UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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In this issue:

Crop conditions

Potatoes are up and the beetles are active! Many farmers are cultivating and hilling their potatoes. Be careful not to hill the plants too closely since fine roots grow laterally and near the surface. Early sweet corn is being cut out of plastic in some fields but is still under row cover or plastic is some areas. A sunny Memorial Day weekend fired up the pace of sales at farmstands and farmers markets. Greenhouses are emptying out, warm season crops are being transplanted and protected with row cover, weeds are thriving, and the field season is in full swing. Asparagus, rhubarb and spring greens are still being harvested. Rye covercrop is at the milk stage in some fields and already tilled under or killed for no-till in others for fall cucurbits. After heavy rains throughout much of the state in the last week, now would be a good time to take Pre-sidedress Soil Nitrate Tests (PSNT)for sweet corn, potatoes or other crops about to make their major growth spurts for the season. Last night there was a light frost in some areas, causing injury to unprotected sensitive crops, and last week included localized hail storms.

Potato at a good stage for PSNT sampling, and showing sensitive lateral roots

Besides the crops, training of new workers is on the minds of many farmers. Remember that training in the Worker Protection Standards is required for workers on all farms using organic or conventional, general or restricted use pesticides. See the Events section of this issue for more details on an upcoming training.

Pest alerts[1]

Call for Basil Downy Mildew Samples: Basil Downy Mildew was reported on overwintered, potted sweet basil plants in an unheated high tunnel in Virginia the first week of May. This pathogen requires a living host, and survived on the plants over winter. Here is New England, keep an eye out for signs of basil downy mildew on seedlings from the south. Symptoms can look like nitrogen deficiency, but the leaf yellowing is interveinal, and sooty dark patches on lower leaf surfaces are the spores.

Basil downy mildew is most susceptible in sweet or Genovese cultivars

The Plant Pathology Laboratory at the University of Massachusetts is conducting a study of genetic diversity in *Peronospora belbahrii*, the cause of downy mildew on basil. Samples are needed. We will accept whole plants, cuttings, or sporangia (leaf washings in 100% ethanol). We are interested in samples of downy mildew from both basil and coleus, as the causal organisms are similar. Please provide all of the following information (**Submitter name; Address; Date of sample collection; Host plant species (include cultivar if known); Origin of seed or seedlings, if known)** and submit with your samples to:

Angela Madeiras, Fernald Hall, UMass, 270 Stockbridge Road, Amherst, MA 01003

Table 1. Accumulated Growing Degree Days (F): Jan 1 to May 29, 2014	
Location	**Base 50°F (10°C)**
Pittsfield, MA	215.4
S. Deerfield, MA	282.3
Northboro, MA	259.3
Dracut, MA	296.8
Boston, MA	316.4
Sharon, MA	301.9
Seekonk, MA	307.0
Burlington, VT	305.4
Middletown, RI	237.7

European Corn Borer: **Set Traps to Monitor First Flight**. Based on the accumulated growing degree days (see Tables 1 and 2), European Corn Borer (ECB) emergence should be occurring soon. One ECB moth has already been captured in a trap on a New Hampshire sweet corn farm this year. ECB overwinters as a late-instar larva in the stalks of corn and other host plants. Its development into a pupa and then emergence as an adult moth is temperature-driven.

Table 2. First Generation ECB Development by Growing Degree Days (F)	
Development stage	GDD (base 50F)
emergence	375
first eggs	450
egg hatch	550

Corn growth is slower than usual, and many growers are using row cover or plastic later than usual. Even if your corn is small, farmers who are using pheromone traps to monitor flight should put them up as soon as possible to be able to tell if flight has begun in your area. Farmers with early corn that will be advanced to the late whorl to early tassel stage during the first generation flight should keep in mind that these plantings will attract the most egg-laying, and that larvae resulting from eggs laid in these stages will not appear in the emerging tassel, so treatment decisions in these fields should not be based on scouting. One or two insecticide applications soon after peak flight to prevent larvae from boring into the plant has been effective for controlling ECB on this very advanced corn. Note that egg hatch begins 125 GDD after first flight and GDD can accumulate rapidly at warmer temperatures. Paying attention to the GDD accumulation is important for the many growers who are using *Trichogramma ostriniae*, the tiny wasp that lays its eggs in ECB eggs, to control ECB. Timing is key for effectiveness: once eggs are hatched it's too late! The ideal time to release *T. ostrinae* is when first eggs are present in the field, but before eggs hatch. Growing degree day information (including 5-7 day forecasts) for many locations in MA can be obtained through the NEWA website (http://newa.cornell.edu/) and is published in this newsletter throughout the growing season. Note that the base temperature-for ECB is 50° degrees Fahrenheit (10°C).

