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Crop conditions

Garlic harvests have begun! New crops being harvested this week include sweet and bunching onions as well as hot and sweet peppers. Corn picking has moved into 2nd succession plantings and despite a few caterpillars, growers report good harvests. Rather than spray, some farmers have educated their CSA members that some corn will have worms. The hot humid weather is making it oppressive to work in fields, but harvests must continue. All forms of cultivation equipment are at work trying to keep fields clean of weeds before winter squash vines fill in completely.

Pest alerts

Local box filled with this season's field produce and a greenhouse tomato at Stonefield Farm in Acton, MA Photo, K. Campbell-Nelson

Allium:

Onion thrips numbers have jumped this week in Franklin and Hampshire Cos., MA. In hot weather, a generation can be completed in 2-3 weeks, so it is no surprise that populations can jump so quickly. The number that constitutes an economic threshold varies with the stage of plant growth, efficacy of insecticide to be used, water availability, and health of -the plants. A widely used threshold is 1-3 thrips per leaf .

Brassica:

Cross-striped cabbage worm was reported last week in Barnstable Co., MA and this week in Litchfield Co., CT on broccoli. This brassica caterpillar pest is different from the other caterpillars because it lays eggs in batches of 3-25 and can therefore cause a lot of damage in a small area. Egg batches are yellow, flattened, and attached to the lower leaf surfaces turning darker just before they hatch. Treat young caterpillars when 5% of the crop is infested.

Cabbage root maggot**:** Damage to root crops like salad turnips is being seen now in Barnstable Co., MA. Some transplanted crops have also wilted and died due to CRM feeding. This damage is caused by the larvae from the second generation of flies. A third generation of flies will emerge soon and may affect fall brassicas. Pay attention to the stages of flights using the NEWA model: http://newa.cornell.edu/index.php?page=cabbage-magot.

Cucurbits:

Cucurbit downy mildew was diagnosed this week on cucumber in the Hudson Valley, NY bordering MA. New outbreaks have also been reported this week across PA, in northern NJ and Western NY in cucumber and cantaloupe. We have been actively scouting for this disease in MA, but it has not yet been confirmed here. Spores of this pathogen are wind-blown long distances with each advancing storm and their dark coloration makes them resistant to UV degradation, allowing them to survive a long trip on a storm front. Protective fungicide applications are recommended for cucumbers

Table 1. Squash Vine Borer (SVB) trap captures for 7.12.17-7.19.17

Location	SVB
MA	
Deerfield	0
Easton	3
Westhampton	0
Millis	24
Sharon	81
Leominster	9
Berlin	25
NH	
Litchfield	10
Hollis	1
Mason	13

and cantaloupes in MA at this time, especially ahead of any storms from the south or west. Identifying initial symptoms in cucurbits (particularly cucumber and cantaloupe, which are most susceptible and are the crops currently being affected nearby) is critical for successful management. See here: http://vegetablemdonline.ppath.cornell.edu/NewsArticles/Cuc_Downy_Mar06.html

Squash vine borer trap catches in NH and MA remain steady in some locations, which means that adults are still laying eggs (see Table 1). Meanwhile, the first boring larvae have been reported in Worcester Co., MA (see photo, right) in zucchini. See article this issue for management tips.

Squash vine borer larva in zucchini stem. Photo, R. Hazzard

Squash bugs: Anasa wilt caused by nymphs injecting toxins into cucurbit leaves while they feed is being seen now across MA and in many crops. High numbers of egg masses (2 per plant) are also being reported in scouted locations in Eastern MA and southern NH. See article this issue for management tips.

Black sclerotia inside tomato stem. Photo, A. Madeiras

Tomato:

White Mold was diagnosed in tomato from Hampshire Co., MA and in cucurbits from Chittenden Co., VT this week. *Sclerotinia sclerotiorum* has a very wide host range, attacking more than 300 plant species. It becomes a problem on tomatoes when cool and wet weather occurs during crop development. The fungus produces hard, black sclerotia within crop petioles or stems which can survive in soil for many years. Rotate with non-hosts such as grasses, cereals, and onions for up to 8 years. The biological control organism *Conothiriam minitans* sold commercially as 'Contans' can be used to shorten the lifespan of these sclerotia in soil—apply in fall, 3 to 4 months before planting to allow for the biocontrol agent to infect and destroy the sclerotia.

