for more details.

**Organic insecticides**. OMRI-list insecticides available for use in organic cucurbits include kaolin clay (Surround WP), pyrethrin (Pyganic Crop Spray 5.0 EC), and spinosad (Entrust). Pyrethrin is a short-lived contact toxin that has shown poor results on SCB in trials. Spinosad acts both as a contact and a stomach poison and has shown reasonably good results in recent trials. See last week's issue for more details. Surround WP should be applied before beetles arrive because it acts as a repellent and protectant -- beetles do not "recognize" the plant and so do not feed -- not a contact poison. With direct-seeded crops, apply as soon as seedlings emerge if beetles are active. Transplants can be sprayed before setting out in the field. Surround can also be used on the main crop of a PTC system, creating a "push-pull" dynamic.

**Perimeter trap cropping**. This strategy saves time and money – and it works! See last week's article or the www.umass-vegetable.org website for more details.

**Systemic controls**. Two systemic neo-nicotinoid products, imidacloprid (Admire) and thiamethoxam (Platinum), are registered for use in cucurbits. In New England, Platinum is labeled for use specifically for striped cucumber beetle only in MA and CT. These are systemic insecticides that "may be used as an in-furrow, banded, drench, or drip irrigation application to the seed/seedling root zone during or after planting/transplanting operations." DO NOT apply as a foliar spray. Note that imidacloprid is being sold in different formulations that differ in concentration. Admire 2F (21.4% active ingredient) is half as concentrated as Admire Pro (42.8% active ingredient) and generic products are also available. Label rates change according to concentration.

Because of the systemic activity when applied to soil or seed, these products are taken up through the roots and transported into new leaf tissue where they persist through the critical early plant stages. They can be applied in the furrow or as a surface band at planting, which simplifies control efforts especially in fields where a sizable invasion of cucumber beetles is likely. They may also be applied through drip irrigation, which allows application to be timed shortly in advance of the expected arrival of the pest, and is suited to crops grown on plastic. They can be applied as a transplant drench prior to setting out in the field. Also, they are very well suited to a perimeter trap crop system – which dramatically reduces the cost per acre for pest control.

**Using systemics in direct seeded crops.** It is important to get the insecticide into the soil to avoid photochemical breakdown; placing it in the furrow or irrigating it in can accomplish this. One of the most efficient systems for an in-furrow treatment is to attach an injector to the planter for placement at the seed level after the furrow is opened and before the seed drops. This has the advantage of one trip through the field and very precise targeting of material. Where it is applied to the soil surface, it should be watered in with irrigation (or rainfall) to move it to root depth for seedlings. For growers who plant by hand on a two-way grid for cross-cultivation, apply in a twelve-inch band at the time that fertilizer is incorporated.

Platinum rates in cucurbits are 5 to 8 oz per acre. The label provides a chart of recommended rates per 1000 feet of row at various row spacings. For example, at 3 foot spacing, the recommended range is 0.34 to 0.55 oz/1000 liner feet, while at 7 foot spacing, the rates range from 0.8 to 1.29 oz/1000 feet. It may be possible to use a similar approach as for Admire by calculating rates per row feet. In a trial conducted at the UMass research farm in 2005, both high and low rates gave comparable levels of control compared to imidacloprid.

The Admire Pro label gives a range of 7.0 to 10.5 fl. oz per acre. Replicated studies and field experience has shown that a rate equivalent to 0.5 oz Admire Pro per 1,000 feet of row is sufficient for controlling cucumber beetle in the critical early weeks. Given the wide range in row spacing with these crops and the fact that this is a banded application, we have suggested that grow-

ers calculate rates based on the number of row feet to be treated per acre or per block. For example, at 6 ft spacing, one acre has 7,260 linear row ft (43,560 sq feet divided by 5 ft between rows).

**Using systemics on transplants**: This method of application is, obviously, less expensive than a furrow drench. Note that rates are based not on application to the furrow (including where the plant is PLUS the area between plants) but only to the plant itself. The best time to treat is about 1 day prior to planting in the field. We see effective results with a rate of 0.02 ml/Admire 2F (equivalent to 0.01 ml Admire Pro) per plant. Slightly higher rates may not be phytotoxic, but caution should be used because phytoxicity can occur at higher rates. For example, don't concentrate the full amount that would be used in furrow applications on the plant. Note: there are 29.6 milliliters (ml) in one fluid oz.

Another way to apply imidacloprid to transplants is through a water wheel planter. Use the same rate per plant as you would for a transplant drench and the rate of water per plant that fits your planter (e.g. 8 oz). Multiply by the number of plants and mix the total insecticide needed with the total water needed in the tank. Make sure your workers wear protective gloves and allow time for uptake (1+ days) into leaves. Note that the highest rate of uptake will be into new growth.

**Drip application**: A drip system can be used for Admire or Platinum applications to either direct seeded or transplanted crops. Know your system well enough to know how long it will take to inject a given amount of concentrated solution (eg one bucketful) and to soak the area between emitters. Apply early enough to allow the plant roots and leaves to take up the material before beetles arrive. The system should be primed with water first, and the insecticide injected slowly for even distribution. Make sure to use enough water to soak the area between emitters. More emitters provide more even distribution of product.

Calculate the total insecticide that is needed, based on the rate, per 100 or 1000 ft of row and the number of row feet of line that will be treated. Place the total amount in the bucket with enough water for 20-30 minutes of injection. Charge the system with water first to get the soil wet. Turn on the Venturi or other injector, to inject slowly for even distribution (20 or 30 minutes). Then flush lines with clear water and to move product out and down.

**Non-target effects: Bees are very susceptible to imidacloprid and thiamethoxam** and could be affected by its presence in pollen if it is still at high levels in the plants at the time of flowering. Bees intoxicated by Admire or Platinum, like beetles, show unusual behaviors such as tremors, staggering, and falling over before dying. This could happen with bees at excessively high rates of these insecticides. We have not observed it at the rates suggested in this article. The foliar formulation of imidacloprid (Provado)is **not** labeled for cucurbits, and the foliar formulation of thiamethoxam (Actara) has a label for cucurbits but **may not be sprayed during bloom**. Carbamates such as Sevin and synthetic pyrethroids should not be used during bloom to avoid killing bees. Given the high losses of hives to hive collapse syndrome, protecting bees is an especially important concern.

**Resistance from overuse**. The down side of systemic products might be that they are 'too easy'. That's not necessarily a bad thing for growers who are always too busy! However if these are overused on a routine basis, these products may well be lost to resistance in a fairly short time. Furthermore, they are not cheap. For a truly IPM approach, combine or alternate these materials with crop rotation, perimeter trap cropping, and field scouting followed by foliar sprays with other classes of insecticides to reduce the likelihood of resistance and keep use rates low. Perimeter trap cropping provides a large, untreated refuge which can delay resistance.

*-Ruth Hazzard, University of Massachusetts*

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