Cabbage Root Maggot: Not a lot of damage seen by scouts in RI or VT. Damage with small and full grown maggots have been seen in a trial in South Deerfield, MA. The first generation flight is over when accumulated GDD's (in Celsius, base 4° C) are over 448, and most locations regionally are now over this first generation's pressure. See Table 3.

Onion Root Maggot: Flies were spotted in Northbridge, MA and maggots in an onion crop in Dover, MA. Most locations being scouted are near or above their peak for first flight. Scout for eggs and maggots if yellow sticky cards checked and replaced twice weekly are capturing adult flies. See Table 3.

Table 3. Accumulated Growing Degree Days[y] as of 5/28/14 for Cabbage and Onion Root Maggot. Values based on NEWA Cabbage Maggot model.

Location	**Cabbage Root Maggot**		**Onion Root Maggot**	
	Accumulated GDD's (4° C)	**Emergence**	**Accumulated GDD's (40° F)**	**Flight Peak[z]**
South Deerfield, MA	448	100%	755	>1st Peak
Orange, MA	387	95%	651	-
Waltham, MA	458	100%	772	>1st Peak
Seekonk, MA	508	100%	855	>1st Peak
Middletown, RI	468	100%	782	>1st Peak
Burlington, VT	396	100%	668	-

[y] For Cabbage RM, GDD are in Celsius with base 4C; for Onion RM, GDD are in Fahrenheit with base 40F.

[z] Onion Root Maggot 1st Peak = 700 GDD, 2nd Peak = 1960 GDD, 3rd Peak = 3240 GDD

Onion Thrips: Scouted and spotted in crops in Northbridge, MA (onion), Saunderstown, RI (brassicas, onion and garlic). Time to get out and scout for this pest! Treat if thrips reach 1 to 3 per leaf.

Brassica Flea Beetle: Damage is not high in Burlington, VT where cool temperatures still allow growers to keep brassicas under row cover. Reports of damage come from the Connecticut River Valley, MA and Saunderstown, RI. Control if damage to cotyledons or seedlings is stunting growth, or if damage to greens will reduce marketability. More information in article this issue.

Colorado Potato Beetle: Adults spotted in Dover, MA. Egg masses spotted in Amherst, MA and Saunderstown, RI. Small larvae spotted on tomato in high tunnel in Burlington, VT. Time to scout and control early to reduce pressure from future generations and protect establishing crops.

Striped Cucumber Beetle: Spotted on sticky cards in South Deerfield, MA, in greenhouse cucumbers in Amherst, MA and in fields in Saunderstown, MA. Beetle feeding spreads bacterial wilt to young plants, especially before the 5-leaf stage. Treat when beetle numbers reach 1 beetle per 2 plants. More information in article this issue.

Wireworm: Damage from this pest has been high in the Connecticut River Valley, MA this year. Damage has been reported in Hadley, MA (potato, onion), South Deerfield, MA (Brassicas). Chemical control is not well studied in organic products, and a bare fallow is recommended to reduce pressure for this pest that has a larval stage of 3-7 years depending on the species. Most common in 1st or 2nd year after sod.

[1] Scouting data for our Pest Alerts is being collected regionally from farms in Rhode Island, Vermont, and Massachusetts in 2014-2015 thanks to funding from the Northeastern IPM Center. Data from Squash Vine Borer and Corn pest traps are also coming from University of New Hampshire.

EARLY SUMMER COVER CROPS

Summer can be a good season to improve fields with a cover crop. If the soil is wearing out, a soil-building crop can be very beneficial. Also, when you harvest short season vegetables, you may have bare fields before garlic, wheat or fall cover crops. Bare soil is subject to pounding rains, erosion and proliferation of weeds. In fact, according to Natural Resources Conservation Service, farm soils in Massachusetts are most prone to erosion in early summer when we get heavy rains on tilled fields. Fill that open niche by planting a soil-improving, short-cycle cover crop. For planting in June or July, there are several good legume and non-legume choices that grow rapidly in the summer warmth. Here are some recommendations from Gordon Johnson, Extension Vegetable and Fruit Specialist from University of Delaware.