Early blight and **Septoria** symptoms are now being seen across New England in field tomatoes. Symptoms typically start on the lower leaves and moves upward as spores are splashed up onto younger foliage. Both fungal diseases are managed similarly. Rotate out of tomatoes for two years. Consult the New England Vegetable Management Guide to find a list of fungicides labeled for these diseases here: http://nevegetable.org/crops/disease-control-23.

Pepper:

Pepper Maggot stings and adult flies were found on hot cherry peppers in a perimeter trap crop in Hampshire Co., MA this week, although none were found in traps near the field. See article this issue for management tips.

Sweetcorn:

European corn borer first generation flight has mostly stopped in MA and NH, though one hot spot in southeastern MA (Swansea) is still catching them. Carrot seed moths are non-pests that are being found in many

Carrot seed moth bugguide.net

Table 2. Sweetcorn pest trap captures for 7.12.17-7.19.17

Location	ECB	FAW	CEW	Spray Interval for CEW
Western, MA				
Sheffield	0	-	10	*4 days*
Whately	1	-	0	*no spray*
Central, MA				
Leominster	0	-	4	*5 days*
Lancaster	0	5	5	*5 days*
Northbridge	0	1	1	*5 days*
Eastern, MA				
Concord	2	-	2	*6 days*
Ipswich	0	2	5	*5 days*
Millis	0	-	4	*5 days*
Sharon	8	-	1	*no spray*
Swansea	10	-	30	*4 days*
Dover	0	-	1	*no spray*
Seekonk	8	-	10	*4 days*
NH				
Litchfield	0	2	8	*4 days*
Hollis	0	4	6	*4 days*
Mason	0	1	0	*no spray*
Washington County, NY	1	-	0	*no spray*
Albany, NY	0	-	0	*no spray*

European corn borer (ECB), Fall armyworm (FAW), Corn earworm (CEW)

ECB-E traps now (see photo, right). They are similar in size to ECB, but are a paler lime color with a small black dot on each forewing. In untreated fields, some ECB is being found in harvested corn.

Corn earworm: Many locations across MA are at 4-6 day spray intervals for this pest due to their arrival on various storm fronts we've had over the past few weeks. Some picked corn also has CEW in it now. This pest is difficult to scout for since the caterpillars crawl down the silk and into the ear often before they can be seen.

Fall armyworm flight has begun, with moths being captured now in MA and NH. This means it is time to scout fields for this pest and treat if there is a 15% infestation.

Multiple

Potato leafhopper: Hopperburn has been seen in beans and potato across MA and NH, and even in cantaloupe in Franklin Co., MA. Some growers have contacted us concerned about nutrient deficiencies or disease only to find that they are suffering from hopper burn. This pest did not arrive early this year, but there have been high numbers, which means that regular scouting and multiple sprays are likely needed to control the pest. However, most insecticides should not be used on flowering crops for pollinator protection and some labels even prohibit applications at this time, so, protect younger successions to ensure a healthy established crop.

SQUASH BUG MANAGEMENT

Squash bugs (*Anasis tristis*) are being reported causing extensive damage in MA and southern NH this year. Squash bug adults are now moving into summer and winter squash plantings, mating laying eggs and nymphs have been causing damage for a week or two now. Early season control is critical to keeping the population from growing to a damaging level, so it is time to scout and determine whether numbers warrant controls.

Squash bug adults (above) look similar to brown marmorated stink bug adults (below left) and native stink bugs like the spined soldier bug (below right)
Photo, R. Hazzard

Bronze-colored squash bug eggs and grey nymphs.
Photo, UMass Vegetable Program

Life stages and identification. Squash bugs are a type of stink bug not to be confused with brown marmorated stinkbug or native stinkbugs. Adults are 0.5 to 0.75 of an inch long, flattened and grayish-brown. The edge of the abdomen is marked with alternate gold and brown patches. Adults are long-lived and lay eggs over several weeks. A single female can lay up to 250 eggs. Yellow to bronze colored eggs are usually laid on the underside of leaves, often in the junction of leaf veins, in an orderly cluster (like a fighter jet formation) and hatch in 7-10 days in summer conditions. Wingless nymphs are light green when small, with a brown head and dark legs, and are usually found in groups. Nymphs become darker gray and more solitary as they grow and molt through 5 nymphal stages. There is one generation per year in the Northeast, and the complete life cycle requires 6-8 weeks. Sheltered and protected areas such as field borders, woods edges, brush or wood piles provide a home for unmated adults through the winter.

