UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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In this issue:

Garlic scapes have been harvested and the crop is looking great at this farm in Norfolk Co. this week. Photo: L. McKeag

Crop conditions

What a spring so far! From record-setting high temperatures in April to fruit-freezing lows in May; long dry spells punctuated by a few heavy rains; an extra-intense allergy season; and now smoke from Canadian wildfires filling New England skies and leading to air quality warnings—growers are putting on and pulling off row covers, setting up irrigation, and now maybe pulling out COVID-era N95 masks to filter out some of the haze.

Despite all the challenges, fields and farmstands are filling up and the list of things to harvest keeps growing. We're seeing hearty greens like kale, collards, and chard; tender lettuce, bok choy, and Napa cabbage; pea shoots, and the earliest zucchini and summer squash; bunched carrots and radishes. High tunnels are putting out ripe tomatoes and strawberries, and field strawberries are ripening now too. Potatoes are up everywhere, the earliest corn is starting to tassel, even after some setbacks from the cold, and folks are planting winter squash and melons. Asparagus is still coming in, and the first garlic scapes are up.

Speaking of garlic, we're seeing some yellow tips and streaking in garlic leaves. Remember that bulbs need water to size up and will benefit from irrigation up to a couple weeks before harvest if they're not getting enough rain. Yellowing and streaking may be the result of bulb mites or a suite of potyviruses, all of which can be be transmitted via seedstock, but giving them enough water will give them their best chance to size up under other stressors. If you want to sidedress to get the plants a bit more N, do so before the end of May. Garlic will not respond to N applied after late June, and N applications after that time can actually delay the normal maturity of the crop and can aggravate some diseases.

Pest alerts

Alliums

Onion thrips are becoming established on older plantings of onions. At one location in Hampshire Co. this week, a newer planting of onions had no thrips while an older planting had up to 0.75 thrips/leaf. The threshold for treatment is 1-3 thrips/leaf – growers using organic materials should use the lower threshold. These were plants grown from seed, meaning the thrips have moved into the crop from the surrounding environment. Transplants purchased from warmer parts of the country can also bring thrips with them and result in high populations early in the season. Thrips feed on allium foliage with rasping mouthparts, resulting in silvery damage that can make crops unmarketable.

Contact Us:

Contact the UMass Extension Vegetable Program with your farm-related questions, any time of the year. We always do our best to respond to all inquiries. **Office phone:** (413) 577-3976 **Email:** umassveg@umass.edu

Home Gardeners: Please contact the UMass GreenInfo Help Line with home gardening and homesteading questions, at greeninfo@umext.umass.edu.

The feeding also allows bacteria to enter the leaves, which can lead to bacterial bulb rots later on, where one or more layers of the onion becomes watery and rotten. The most effective material for organic growers is spinosad (e.g. Entrust). Apply with insecticidal soap (e.g. M-Pede, at the 1.5% v:v rate) to increase efficacy. Entrust can only be used two times in a row before rotating to a different insecticide class. Neem oil (e.g. Trilogy) and azadirachtin (e.g. Azatin O) may be effective also if applied when populations are still low. Pyrethrin (e.g. Pyganic) can provide knockdown control. Labeled conventional materials include neonicotinoids (e.g. Assail, Admire Pro), pyrethroids (e.g. Delta Gold, Declare, Warrior, Pounce, Mustang), spinetoram (e.g. Radiant), and spirotetramat (e.g. Movento). Movento and the neonicotinoids are systemic or translaminar and will work by ingestion; pyrethroids work on contact and will not have long residuals. Use an adjuvant with all materials to help materials adhere to waxy allium leaves, unless it says otherwise on the label.

Silvery damage from thrips feeding in onion. Photo: G. Higgins

Garlic planted from new seed stock on the left, compared to 8-year old seed stock on the right. Photo: S. Scheufele

Garlic yellowing is a new normal, often caused by a suite of potyvirus and/or bulb mites which infest the plant and are carried over to the next year with the seed. Periodically buying new seed stock from a reputable supplier can help (see photo above). There are currently no research-proven controls for bulb mites.

Brassicas

Signs of **cold damage** on older leaves or leaf tips are still apparent in many brassica plantings. Cold injury in brassicas looks similar to sunburn, leaf scorch, or nutrient deficiencies. If the new growth looks healthy then don't panic – the plants will continue to grow out of the damage.

Buttoning has also been reported in broccoli and cauliflower. Buttoning is a premature formation of broccoli or cauliflower heads; the heads will never size up. It is caused by plant stress, including drought, heat, and temperature fluctuations.

Cold injury in cabbage. Photo: G. Holmes, Strawberry Center, Cal Poly San Luis Obispo, Bugwood.org

Nightshades

Colorado potato beetle laying eggs.