Legumes

Cowpea (*Vigna unguiculata*). Also known as blackeye or southern pea, this crop is underutilized in our area. It is fast growing with peak biomass often in 60 days. Cowpeas can fix up to 100 lbs of N per acre with biomass of 3000-4000 lbs/A. Cowpeas grow well in poor soils and can handle droughty conditions. Drill at 40-50 lbs/A. Certain varieties such as California Blackeye #5 and Mississippi Silver are poor nematode hosts and will be beneficial in systems where root knot nematode is a problem. See this site for nematode ratings of different cowpea varieties http://edis.ifas.ufl.edu/in516#TABLE_1. Cowpeas also can be harvested in the immature pod stage as a fresh legume so can serve dual purpose in small farms.

Soybean (*Glycine max*). Soybean can also be a good cover crop drilled at 60 lbs per acre. Forage-type soybeans produce considerable biomass and make excellent cover crops. For nematode suppression, use of root knot nematode resistant varieties may be beneficial. Edamame types can be harvested and sold in green pod stage and the residue returned to the soil for soil building, again serving a dual purpose on small farms.

Sunnhemp (*Crotalaria juncea*). Growers should consider planting sunhemp as a summer soil-builder. This is a tropical legume that is used extensively for soil building in countries such as Brazil and India. Drill 20-30 lbs/A. Sunhemp can produce very high amounts of biomass (10 ton biomass is not unheard of in Florida – amounts will be lower in New England, expect 3-4 tons). It is a high nitrogen fixing legume and can contribute over 100 lbs of N to a following crop. Sunhemp grows very fast in the summer, reaching 6 feet or taller in 8 weeks. However, a better way to manage sunnhemp is to let it grow to about 1-3 feet tall, then mow it and let it regrow again. If allowed to get too tall and old the stems will become tough and fibrous and will not decompose rapidly. Sunnhemp is a day length sensitive crop. It will grow any time during the summer, however it will not flower and go to seed until the days start getting shorter in very late summer.

Non-Legumes

Sorghum-Sudangrass (*Sorghum bicolor* x *S. sudanense*). Sorghum-sudangrass is a cross between forage or grain sorghum and sudangrass. It is a warm-season annual grass that grows well in hot conditions and produces a large amount of biomass. Plant at 20-40 lbs/A drilled. Of all the non-legumes, it is the most useful for soil building. Sorghum-sudangrass will often reach 6 ft in height. Like sunnhemp, it can be mowed and allowed to regrow to enhance biomass production and have younger material that decomposes more quickly. Expect 3-4 tons of biomass production per acre. As a grass, to get the most growth you will need to add nitrogen fertilizer (40-80 lbs/A). If incorporated when the plants are young,

Sorghum sudan first mowing S. Deerfield Research Farm, August

the nitrogen will be re-released for the following crop. Sorghum-sudangrass is very effective at suppressing weeds and has been shown to have allelopathic and biofumigant properties. Research on suppression of nematodes by sorghum-sudangrass has not been consistent but some studies show that sorgum-sudangrass suppresses nematode levels. Choose finer stemmed, leafy varieties when available. Brown midrib types will decompose more quickly because they have less lignin.

Forage-type Pearl Millet (*Pennisetum glaucum*) Pearl millet is a tall summer annual grass that grows 4 to 8 ft. tall. It is well adapted to sandy and/or infertile soils and does well in the summer heat. Forage types are better adapted for soil improvement than the grain types. Seed at 20-30 lbs/A drilled. Expect 3-4 tons of biomass production per acre. Again, as a grass, to get the most growth you will need to add nitrogen fertilizer (40-80 lbs/A). Pearl millet has been shown to suppress some nematodes. Forage pearl millet can make a good mulch for late-summer planted crops no-till or strip till.