Brown marmorated stink bug (above) is an invasive pest of many crops.
Photo, bugguide.net

Spined soldier bug is a beneficial insect that preys on many agricultural pests like this Colorado potato beetle larva.
Photo, UMass Vegetable Program

Host crops and damage. The most susceptible and attractive crops are yellow summer squash, zucchini, and pumpkin (*Cucurbita pepo*) as well as Hubbard squash (*Cucurbita maxima*) and other *C. maxima*. Watermelon, cucumber, muskmelon and butternut resist damage, and provide poor food quality for adults and nymphs. Resistant varieties also include sweet cheese pumpkins (*C. moshata*) and royal acorn squash (*C. pepo*). Both adults and nymphs feed by inserting their beak and sucking sap from plant tissue. Adult feeding on seedlings can cause wilting of the whole plant. Places on the

leaves where the bugs feed develop small, yellow specks that eventually turn brown due to a toxin released by the bug while it feeds. High densities and intensive feeding cause foliage to wilt, turn black and die in a condition known as "Anasa wilt". Squash bugs also feed on the fruit, causing scarring that can make the fruit unmarketable.

The squash bug has also been identified as the vector of the bacterium, *Serratia marcescens* that causes cucurbit yellow vine decline in the United States. The bacterium is inoculated into a cucurbit plant by the piercing-sucking mouthparts of the squash bug and enters the phloem of the plant. Symptoms of yellow vine decline include a general yellowing of the entire vine within a two to three day period. Infected plants usually collapse completely approximately 10 to 14 days before the fruit matures. This disease was found in 2003 in MA, but has not been confirmed since.

Cultural strategies. If possible, rotate cucurbit crops between fields as far apart as possible. Placing row covers over the young crop prevents adult access until blooming, when covers are removed. Natural enemies of the squash bug include the tachinid fly (*Trichopoda pennipes*) which is a parasitoid that attacks nymphs and adults, and several wasps that parasitize eggs (Hymenoptera: *Encyrtidae* and *Scelionidae*). Squash bugs like sheltered hiding places. Keep headlands and field borders mowed and free of trash to reduce overwintering sites. Black or white plastic, straw mulch, and reduced tillage systems encourage higher populations, probably by providing good hiding places. In small plantings, boards can be used to attract adults seeking a protected hiding place; check in evening or morning and spray with insecticide or capture and remove. A study conducted by Oklahoma State University found that squash bugs prefer to lay eggs on yellow straightneck and crookneck (Bonjour et al. 1990) and these cucurbits can be used effectively as a trap crop planted earlier in the season along field edges where adults will be attracted first while the main crop gets planted later and establishes. The trap crop must then receive an insecticide application or be mechanically destroyed before eggs hatch. Remove crop residues and/or till field immediately after harvest to kill adults before they move to field edges seeking shelter.

Scouting and Chemical control. Scout plants from seedling to vining/flowering stage to detect adults as well as eggs and nymphs. After flowering, thresholds are based on egg masses and young nymphs, but also note adults and large nymphs while scouting.

There are two key windows for control:

1. Target adults on young plants (before flowering or vining). An application made when adults are colonizing plants in June will prevent subsequent egg and larval populations. Coverage is easier at this time, and broad spectrum pyrethroids (eg bifenthrin, lambda-cyhalothrin, permethrin) or carbaryl, which are reported to be effective on adults at this stage, can be used without risk to bees on the crop. Organic materials for adults include pyrethrin. The threshold for targeting adults has been determined for watermelon crops at an average of 1 adult per plant (Dogramaci et al. 2006), but in more susceptible crops such as summer squash and zucchini, it might be appropriate to use a lower threshold (eg 1 adult/2 or more plants). Aim for coverage of underside of leaves and stems where bugs hide. Systemic furrow, drip or seed treatments and sprays for cucumber beetle at the seedling stage may also control colonizing squash bug adults.
2. Target smaller nymphs on flowering plants. Scout for egg masses and note first arrival of nymphs. The threshold is reached at an average of one egg mass per plant and when the first nymphs are seen. Good coverage of undersides of leaves is needed. For newly laid eggs and nymphs, consider a foliar application of acetamiprid (Assail 30 SG) which has moderate toxicity to bees (lower than other neonicotinoids). Adults and larger nymphs are more difficult to control, partly because they hide in the lower canopy and near the soil. Organic options for nymphs a mixture of pyrethrin (a contact toxin) and azadiractin (an insect growth regulator, made from neem). This can be achieved by mixing separate products or with a product called Azera, which has both. This would be easier on bees than a high rate of pyrethrin alone, and would include two modes of action. Insect growth regulators work to disrupt the molting process so are useful only on immature stages. Treat late in the day when the flowers are closed to reduce risk to bees.

