UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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In this issue:

Crop conditions

Growers are finishing their big push to get transplants of fruiting crops out into the field. We've seen transplants that are taking off very well and others that seems to be struggling to take hold. Higher temperatures, strong sun and winds over several days this week caused scorch and burn on some pepper and cucurbit transplants, especially cucumber. Asparagus harvest is good; cool weather has favored the crop, but not the beetles. Greenhouse tomatoes and cucumbers are producing. Lettuce, bok choy, salad mix, braising greens, and radishes are being harvests. Strawberries are late, just coming in on early, row-covered crops. Corn is slow; row covers are being removed in cooler sections of the state, and made a big difference in growth this year. Seeding and transplanting winter squash and pumpkins is ongoing. Sweet potato slips will be going in soon. Some growers have tried reflective plastic mulch for onions this year. This is the time for pre-sidedress soil nitrate tests to determine if potato, early corn, brassicas or onions need additional fertility. It's also a good time of year to prep beds in advance, let weeds germinate, and use a stale seed-bed technique with shallow cultivation, flaming, or burn-down herbicides. Field preparation, applying soil amendments, bed prep and plastic laying, handling row cover, seeding and transplanting and keeping up with weeds keep the whole crew busy.

Pest alerts

ECB caterpillar and damage to pepper fruit.

European Corn Borer: ECB moths are being captured in pheromone traps and egg laying has begun. Eggs take 5-7 days to hatch. If you are using Trichogramma ostriniae wasps in sweet corn, it is time for the first release (Table 1). High tunnel peppers could be at risk from first-generation ECB caterpillars, which will begin boring into the top of fruit when it is about ping-pong ball size. It may be a good idea to scout for small, translucent egg masses on the underside of pepper leaves and make an insecticide application or release *Trichogramma ostriniae* wasps when eggs are present, though managing this pest in greenhouse peppers has not been well studied. Use caution in selecting insecticides, and follow label instructions on use in a greenhouse setting. Field peppers are not at risk until the second generation ECB flight.

Table 1. Accumulated Growing Degree Days: 1/1/14 – 6/4/14 and trap counts. According to models, first generation emergence is at 375 GDD (Base 50°F), however, traps are capturing moths in some areas still below this GDD threshold.

Location	Base 50°F (10°C)	Total ECB trap counts
Pittsfield, MA	*287.6*	na
Amherst, MA	*370.1*	12*
Northboro, MA	*331.0*	na
Dracut, MA	*362.8*	na
Sharon, MA	*366.2*	na
Seekonk, MA	*380.9*	na
Litchfield, NH	-	9
Hollis, NH	-	2
Mason, NH	-	5
Burlington, VT	*364.6*	na
Middletown, RI	293.0	na
**2 night catch*		

Imported Cabbageworm: Has been spotted in several locations in Western MA. Caterpillars are gray-green, slightly fuzzy, and sluggish. They grow to > 1 inch and feed in the center of the head as it grows. You may first notice the wet green frass (droppings) it produces building up at leaf nodes. Scout by counting the number of plants with one or more caterpillar present to determine % infested. Treatment may be required at the following thresholds, which vary depending on the crop and growth stage: before heading, 35% infested; heading, 20% infested; leafy greens, 15% infested.

Colorado Potato Beetle: Adults were observed in MA, RI and VT and egg laying is increasing quickly in Washington County, RI (19 egg masses on 30 plants). Eggs can build up during cool weather and hatch all at once if we get a hot spell in June– be prepared! See article below for details.

Adult CPB laying eggs on potato leaf. Photo by Lauren Breene, URI.

Onion Thrips: Have been observed but are below threshold in crops in Franklin County, MA (onion), and in Washington County, RI (onion and leeks). Now is the time to scout for this pest. Treat plants if the population reaches 1 to 3 thrips per leaf.

Leafminer: Has been observed causing injury to spinach and beets in Middlesex County MA, with eggs still being laid. Scout for small, white, thin egg clusters on the underside of leaves. If treatment is needed, be sure to get adequate pressure or use drop nozzles to get good coverage of lower side of leaves.

Cabbage Maggot: First generations are complete in most locations (Table 2) and the worst of the damage is past. Onion Maggot: Adult flight is past the peak and larval feeding and damage to onion roots is occurring now across MA. Damage is only a continued concern if soils remain cool and wet. Hot soil surface in June (above 90°F) will kill maggots as they emerge from eggs.

Table 2. Accumulated Growing Degree Days[x] as of 6/4/14 for Cabbage and Onion Root Maggot. Values based on NEWA models.