Buckwheat (*Fagopyrum esculentum*). If weed suppression is the main goal, buckwheat is preferable and can be sown as early as May 20. As a broadleaf plant, it covers the ground earlier than grass cover crops, especially in early June, and out-competes weeds. Buckwheat can be drilled at 50 lbs/A or broadcast at 70 lbs/A. A good stand of buckwheat attracts beneficial insects, improves soil tilth, and produces more biomass than any other cover crop in the short time it grows, but doesn't do well if the plow layer is compacted. It scavenges phosphorus from soil and makes it available for subsequent crops. If the field is low in nitrogen and phosphorous, buckwheat will do well without additional fertilizer. Buckwheat should be mowed about 40 days after planting or right at flowering to prevent it from going to seed. Buckwheat decomposes quickly after incorporation. The main production risks associated with buckwheat are a failed stand and letting it go to seed.

Additional Information

Summer Soil Improving Crops for Vegetable Rotations, Gordon Johnson, Extension Vegetable and Fruit Specialist, University of Delaware.

Managing Cover Crops Profitably: http://www.sare.org/publications/covercrops.htm

-Updated by Katie Campbell-Nelson

PHEROMONES AND PEST MONITORING

One way insects communicate with individuals of the same species is with pheromones. Pheromones are volatile chemicals released by an insect that usually can be detected only by individuals of the same species. There are a number of different types of pheromones, but the most common type is the sex pheromone. Usually the females will emit a tiny amount of a chemical that attracts the male to her and increases the likelihood of mating. Because the chemical is volatile, air currents carry it. The male detects the pheromone in the air with receptors on his antennae. He then flies upwind to find the source of the pheromone, a prospective mate. The chemical compositions of pheromones for a number of pest species have been identified and synthetic copies can be produced in the laboratory. Synthetic pheromones can be used in conjunction with traps to catch male insects. This is a valuable tool for monitoring the adult population in a given area.

Using Pheromones to Monitor for Sweet Corn and Cucurbit Pests

In New England, pheromone traps are widely used to monitor the major pests of sweet corn, European corn borer (ECB), corn earworm (CEW), and fall armyworm (FAW). The caterpillar stages of these moths cause significant damage to ears and developing plants, and are the major drivers of pesticide applications in sweet corn fields. Monitoring the populations of the adult moths is key for early detection and season-long control, allowing growers to time sprays to respond quickly to changes in flights and to avoid unnecessary applications.

ECB overwinters in Massachusetts and typically produces two generations per growing season. The first adults emerge in late May or early June; the second flight begins to emerge in mid-July. (See Pest Alerts section for information on monitoring ECB flights according to growing degree days). CEW and FAW moths both migrate from the south, carried on storm fronts beginning in mid-July through September. The number of moths captured in a trap are used in conjunction

with previously established action thresholds. These thresholds, which can be found in the NE Vegetable Management Guide, tell you when to take action to avoid economic damage. We will publish trap captures in Vegetable Notes from a number of New England sites throughout the growing season. We also encourage growers to monitor populations on their own farms, as pressure can vary greatly across the region, and among farms within local areas.

Pheromone traps can also be used to monitor the flight of the cucurbit pest, Squash vine borer (SVB). The larval stage of this moth is a large, cream-colored caterpillar 1 to 1 1/2 inches long. They overwinter in New England soils as pupae. Adults emerge in late June and early July and lay their eggs at the base of cucurbit plant stems, just above the soil line. Larvae bore into the stems where they emerge and feed within, and can eventually destroy the vine. Preferred hosts have thick stems, while thin-stemmed squashes tend to be more resistant to attack. Winter squash, pumpkins, and zucchini are most susceptible while butternut squash is resistant. Yields of summer squash can be reduced by 1/3 if infestations exceed 5 larvae per plant. Sprays for this pest need to be well-timed to target larvae as they hatch, before they burrow into stems, where they can't be reached by pesticides. Trap counts can help determine the optimum timing for applications.

To get the most from your pheromone traps, they must be used properly:

- Place the traps and the pheromones out before you would normally expect the insect pest to be active. That way you can monitor the adult activity, which will warn you that damage from the larvae may be coming soon. European corn borer pheromone traps should go out about June 1 and corn earworm traps when there is silking corn or in early July. Squash vine borer traps should go out mid-June.
- Be careful how you store pheromones. Stored in the freezer, they will keep for years. For short-term storage, they should be refrigerated. If you keep them on the dashboard of your truck, they won't work well when you place them in the trap.
- When handling pheromone lures, do not touch them with your hands. Use a pair of forceps or wear latex gloves. This is especially important when you are using pheromones for more than one pest, as cross-contamination among lures for different pests will likely reduce their effectiveness.
- Lures usually should be changed every 3-4 weeks, although this will vary for individual lures.
- Check traps regularly, at least weekly. CEW traps should be checked twice weekly.