Take note of re-entry and pre-harvest intervals of materials used on summer squash and zucchini that are being harvested frequently.

For more information on rates and products for squash bug control, check the New England Vegetable Management Guide.

- Adapted by K. Campbell-Nelson, R. Hazzard & A. Cavanagh.

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SQUASH VINE BORER MANAGEMENT

Squash vione borer adult moth. Photo, Brian Caldwell, Cornell Univ.

Squash vine borer moths are now being caught in pheromone traps in MA and NH. Eggs have been found in fields over the past few weeks and the first borers were reported this week in Worcester Co., MA. Populations vary greatly from site to site even within the same town, so only make treatments based on scouting or trap captures in a specific field.

Life stages and identification. Squash vine borer adults are day-flying moths with a 1- to 1.5-inch wingspan, black forewings, clear hind wings, and a bright red-orange abdomen. In flight, they can look like wasps. There are 1-2 generations each year in New England. First generation adults emerge mid-June to early July, and peak flight is in mid-July. Over the last few years, we have been trapping adults in pheromone traps at 450-500 GDD base 50F in NH and MA. A second generation in late August has been indicated by trap captures in seasons with particularly high degree day accumulation. Moths usually fly for a couple of weeks before beginning to lay eggs, and their lifecycle lasts about 60 days. Each female can lay 150-200 eggs. Eggs are small (~1mm) ovals, reddish brown in color, and are usually found singly on squash vines, within a foot of the soil. Eggs hatch in 10-15 days. Larvae are cream-colored, about 1 inch long, and have a brown head capsule. Within hours of hatching, the larvae bore into stems, where they feed for 4-6 weeks before exiting to drop into soil, spin a brown cocoon, and pupate not far below the surface. They remain in the soil until the following spring, or may hatch as adults for a second flight in late summer.

Host crops and damage. Larval feeding within vines causes leaf stems to wilt and collapse, reducing fruit yields, and can even sever a plant from its roots. Smaller plantings often suffer more injury and damage than extensive plantings, because eggs are concentrated on fewer plants. Occasionally larvae will bore into fruit of hard squash and pumpkins. Thick-stemmed Cucurbita species including *Cucurbita pepo* (summer squash, zucchini, pumpkin) and *C. maxima* type winter squashes (e.g. Hubbard, Buttercup) are preferred and are most suitable for larval development. Pumpkins can sustain high infestations without yield reduction. Generally, vining plants can withstand higher infestations compared to bush-type plants, as they tend to root at the vine nodes, allowing the vine to survive despite having borers within the stem. Butternut squash, cucumber and melon are considered resistant to this pest.

Cultural strategies. Crop rotation can be an effective strategy to reduce damage, as it will take emerging adults longer to find and lay eggs within a host crop. Move cucurbit plantings to distant fields year to year, and do not plant this year's summer squash into last fall's pumpkin field. Postharvest or spring plowing can destroy or bury pupae, and subsequently reduce populations. Row covers may prevent egg-laying, but may also interfere with pollination or increase aphid populations. Trapping data indicating the presence of adults and peak flight may help determine when row covers are necessary, so that covers can be removed for pollination when plants are at less risk of infestation. Straw mulch near the base of plants also keeps the adult moths from laying eggs, but can become a reservoir for squash bug.

Monitoring: Pheromone traps (Heliothis net traps work best) can be used to monitor adult flight (sources for traps and pheromone lures include Gempler's, Great Lakes IPM, Trece). Traps should be placed in a susceptible crop, with the bottom of the trap just above, but not blocked by, the plant canopy. Traps may have to be moved up as the plants grow. Once

the first adult moths are captured, check the bases of stems for eggs (see photo, right), sawdust yellow-orange frass, or entry holes of larvae. Cutting open the stem just above the hole is a good way to find out if damage has just begun or if the larvae are already well developed in the field. If the damage has just begun, it may still be early enough that a spray targeted at the base of plants will control hatching larvae.