Location	Cabbage Root Maggot		Onion Root Maggot	
	Accumulated GDD's (4° C)	Generation[y]	Accumulated GDD's (40° F)	Flight Peak[z]
South Deerfield, MA	539	F1	912	>1st Peak
Orange, MA	469	overwinter	789	>1st Peak
Waltham, MA	534	F1	903	>1st Peak
Seekonk, MA	591	F1	999	>1st Peak
Middletown, RI	541	F1	907	>1st Peak
Burlington, VT	493	F1	837	>1st Peak

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

[y] After completion of spring emergence, accumulated degree days need to be reset to zero after each F1 (508 GDD +/- 33), F2 (465 GDD +/- 21) and F3 (399 GDD +/- 3) generations.

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

WORKER PROTECTION STANDARDS APPLY TO ALL FARM WORKERS

The Worker Protection Standards (WPS) are federal regulations designed to reduce poisoning and injuries among agricultural workers and pesticide handlers. The WPS require that farm owners and employers provide protection to workers and handlers from potential pesticide exposure, train them about pesticide safety, and provide mitigations in case exposures may occur. These regulations apply to all farm workers, regardless of whether the farm uses restricted- or general-use pesticides, and all farms need to be in compliance with these laws. Luckily, the regulations are straightforward and relatively easy to implement.

"Restricted use" is a federal EPA designation that restricts a pesticide to use only by a certified pesticide applicator or under the direct supervision of a certified applicator. Only about 25% of all pesticides fall into this category with atrazine being the most common active ingredient in this category. Massachusetts Department of Agriculture (MDAR) requires that farmers who want to apply restricted-use pesticides on their farms have a private certification for pesticide application.

Most pesticides fall into the "general use" category, including those listed by the Organic Materials Review Institute as

allowed for use in organic systems. There is often a misconception that pesticides used in organic systems are safer and may be exempt from these regulations but this is not at all the case. As an example, copper formulations tend to have "warning" hazard labels as opposed to the lower "caution" label, as they can be fatal if swallowed and are eye irritants and therefore the REI is 48 hours and contaminated clothes must be washed before they are re-used. In Massachusetts*, farmers who apply only general use pesticides are not required to be certified or licensed to apply pesticides, but they must be trained as EPA Worker Protection Standard (WPS) pesticide handlers. Handlers are defined as any farm workers who apply general-use pesticides and/or perform tasks such as mixing and loading pesticides, transferring or cleaning opened pesticide containers or spray equipment, or going into a treated area before the restricted entry interval (REI) has expired. Farm employees who do not mix or apply pesticides and handle only unopened or decontaminated containers are considered workers and require WPS worker training.

Training. All workers and handlers must receive WPS training before they perform a pesticide related task, enter a treated area, or before they accumulate more than 5 separate days of entry into areas on your farm where a pesticide has been applied or a restricted-entry interval has been in effect within the past 30 days. All workers and handlers must be trained at least every 5 years, however, there is legislation pending which would shorten the WPS training interval to one year. In order to provide worker training one must be an EPA certified handler or have completed a train-the-trainer program or be a certified pesticide applicator. To provide handler training one must be a certified pesticide applicator, be a state or federally designated trainer of certified applicators or handlers, or must have completed a train-the-trainer program.

You can get training by becoming certified as a pesticide applicator (exams held once/month, click here for more details) or at two upcoming UMass Extension events (see events listing this issue)

The main components of WPS are: that all workers must undergo pesticide safety training that provides information on how and where pesticide injuries may occur and how to prevent them, product labels and spray records must be made available to workers at a central posting location where a pesticide safety poster and location of nearest medical facility are displayed, treated areas must have clear signage to keep people out until the REI has ended, decontamination materials (soap, water, and paper towels) must be available in the event of an accident, and access to emergency assistance must be provided. Below is a more specific list of WPS requirements, with links to more resources:

- Pesticide safety training — for workers and handlers
- Access to labeling information — for pesticide handlers and early-entry workers including product labels and material safety data sheets (MSDS)
- Access to specific information — for workers and handlers, which includes providing information about when and where on the farm pesticide applications are made, emergency information, and a pesticide safety poster at a central location
- Keep workers out of areas being treated with pesticides
- Keep workers out of areas that are under a restricted-entry interval (REI), with a few narrow exceptions,
- Protect early-entry workers who are doing permitted tasks in pesticide-treated areas during an REI, including special instructions and duties related to correct use of personal protective equipment
- Notify workers about pesticide-treated areas so they can avoid inadvertent exposures
- Monitor handlers using highly toxic pesticides
- Provide required personal protective equipment to handlers
- Decontamination supplies — a sufficient supply of water, soap, and towels for routine washing and emergency decontamination, and
- Emergency assistance — making transportation available to a medical care facility in case of a pesticide injury or poisoning, and providing information about the pesticide(s) to which the person may have been exposed.