Here is a list of traps and lures specific to sweet corn and cucurbit pests. Brands listed have proven reliable in New England. These can be purchased from many of the suppliers listed below.

1. Scentry Heliothis net traps: two traps each for monitoring both European corn borer (There are two strains of ECB common in New England, the Iowa (ECB I or ZI) and New York (ECB II or EII) strains. You will need one trap for each strain.) and corn earworm (Traps should be placed in blocks that are in fresh silk. With two traps, you can leapfrog into freshly silking corn each week.) in sweet corn, and 1 trap for monitoring squash vine borer (Place trap directly above plant canopy for SVB.) (5 traps total).
2. Universal Moth Trap for monitoring fall armyworm (one trap)
3. Trécé lures for European corn borer (Iowa strain =ZI, New York strain=EII)
4. Scentry lure for fall armyworm (type: two-component PSU lure)
5. Hercon lure tape for corn earworm
6. Hercon vapor tape for Universal Moth Trap
7. Scentry lure for squash vine borer

Listed below are some, but certainly not all, of the suppliers of pheromones and traps:

Alpha Scents, Inc.; 1089 Willamette Falls Dr, West Linn, OR 97068; 503-342-8611; www.alphascents.com
Gempler's; P. O. Box 270, 100 Countryside Dr, Belleville, WI 53508; 800-382-8473; www.gemplers.com
Great Lakes IPM; 10220 Church Rd, NE; Vestaburg, MI 48891; 517-268-5693; www.greatlakesipm.com
Insects Limited Inc.; 16950 Westfield Park Rd, Westfield, IN 46074-9374; 317-896-9300; www.insectslimited.com
Pacific Biocontrol Corp; 620 E. Bird Lane, Litchfield Park, AZ 85340; 800-999-8805; www.pacificbiocontrol.com
Scentry Biologicals Inc.; 610 Central Ave, Billings, MT 59102; 800-735-5323; www.scentry.com
Trece Incorporated; P. O. Box 129, Adair, OK 74330; 866-785-1313; www.trece.com

For more information, photographs, and detailed sweet corn scouting instructions, see the UMass Extension publication, Using IPM in the Field: Sweet Corn Insect Management Field Scouting Guide.

- Adapted by Vegetable Notes editors from an article by Rick Foster, rfoster@purdue.edu, Purdue University Extension

STRIPED CUCUMBER BEETLE: FOCUS ON EARLY CONTROL

Striped cucumber beetle adults spend the winter in plant debris in field edges and with the onset of warm days move rapidly into the crop. High tunnel and greenhouse cucumbers draw beetles first, followed by early field crops. 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, delayed plant growth, and reduced yield. Eggs are laid in soil near the stem, and a hidden but important impact of SCB is the larval root feeding, which reduces plant vigor and yield. The striped cucumber beetle also vectors *Erwinia tracheiphila*, the causal agent of bacterial wilt, and this can be more damaging than direct feeding injury. Focus on early, effective control to avoid yield impacts and to protect pollinators.

Crop rotation, transplants, and floating row cover are cultural controls that help reduce the impact of cucumber beetles. Row covers provide growth benefit and insect protection, and need to be removed when flowering begins. Perimeter trap cropping with a preferred cucurbit crop (usually a *C. maxima* such as blue Hubbard or buttercup) can give excellent control with a dramatic reduction in pesticide use, in both organic and conventional systems. For more details on perimeter trap cropping see articles on PTC at http://extension.umass.edu/vegetable/insects/cucumber-beetle-striped

Striped cucumber beetle can cause severe damage to developing cucurbits

Thresholds and foliar controls. Cucurbit plants at the cotyledon and first 1-2 leaf stage are more susceptible to infection with bacterial wilt than older plants. Thus, it is especially important to keep beetle numbers should be kept low before the 5-leaf stage. Scout frequently (at least twice per week up to emergence, and for two weeks after) and treat after beetles colonize the field. The economic threshold depends on the crop. To prevent bacterial wilt in highly susceptible crops such as cucumber, muskmelons, summer squash, and zucchini, we recommend that beetles should not be allowed to exceed one beetle for every 2 plants. Less wilt-susceptible crops (butternut, watermelon, 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.