Chemical control. Targeting stems before eggs hatch and larvae as they hatch is important for effective control because the larvae can't be reached once they have bored deep into the stems. Use a threshold of 5 adults per trap per week for bush varieties. For vining crops, the plants may be able to tolerate more damage and the threshold can be higher. A 2014 fact sheet from UNH suggests a threshold of 12 moths per trap per week for vining-type squash or pumpkins. A total of 2 to 3 applications 5-7 days apart targeted at the plant base may be necessary for as long as adults are being caught in traps. See New England Vegetable Management Guide for treatment options. Many of the insecticides labeled for this pest are broad-spectrum materials with high toxicity to bees and are not recommended for use during bloom when the vine borer is active. Squash bees and bumble bees may spend the night inside of blossoms, so targeting sprays at the base of plants, rather than at blossoms and foliage, can also help to protect pollinators. Several selective products labeled for cucurbits (with low or medium bee toxicity) including spinetoram (Radiant), spinosad (Entrust), and *Bacillus thuringiensis* are labeled for squash crops and have been shown in trials to provide control when used as described above. Bt *aizawi* (Xentari) was somewhat more effective than Bt *kurstaki* (Dipel) or spinosad in some trials. Injecting entomopathogenic nematodes *Steinernema carpocapsae* into cucurbit stems near the base of the plants has been shown to be effective and the hollow moist vines are conducive to survival of the nematodes,but this is not practical for large plantings.

--updated for 2017 by Katie Campbell-Nelson from article by Ruth Hazzard, UMass Extension Vegetable Program.

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WATCH FOR PEPPER MAGGOT FLY & EUROPEAN CORN BORER

Pepper maggot fly (*Zonosemata electa*) adults emerge in mid to late July and are active for several weeks, so this is the time to watch for their activity. Adult flies and stings on hot cherry pepper were found in Hampshire Co., MA last week. The fly is confined to solanaceous plants, including ground cherry, horse nettle, tomato, pepper and eggplant. Pepper is the preferred host and green bell peppers and cherry peppers are especially susceptible to pepper maggot fly damage.

Pepper maggot fly
Photo, bugguide.net

The pepper maggot fly is found throughout eastern North America and in New England, the range of pepper maggot has been creeping northward and now extends into southern NH and throughout Massachusetts. Pepper maggot fly activity is very localized, and varies by farm, by region, and by year. Many farms never have a problem with this pest. Some may have it and not realize it, because it is possible to confuse maggot damage with damage caused by European corn borer. The best way to detect activity is to look for stings on the fruit, and these are easiest to spot on cherry peppers.

Pepper maggot egg-laying stings.
Photo, Ontario Crop IPM

Pepper maggot flies are smaller than a house fly, bright yellow with three yellow stripes on the thorax, green eyes, and clear wings with a distinct banding pattern (see photo, above). Flies aggregate in forested field edges and enter the field during the day to lay their eggs. Females insert eggs directly into immature pepper fruit and leave a

European Corn borer (left) and pepper maggot (right) inside bell pepper
Photos, Ontario Crop IPM

small dimple— an ovipositor sting or scar. Eggs hatch after about 10 days and the white maggots then feed and tunnel inside the fruit, especially in the placenta, causing soft spots on the wall of fruit and brown mines within. Maggots reach about ½ inch in length over a period of about two weeks, and do not have a distinct head capsule. When they are ready to pupate, they exit at the blossom end, leaving tiny round exit holes, usually in the end of August or in early September. These holes allow for the entry of soft rot bacteria into the fruit. Sometimes the oval brown pupae can be found inside the fruit. Often damage is detected only because of premature ripening or decay of the fruit.

Pepper maggot monitoring: It is possible to monitor for pepper maggot flies but it is much more complicated than placing yellow sticky cards in the field. To be successful, you must use ammonia baited sticky traps placed 20 feet up in maple trees along hedgerows. The pepper maggot fly has three bright yellow strips down its back (thorax) and banded wings, with a distinct pattern. A simpler way to monitor for fly activity is by looking at their most preferred crops for the first signs of damage, the stings made by ovipositing flies. Maggots prefer to lay eggs in the small (1-3 cm in diameter) round fruit of cherry peppers, and when these are planted in border rows around a pepper crop they work very well as indicator plants. The egg-laying stings appear as depressions or scars and are easy to find on these small, round fruit. By timing insecticide applications with the first occurrence of the stings on the indicator plants' fruit, damage to the main crop can be avoided with a minimum of spraying. If cherry peppers are not part of your crop mix, look for stings on bell peppers— these are their second favorite type of pepper.