WPS Farm Inspections. All farms using restricted or general use pesticides may be subject to a pesticide inspection to ensure the WPS standards are being met. State agencies generally have primary jurisdiction for enforcing WPS misuse violations. If you are contacted by MDAR to schedule an inspection, they will be looking to see if your workers have had WPS training, if you have a WPS Central Information Display Area, and are following other requirements of the WPS regulations. If you are a certified pesticide applicator, you may also be asked to show your pesticide application records,

storage and mixing areas.

*Please note that other states may require pesticide certification for farmers who apply general use products and check with your department of agriculture to determine pesticide use requirements in your state.

--Susan B. Scheufele, UMass Vegetable Extension

DISINFECTING USED TOMATO STAKES

Wooden stakes are a place where the bacterial pathogens that plague tomatoes can survive between crops. Considering the importance in disease management of controlling initial inoculum and the challenges of effectively managing bacterial diseases, it is prudent for growers to disinfect stakes that were in a field where a bacterial disease occurred last year. This step is worthwhile even if there is uncertainty about occurrence. There are three bacterial diseases of concern on tomato: speck, spot and canker. Bacterial canker is sufficiently destructive that discarding stakes is recommended after an outbreak.

Step one in disinfecting anything is removing as much dirt and debris as possible because this can protect pathogens and de-activate disinfectant. Therefore start by hosing down used tomato stakes. An agricultural disinfectant containing quaternary ammonium chloride salts like Green-Shield is a good choice for the disinfecting step. Use at 1 Tablespoon (= 0.5 fl oz) of Green-Shield in 1 gallon water. While this disinfecting solution will be more stable than bleach after diluting with water, it should not be used more than 24 hours after preparation. Soak stakes for at least 10 minutes. Another option, albeit not as good, is Clorox or other household chlorine bleach (5.25% sodium hypoclorite). Use bleach at a rate of 0.5% (= 1 part bleach + 9 parts water). And use in a well-ventilated area. Soak stakes for 30 minutes. While bleach is highly effective, it is short-lived after mixing in water, with a half-life of only 2 hours, and it is especially prone to being inactivated by organic matter, thus pre-cleaning is critical.

–Meg McGrath, Cornell Cooperative Extension, Originally Published in Long Island Veg Update, 5/22/14

MEASURING INSECTICIDE OR FUNGICIDE FOR BACKPACK SPRAYERS

Always calibrate your backpack sprayer to achieve the correct rate.

Growers with diverse crops and small plantings often need to apply pesticide to beds or plots of several hundred square feet. It can be difficult to figure out how to calibrate a backpack sprayer for spraying a small area. Some labels give rates for backpack sprayers (i.e. amount per gallon of water), but most only provide rates per acre (i.e. amount per land area treated). Rates may have to be calculated by converting from the rate per acre (per 43,560 sq ft) to rates for a few hundred square feet. Careful division gives you the amount you need. However, it is also critical to properly calibrate your sprayer by determining how much water you use to cover a given area.

For some products, spraying small areas may mean that you need to measure extremely small amounts. A small graduated medicine cup purchased from your local pharmacy comes in handy with oz. and ml. units of measurement. Liquid measured in (fluid) ounces is already a volume so it is easier to measure. One fluid ounce equals 29.6 milliliters (ml). Some pesticides call for very low rates per acre and may need to be measured in ml when treating small areas.

Even if you are using pesticide products that are relatively safe, always store in a safe place, handle carefully, follow the directions on the label (it's the law), and use the required protective gear for mixing, spraying, and cleaning your sprayer. Mix in a designated area that is away from workers and the public. Only mix the amount of product that you are going to use for a given application. Never store mixed pesticides in a backpack sprayer or any other vessel, and never store pesticides in anything other than the original labeled container.