Conventional foliar insecticides. There are a number of broad spectrum conventional insecticides which can be used for foliar control, including carbamates, pyrethroids, and neonicotinoids. All are highly toxic to bees and should only be used before bloom. Avoid using neonicotinoid sprays Actara (thiamethoxam) or Assail 30SG (acetameprid) if systemics in the same class were used (see below) See 2014-2015 New England Vegetable Management Guide for more details.

Systemic insecticides. Two neonicotinoid products, imidacloprid (multiple trade names) and thiamethoxam (Platinum) are registered for use in cucurbits as an in-furrow, banded, drench, or drip irrigation application to the seed/seedling root zone during or after planting/transplanting operations. Note specific application methods and rates on label. Commercially-applied seed treatments (eg thiamethoxam, Farmore) are also available for early season control.

Organic insecticides. Kaolin clay (Surround WP), pyrethrin (Pyganic Crop Spray 5.0 EC), and Azera (mixture of pyrethrin and azadiractin) are labeled for SCB in cucurbits and can be tank mixed with an additive effect. Surround should be applied before beetles arrive because it acts as a repellent and protectant and is not a contact poison. With direct-seeded crops, apply as soon as seedlings emerge if beetles are active. Transplants can be sprayed or dipped before setting out in the field. As with other insecticides, it must be re-applied after heavy rain and on new growth. Pyganic provides a short term knock-down with no residual effect. Spinosad is labeled for the cucurbit crop group, though not for SCB.

Reducing risk to pollinators. The New England Vegetable Management Guide describes many steps that growers can take to protect honeybees and native pollinators when using insecticides. The issue of neonicotinoids, in particular, has received a great deal of attention in recent years. This is a group of insecticides that have a chemical structure very similar to nicotine. They have been widely used in agriculture because they are effective against a wide range of insects, have lower mammalian toxicity compared to older classes of insecticides, and because they can be absorbed by roots and

moved through the entire plant. This trait allows for applications to be made to soil or on seeds, with less exposure to humans and to natural enemies of insect pests. Neonicotinoids are highly toxic to bees, and label requirements prohibit use on blooming crops or where there are blooming weeds or borders. Additional concern about impact on bees arises because research has shown that detectable, low concentrations of neonicontinoids can move into pollen or nectar. These are present at sublethal concentrations, but may affect the foraging behavior of bees or suppress their immune system. The long-term or colony effects of are difficult to assess in the field, because bees from each colony travel long distances and forage in many different habitats and types of plants. In cucurbits, both native bees (eg squash bees and bumblebees) and honeybees visit flowers to gather both pollen and nectar, and are essential to crop pollination. Research in cucurbits has shown that the sublethal concentrations that may be found in pollen or nectar. Higher levels were found after foliar applied treatments and chemigated insecticides applied through drip irrigation during flowering. Lower levels were detected in treatment regimes that involved a single application at planting via seed treatment, drench applied to transplants trays, or transplant water treatment. Thus growers should avoid high rates and multiple applications, especially through trickle irrigation as the crop approaches flowering.

Beekeepers in Europe and North American have faced some difficult problems in the last 10 years, including a parasite of bees called the Varroa mite and Colony Collapse Disorder—a disorder in which bees seem to mysteriously disappear over a short period of time. Extensive research on Colony Collapse Disorder suggests that the most important causes of this syndrome are a combination of several bee diseases with other stresses. At this time, insecticide use is not considered to be a direct cause of Colony Collapse Disorder.

-R Hazzard. Sources include Protecting Pollinators in the Yard and Garden, David Smitley, Professor of Entomology, Michigan State University, April 3, 2014 and G. Dively & A. Kamel, Insecticide Residues in Pollen and Nectar of a Cucurbit Crop and Their Potential Exposure to Pollinators, J. or Agr. And food Chemistry. 2012.