Pepper maggot threshold: Farms that have never had a problem with this pest generally do not need to be concerned; however, the range of this pest seems to be expanding. If a given farm has a history of pepper maggot activity, then it is recommended that an insecticide be applied if flies have been captured in sticky traps or stings have been observed. Control options need to target the adult fly because eggs are deposited under the skin of the fruit and are hard to kill, as are the maggots which reside inside the pepper. If stings are observed on fruit, make two insecticide applications, 10-14 days apart, with a material labeled for pepper maggot.

When the activity of European corn borer and pepper maggot fly overlap, use of Orthene at 8-10 day intervals for control of ECB will also provide control of pepper maggots. However other, selective insecticides for ECB will not control pepper maggot. Insecticides labeled for pepper maggot fly include Dimethoate, Malathion, Mustang (zeta-cypermethrin), and GF-120 Naturalyte (spinosad). GF-120 Naturalyte is allowed for organic production. When using Naturalyte, a large spray droplet size of 4-6 mm is recommended to optimize the duration of this bait's attractiveness to the flies. See Vegetable Management Guide for more details on using these products.

ECB frass around bell pepper calyx
Photo, Ontario Crop IPM

European Corn Borer (ECB)

European corn borer is a resident pest that has 2 generations per year in southern and central New England and 1 generation in northern New England. ECB generally does not become a pest in peppers until the appearance of the second generation in late-July or early-August (1400 GDD base 50°F).The severity of ECB in peppers varies in MA and around New England. Some farms—typically in areas where farming is less dense and ECB populations have not built up— do not see much damage from this pest. In the Connecticut Valley and in Southeastern MA, an unsprayed pepper field may have

anywhere from 10 to 100% of the fruit infested. In some cases, it seems that sweet corn—which ECB prefer over peppers—helps to draw ECB away; in other cases, presence of sweet corn near peppers provides no benefit at all.

Life Cycle and Damage: Larvae overwinter in stalks of corn and other host plants and pupate in the spring. Adult moths emerge in late-May or early-June and mate in weedy or grassy areas. The moths are about 3/4" long, light brown in color with lighter bands on the wings. Three to 7 days after emergence (depending on temperature), females begin to lay flat, white egg masses on the underside of leaves. Eggs hatch in about 5 to 7 days (100 degree days, with a base temperature of 50°F). After the eggs hatch, the newly emerged larvae feed on leaf tissue for a short period and then tunnel into stems or fruit. ECB larvae often burrow into the fruit beneath the calyx. In addition to this direct injury, ECB also causes premature fruit ripening and fruit rotting by pathogens entering the wound. Controlling ECB larvae before they reach the pepper fruit is essential to effectively managing this pest.

Thresholds and Control: Check state sweet corn IPM reports for ECB activity, or use pheromone traps for monitoring adult flight. Make a first application 1 week after moth count equals or exceeds 7 moths per week and fruit are present on the plants. Discontinue sprays 1 week after moth counts drop below 21 moths per week. The spray interval depends on the residual period of the insecticide used as well as weather conditions and pest pressure. Use shorter spray intervals during peak flights and while pheromone trap catches exceed 150 moths per trap weekly (this rarely happens). Choose selective/microbial products such as *Bacillus thuringiensis aizawai* or *kurstaki* strains whenever possible to preserve beneficials and reduce the chance of aphid outbreaks, which can be caused when pyrethroids are used and natural enemies are killed.

Using Trichogramma wasps for biological control of ECB in pepper. Sweet corn is not the only crop where ECB can be controlled with the parasitic wasp, *Trichogramma ostriniae*. ECB will invade pepper fruits that are > ½ inch across, and *T. ostriniae* attacks only the egg stage, so timing is critical. We recommend that you begin releases the week that flight begins and continue weekly releases for a total of 4 weeks. Release 90,000 to 120,000 wasps per acre and spread the cards out throughout your pepper block. Higher rates are needed in peppers compared to sweet corn because the tolerance for damage is virtually zero and ECB larvae attack the fruit directly. Four releases are needed because the egg laying period for the second generation is longer than for the first generation of ECB. Fortunately, peppers are also a higher value crop and worth the extra cost. After four releases, Trichogramma will have reproduced in the field and biocontrol should continue. Wasps can be ordered from IPM Laboratories, at www.ipmlabs.com or by phone, 315-497-2910. Wasps can also be used in combination with insecticides, but choose a selective material (see above) that will not kill wasps.

-R. Hazzard, University of Massachusetts with source material from J. Boucher, University of Connecticut Extension

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Vegetable Notes. Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors.

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