When calibrating and using your sprayer, be consistent. The amount of spray you apply to an area will depend on four variables: your walking speed, the pressure you select, your spray swath width, and the nozzle tip you've chosen. *If you change any one of these, you change the amount of spray you apply.*

Walking speed. This constant walking speed should be one that you can comfortably maintain over the entire time you

intend to spray. It also must be the same speed at which you calibrate the sprayer. If you double your walking speed while maintaining pressure and swath width, you'll apply half as much spray. You would then require twice as much pesticide per gallon (that is, a greater concentration) to apply the same amount of pesticide per acre. A comfortable and easy walking speed to maintain is 3 miles per hour, which translates to 23 seconds per 100 ft. This also happens to be a good speed for tractor driven pesticide applications. You can easily calibrate this walking speed by walking 100ft. between irrigation hydrants on your farm while spraying water to test your coverage.

Pressure. If you change the pressure while you spray, you change output. Increased pressure results in higher output; the exact relationship depends on your nozzle type. 40 psi is a common pressure used when using flat fan nozzles and maintaining an 18" height away from your plant surface. A pressure gauge can be fitted on to a backpack sprayer.

Nozzle tip selection. The proper tip will depend on the situation. Tips are available that cover a wide range of output volumes, spray widths, and pressures. Most backpack sprayers come with a single flat fan nozzle, but a cone tip may be more appropriate for getting the small droplet size that is needed for covering foliage. When making soil drenches for root pests, some growers remove the nozzles entirely, because soil drenching usually requires more water per acre in order to carry the product into the soil in a narrow band along the row. For soil drench, labels frequently give amounts per 100 row ft.

Swath width/nozzle height. Tips are designed for use within certain heights and pressures. Within these ranges, some tips deliver narrow bands; others, like flooding tips, provide swath widths up to 7 feet. The wider each swath width, the less time the operator spends walking up and down fields. The height at which you hold the spray tip above the target influences the swath width. For foliar applications, 18" above the crop is a common distance appropriate for many nozzles. Keep this distance even if you are spraying from the side in order to improve coverage of lower leaf surfaces.

Calibrating backpack sprayers: First, check your sprayer coverage and operation. Select the spray tip or boom setup that provides the desired coverage. Add water, and spray the ground or dry pavement as if you were spraying your field. Check the spray pattern for uniformity to make sure none of the nozzles are clogged and proper spray pattern overlap if you're using a boom. You can also check it over the crop to see if you are getting good coverage by attaching water-sensitive cards to a piece of foliage and inspecting your spray coverage. (These cards are available from suppliers of spray equipment and pesticides.) Adjust nozzle spacing and/or height until you achieve the desired pattern. For insecticides and fungicides, your goal is to use sufficient water to cover the foliage with small droplets, but only until the point of drip off of leaf surfaces. Be certain you're getting uniform coverage before you proceed! Check fittings and hoses for leaks.

Calibration Example:

1. Calculate what portion of an acre is being sprayed. Determine sq ft of area to be sprayed (multiply canopy width x row length x number of rows). Calculate how much of an acre this is (this may be a small fraction of an acre):

Example:

4ft canopy width x 250 ft bed length x 5 rows = 5,000 sq.ft.

5.000 sq. ft / 43,560 ft2 per acre =

Acres to be sprayed = 0.115 acres

2. Calculate how much pesticide to use. Multiply the rate per acre for the crop and pest (from the label) times the proportion of an acre to be sprayed.

Example:

Pyganic 5.0EC at 10 fl. oz. per acre x 0.115 acres

Amount of Pyganic needed = 1.15 fl. oz.

3. Measure water needed per sq ft of crop. Add a known amount of water (eg 1 or 2 gallons) to the tank. Spray the water as if you were actually spraying your field and watch that your crop gets adequate coverage until water drips off the leaves, but not to drench the soil. When making a soil drench application, target the base of the plant and check if enough water is applied to percolate 2 inches deep. Remember, you must maintain constant pressure, constant walking speed, and consistent nozzle height and boom setup or wand motion to achieve the coverage you need. This amount will change with

different crops and size of crop canopy. When the water is gone, stop and mark the spot. Measure the area you sprayed and calculate the square feet (length of swath x width). Calculate how many gallons needed per sq ft.:

Example:

2 gallons used / 1000 sq. ft. tested

Gallon per sq. ft. = 0.002 gallons

4. Determine total water needed:

0.002 gallons x 5,000 sq. ft.

Gallons of water needed = 10 gallons

5. Mix the required amount of pesticide in the required amount of water. It is best to add half the water, add the pesticide, agitate, then add the remaining water. Spray, using the walking speed, pressure, nozzle and boom setup or wand motion that you used for calibrating.