FLEA BEETLES ARE ACTIVE IN BRASSICAS

Flea beetles have emerged from their overwintering homes in the shrubby or wooded areas surrounding fields and begun to feed on the first spring brassica plantings. The crucifer flea beetle (*Phyllotreta cruciferae*) is uniformly black and shiny, while the striped flea beetle (*Phyllotreta striolata*) has two yellow stripes on its back. Both are about 2 mm in length and hop away when disturbed. These flea beetles only feed on brassica crops; those found on corn or solanaceous crops are different species. Though they prefer the tender leaves of *Brassica rapa* & *B. juncea* crops such as arugula, tatsoi, mizuna, bak choi, and mustard, they will also feed on the more waxy Brassica oleracea crops such as broccoli, cabbage, kale and collard. Their feeding damage – small, round holes on leaves, which can coalesce to form large holes as leaves mature, can destroy or delay maturity in seedlings and reduce yield and marketability of older plants.

Brassica flea beetle

The adults in fields now will lay their eggs in the soil. Larvae will feed on the root hairs of brassica crops, pupate underground, and emerge as adults in late July to feed on fall brassicas before moving outside of the field for the winter.

Management

Crop Rotation. Because second generation flea beetles will emerge at the same time that fall cole crops will be at their most vulnerable, it is important to try to locate fall plantings as far from early successions as possible. These second generation adults are also the beetles that overwinter, so next spring, plan to use a field distant from previous late-season brassica fields. After harvests, till crop residue immediately to uproot and kill underground larval populations.

Row Covers. Floating row cover provides the most effective protection from flea beetles, especially in spring and early summer. It is expensive in both materials and time, but it works. It is critical to seal the edges immediately after seeding, because brassica seeds germinate quickly and beetles rapidly find the cotyledons. Flea beetles can fit through small openings – not to mention the large holes and tears that often develop in row cover over time. Edges of the cover must be sealed on all sides using soil, black plastic bags filled with soil, or some other method. Fortunately hoops are not needed on brassica crops, but management is still time-consuming because the cover has to be removed for cultivation. Replace it as soon as possible to avoid letting beetles in.

Other insect barriers, such as Proteknet, Biothrips, and Filbio, are available in a range of mesh sizes and can be used to protect against a variety of pests, including flea beetles. These provide less heat and greater air circulation than spunbonded row covers, though for early spring crops, the additional warming benefit of traditional row covers of various weights may be preferred.

Chemical Control. Maturing plants should be scouted frequently. When plants are young, an average of 1 beetle per plant or 10% average leaf damage is a reasonable threshold for chemical intervention. Several synthetic pyrethroids (Group 3A), carbamates (Group 1A), and neonicotinoids (Group 4A, either as foliar or soil drench) are labeled for flea beetle in brassicas. Avoid repeated use of one type of chemistry over multiple generations or using both soil and foliar applications of the same group. Note that as of 2012, the registration for Thionex has been cancelled and is no longer allowed on cole crops. Soil-applied systemic insecticides, such as Admire Pro and Actara can provide longer term control against damage, although beetles may still be seen when scouting. Be aware that these systemics have longer days to harvest intervals. With foliar sprays, even if good control was achieved, re-infestations can occur rapidly and may require additional sprays.

For organic farmers, the choice of chemistries includes spinosad (Entrust), which now has a federal label for flea beetle. Among organic products that were tested in UMass trials, this showed the greatest efficacy in suppressing flea beetles and reducing damage. Pyrethrin (Pyganic EC 5) showed poor to moderate efficacy in our trials but is reported by growers to cause a significant short-term knockdown. Abby Seaman, NYS IPM, found in 2012 trials that both kaolin (Surround WP) and hot pepper wax worked well. They did not prevent enough feeding for salad greens to be marketable, but they did prevent enough feeding for broccoli, cauliflower, cabbage, etc. to outgrow the damage. In 2012, we observed in grower fields in MA that kaolin reduced feeding damage in high-pressure situations. Use only on early crop stages, before marketable leaves or heads develop.

Control Brassica Weeds. Brassica weeds also harbor flea beetles (both adults and larvae) and reduce the efficacy of our crop rotation schemes that aim to break the pest cycle by changing crop families. Yellow rocket and wild mustard are familiar weeds that are widespread in fields and roadsides. The list of weed hosts probably also includes garlic mustard (Alliaria petiolata), a serious invasive weed in the brassica family. It is a biennial with white blooms in spring (May). It thrives in roadsides and field edges as well as shady woodlands, and has rapidly spread throughout Massachusetts. A good fact sheet on garlic mustard can be found at: http://www.nps.gov/plants/alien/fact/alpe1.htm or through the Invasive Plant Atlas of New England (IPANE) website.