To speed up your mixing process, see the table below for commonly used labeled rates of organic insecticides converted into amounts per 100 and 1,000 sq. ft.:

Product	**Amount/100 sq ft**	**Amount/1000 sq ft**	**Rate /acre**
Pyganic 5.0EC	0.02 oz or.67 ml	0.23 oz or 6.7 ml	10 fl. oz
Entrust	0.014 fl. oz. or 0.4 ml	0.14 fl. oz. or 4.0 ml	6 fl. oz.
Surround WP	1 ½ - 3 cups	4.5 - 9 cups	50 lb

Note that the measure used for Entrust must be accurate to 1/10 ml! For Entrust, do not use more than 3 gallons of water per 1,000 sq ft. For many insect pests, the label requires no more than 2 consecutive applications and no more than a specific label allowable amount of Entrust per year, for resistance management.

--Ruth Hazzard and Katie Campbell-Nelson, UMass Extension Vegetable Program. Sources include Calibrating and Using Backpack Sprayers, C.G. Landgren, Oregon State University, Washington State University, University of Idaho.

COLORADO POTATO BEETLES ON THE MOVE

Colorado potato beetle (CPB) adults are actively moving into potato fields and laying eggs. Hatch can be expected soon. Increasing temperatures mean faster development and feeding rates. While a period of cold, rainy weather slows everything down, it may let eggs pile up. We can expect a surge of shiny yellow eggs, and young larvae to appear with the next hot spell. Scouting fields -- and knowing what to look for -- is key in determining when to use appropriate controls. Colorado potato beetle is also an important pest of eggplant, and these fields should be monitored as well. Good control of CPB in June will not only protect vulnerable crops now; it will also reduce the number of beetles that will reproduce in fields and overwinter to feed on next year's crops. Both adults and larvae cause feeding damage, but larvae damage is the most severe. Because the fourth larval stage (instar) does 85% of the feeding damage it is critical to control larvae while they are small.

Life Cycle: In the Northeast, CPB survives on solanaceous crops and weeds, including horsenettle, nightshade, eggplant, potato and tomato (primarily seedlings). CPB overwinters in the adult stage, primarily in soil (up to 12 inches deep) in the woods and brushy borders next to host crops, though some burrow into soil in the field. In spring the beetles search for food plants by walking from the field edges. Heavy feeding may occur on edges on non-rotated fields. If beetles do not find host plants via walking they will fly in search of food. Once host plants are found adults feed, mate and lay eggs. One female can lay up to 300 eggs. Eggs hatch in 7-10 days, depending on temperature. Feeding damage and larvae are easily seen on leaves. Larvae go through four molts (instars) before they pupate. In the first instar, the larvae are about the same size as the eggs and in the second instar they are about an eighth of an inch long. Mature, fourth instar larvae are hump-backed and plump, and reach 5/8"-long before they drop to the soil and pupate. Adults emerge from pupae after 10-14 days leaving round exit holes at the soil surface. In southern New England there is second generation of eggs, larvae

and adults, while northern New England there is one generation. Beetles fly out of fields in August, seeking overwintering sites at field edges.

Monitoring & Thresholds: Scout beetles on 30 to 50 plants (or later in the season, stalks). One recommended procedure is to walk the field in a V shaped pattern and stop at each of 10 sites across the field. Randomize your selection of sites using a set number of paces,for example stopping every 10 to 30 paces, depending on field size. At each location, select 3 to 5 plants (from when plants emerge until 12"-18" tall); thereafter select 3 to 5 stalks at each site. Alternatively, select plants or stalks individually at random across the field. Count adults, large larvae (greater than half-grown) and small larvae (less than half-grown) separately. A treatment should be considered for adults when you find 25 beetles per 50 plants or defoliation has reached the 10% level. The spray threshold for small larvae is 4 per plant; for large larvae, 1.5 per plant (or per stalk in midseason), based on a count of 50 plants or stalks. Potatoes can tolerate 15- 20% defoliation without reduction in yield.

Scout weekly. If population pressure may be on the rise, such as when new eggs are hatching or larvae are small, scout again in 3-4 days, especially if numbers are above the following thresholds: 15 adults, 75 small larvae or 30 large larvae per 50 plants/stalks. Use these scouting sheets to help keep track of beetle populations and determine when economic thresholds are reached: Potato, Eggplant. These can be used for a range of insects and diseases in each crop.

Cultural Controls & Prevention:

Rotation. The single most important tactic for CPB management is to rotate potatoes, eggplant and tomato to a field that is at least 200 yards from the previous year's fields. Barriers such as roads, rivers, woodlands, and fields with other crops are helpful. This single practice delays and reduces colonization by adults, and reduces subsequent egg and larval populations.