Trap Cropping. Take advantage of the flea beetle's preferences for particular brassicas by using the preferred species or varieties as a draw. Their numbers will build up in the more attractive plants, and are less likely to move into or stay in those less preferred. A border or even a middle row planted to *Brassica rapa* or *B. juncea* crops such as Komatsuna, tatsoi, mizuna, bak choi, and mustard has been shown to reduce numbers and feeding damage on less preferred B. oleracea crops such as broccoli, cabbage, or traditional kale (eg, Winterbor types). Red Russian kale (*B. napus*) and Lacinato kale (*B. oleracea*) seem to of intermediate attractiveness. To make it work, here's some tips:

-Make sure the trap crop is established before the main crop (the one you are trying to protect) or is at least as big (eg transplanted same day). Direct-seeded crops can be used around transplants if seeded 7-14 days earlier.

-Use a fast-growing, vigorous cultivar for the trap crop.

-Use a border crop to prevent beetles from moving farther into the field. Traps at end of rows help make a complete perimeter, which stops beetles coming from all directions. Interior trap crops also can act as a 'sink' within the field.

-Spray only the trap crop to kill the accumulated beetles, and avoid having to spray the main crop. You also want to keep the trap crop viable enough to do its work, and potentially be harvestable as well. Use a longer-residual product, if possible.

-Combine with a repellent on the main crop. Surround WP and garlic sprays can be used for this purpose.

Break the Cycle. Don't grow brassicas before July. This may not easily fit your markets, but it does work. With no food or place to lay eggs, the overwintering adults leave the area, instead of reproducing and emerging in time for midsummer dining. It may take 2-3 years to bring populations down. Control weeds at the same time.

Upcoming events

UMass Fruit and Vegetable Program SWD Twilight Meeting

When: Tuesday, June 10, 2014, 5pm to 7:30pm

Where: Nourse Farms, 41 River Rd, Whately, MA 01093

Spotted Wing Drosophila (SWD) is an invasive fruit fly pest that has been found in Massachusetts since 2011. This meeting will provide growers with recent updates in trapping and management methods and provide an opportunity to ask questions and share information about experiences with this pest. In addition to discussing SWD, we will also have a chance to tour the farm and learn about innovations and new varieties and techniques being used at the farm.
For more information contact Sonia Schloemann at sgs@umext.umass.edu.

Organic Pesticide Use and Worker Protection Standards

When: Wednesday, June 11, 2014 2pm to 5pm

Where: Powisset Farm, 37 Powisset St, Dover, MA 02030

All pesticides – even general-use pesticides, including those that are OMRI-listed for use in organic production – can be dangerous and need to be handled and applied properly. Join UMass Extension for a hands-on workshop covering safe measuring and mixing of general-use products, as well as calibration of backpack and tractor-mounted sprayers for effective and efficient applications. There will also be an overview of the requirements of the EPA Worker Protection Standards (WPS). These regulations are designed to reduce poisoning and injuries among agricultural workers and pesticide handlers. They apply to all employees on farms where any general- or restricted-use pesticides are being used. Come learn what you or your employer need to do to be in compliance, including use of appropriate signage and personal protective equipment.

Contact Lisa McKeag, lmckeag@umext.umass.edu, 413-577-3976 for more information.

Worker Protection Training

When: Wednesday, June 25, 2014, 2:00pm to 4:00pm

Where: UMass Cranberry Station, 1 State Bog Rd, East Wareham, MA 02538

There is a $5 fee for manual. If you have a pesticide license, you do not need this class.

Contact Marty Sylvia, martys@umass.edu, 508-295-2212 x 20 to register or for more information.

UMass Agricultural Field Day

When: Tuesday, July 29, 2014, 10:00am to 4:00pm

Where: UMass Animal and Crop Research Center, 89-91 North River Road, South Deerfield, MA 01373

Come tour the research farm and learn about all of the exciting projects currently underway on a broad range of agricultural topics. A full list of presentations and other details coming soon!

Contact Madeline Madin, cdle@umext.umass.edu, 413-545-5221 for more information.

Vegetable Notes. Ruth Hazzard, Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors. Vegetable Notes is published weekly from May to September and monthly during the off-season, and includes contributions from the faculty and staff of the UMass Extension Vegetable Program, other universities and USDA agencies, growers, and private IPM consultants. Authors of articles are noted.