Crop health. Production practices that include healthy seed and good crop nutrition help plants grow well and withstand feeding injury.

Straw mulch. It has been well documented that when potato or eggplants are mulched with straw, fewer Colorado potato beetle adults will settle on the plants and fewer eggs will be laid. This can be accomplished on larger plantings by strip planting in a rye mulch, followed by mowing and pushing the rye straw over the plants after they emerge. For smaller plots, straw may be carried in.

Barriers. Mechanical barriers such as trench traps, trap crops and straw mulch also delay and reduce infestation. Install plastic-lined trench traps next to overwintering sites at least one week before adults emerge. Trenches should be 1' to 2' deep and 6" to 24" wide at the top. They can be U- or V-shaped with side walls sloping at angles between 65° and 90°. Beetles walking from field borders fall into the trench and cannot fly out.

Flaming. Flame weeders can be used to kill colonizing adult beetles when emerging crop is under 3-4 inches high. Move rapidlty using a tractor mounted or hand-held flamer. The goal is to scorch beetles, as injury to antenae and legs render them unable to orient and climb plants. at this early stage, healthy emerging potatoes have sufficient reserves to regrow foliage and establish well.

Perimeter trap cropping. Potato trap crops may be planted earlier than the main crop to attract beetles before the main crop emerges, or planted between overwintering sites and this season's crop. Flame, vacuum or spray border crop before beetles move into the main crop. Another approach is to plant three to five rows of potatoes treated with a systemic insecticide in a perimeter around the field; this treated border will kill up to 80% of the colonizing beetles. Straw mulch around the host crop has been shown to reduce beetle numbers. Late planting may cause beetles to leave the field before potatoes emerge, resulting in lower beetle numbers.

Biological controls:

Predators and parasites of CPB supress populations and help prevent crop injury. Natural enemies that attack CPB eggs or larvae include twelve-spotted ladybeetle (*Coleomegilla maculata*), spined soldier bug, a carabid beetle (*Lebia grandis*) and a parasistic tachinid fly. *Beauvaria bassiana* has been shown to suppress beetle populations though it does not provide immediate control. If insecticides will be used, use selective rather than broad-spectrum products to conserve natural enemies.

Chemical Controls & Pesticides:

Scout to determine whether or not a damaging population is present. When using products that control only larvae or

only small larvae, scout for eggs, note egg hatch and apply controls before larvae reach third instar to avoid the worst feeding injury. For materials that control all stages, you may wait and scout for adults and larvae to determine the need to apply insecticides.

Resistance management must be part of every potato grower's plan. CPB has a remarkable capacity to develop resistance to insecticides. Based on a fifty-year track record, we can expect that any insecticide that is used repeatedly on the same population of CPB (that is, those in the same field or a farm with nearby fields) will lose its efficacy in less than five years. Where potato production is concentrated and rotation has been limited, resistance may develop on an region-wide basis. If your farm is isolated from other farms where potatoes are grown, it's up to you to manage resistance in the population of beetles on your farm. Note the resistance group number of each insecticides and avoid using chemistries from the same group. Wherever possible, growers should rotate classes of insecticides and avoid using the same chemistry more than once per year or even better, once every other year. Do not use the same chemical class on successive generations in the same year. Note that in the New England Vegetable Management Guide, as well as on pesticide labels, each insecticide has a Group Number, which identifies chemistries with the same mode of action. Avoid using insecticides from the same group. Use newer chemistries first. For conventionally managed fields, there are enough different products to do a two-year rotation that will effectively control CPB while effectively delaying resistance to any one product. Keeping them effective by careful insecticide rotation is a worthwhile investment. For organically managed fields, the selection of insecticides is limited to fewer active ingredients including spinosad, azadirachtin, pyrethrin, and *Beauvaria bassiana*.

For current information on potato insect management including an up to date list of insecticide groups that have products registered for Colorado potato beetle, please visit the New England Vegetable Management Guide.

Do not try to kill every beetle in the field. Potato crops can withstand 15% defoliation without affecting yields. Avoid spraying the beetle in late season, as food reserves in the foliage two weeks prior to senescence add little to final tuber bulking.

--Ruth Hazzard, UMass Vegetable Extension

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 (see article this issue). Come learn what you or your employer need to do to be in compliance, including use of appropriate signage and personal protective equipment. You will receive a card certifying you have completed EPA WPS Handler training.

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. You will receive a card certifying you have completed EPA WPS Handler training.

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.