Colorado potato beetles are continuing to lay eggs in potatoes and eggplants, and more adults are continuing to slowly move into fields. In one field in Hampshire Co. this week, we saw adults walking from a cull pile in last year's potato field to volunteer plants in this year's squash and strawberries. CPB adults are poor fliers, especially in cooler weather, so they often walk to find crop hosts in the spring and don't move far, making crop rotation an especially effective management tool. Removing volunteer potato plants and controlling solanaceous weeds (e.g. Eastern black nightshade, horsenettle) is important too. Take note of when eggs start to hatch in your fields, as pesticides are most effective if they target the smallest larvae. CPB populations readily develop insecticide resistance, so do not use the same chemical class on successive generations of CPB in the same year. In recent years, we have observed resistance to both neonicotinoids and synthetic spinosads in New England. Labeled conventional products include pyrethroids, neonicotinoids, novaluron (e.g. Rimon), cyromazine (e.g. Trigard), and diamides (e.g. Verimark, Exirel). OMRI-listed materials include spinosad (e.g. Entrust), azadirachtin, pyrethrin (e.g. Pyganic), and *Beauvaria bassiana* (e.g. Mycotrol O, Botanigard), which can be tank-mixed and/or rotated. Of those, Entrust is most effective but can only be used 2x on only 1 generation of CPB per season. See the potato insect management section of the New England Vegetable Management Guide for information on cultural controls for CPB.

High tunnel tomato infected with lesion nematode. Symptoms resembled those of nutrient deficiency. Photo: S. Scheufele

Pepper stem scalded by contact with hot black plastic. Photo: G. Higgins

Lesion nematodes were found causing damage in high tunnel tomatoes in Franklin Co. this week. The tomatoes were stunted and yellowing and had symptoms that resembled nutrient efficiency. Tomatoes grafted onto Maxifort root stock were full-sized and lush green—Maxifort is marketed as being resistant to nematodes. If you notice similar symptoms in your tunnel tomatoes and can rule out other causes like nutrient deficiency, consider submitting a sample to the UMass Plant Diagnostic Lab.

Scalded stems have been reported in plasticulture peppers and tomatoes in the last week – a result of the hot weather we had on June 1 and 2. Black plastic becomes very hot in the sun and can burn stems if it comes into contact with them—make sure planting holes are big enough to avoid contact with stems. Another way stem scorch can occur is when plastic or landscape fabric is not flush with the soil, pockets of air get superheated and scorch plant stems as the air escapes out of planting holes. Peppers are especially susceptible. Make sure you have good mulch-soil contact. See the article in last week's issue of Veg Notes for more information.

Sweet corn

European corn borer was captured in low numbers in Whately, Leominster, Bolton, and Swansea this week (see Table 1 on next page). The first ECB eggs are predicted at 450 GDD base 50°F, which we are nearing in most of the state. In whorl stage corn, larvae will bore into the whorl, where they are protected from sprays, so wait to treat until tassels have fully emerged. Treat when 12% of plants in a 50-plant sample have 1 or more larva or show fresh feeding damage.

Corn earworm adults are emerging in parts of NY where there are overwintering populations. None of the four MA

sites trapping for CEW have captured any moths yet. CEW lays eggs in silking corn, so corn is not currently at risk for damage.

See the article in this issue for more information on monitoring sweet corn pests using pheromone traps!

Table 1. Sweet corn trap counts for week ending June 7

Location	GDD* (base 50°F)	ECB NY	ECB IA	FAW	CEW
Western MA					
Westfield	446	-	-	-	-
Chicopee Falls	405	-	-	-	-
Whately	453	1	0	-	0
Central MA					
Leominster	471	1	0	0	0
Northbridge	362	-	-	-	-
Spencer	433	-	-	-	-
Eastern MA					
Bolton	418	0	1	-	-
Stow	384	-	-	-	-
Methuem	404	-	-	-	-
Ipswich	353	-	-	-	-
Millis	-	0	0	n/a	-
Sharon	411	0	0	n/a	0
Sherborn	415				
Seekonk	403	0	0	0	0
Swansea		2	0	-	-

- no numbers reported for this trap
n/a this site does not trap for this pest

*GDDs are reported from the nearest weather station to the trapping site

PHEROMONE TRAPPING FOR SWEET CORN CATERPILLAR PESTS

One of the biggest challenges in sweet corn production is caterpillar damage and the presence of caterpillars in ears. The best tactic for managing these pests involves a combination of trapping using pheromone lures and scouting to determine the optimal times to spray your crop. Spraying based on trapping and scouting information, as opposed to spraying on a strict calendar schedule, can reduce the number of sprays going on a crop, saving growers time and money.

There are 3 major caterpillar pests of sweet corn in New England – European corn borer, corn earworm, and fall armyworm. European corn borer is the earliest of these to show up in the Northeast, and has been caught in low numbers in most parts of the state this week. All three species can be present in a corn field at once.

A brief overview of the 3 major corn caterpillar pests:

European corn borer (ECB) is the first corn caterpillar pest to show up in sweet corn, as they overwinter in the Northeast. Adult moths emerge in May, at 375 GDD base 50°F. (GDDs in MA range from 353 to 471 as of Wednesday.) Eggs are laid on undersides of leaves and caterpillars bore into the corn tassel, stalk, directly into the ear, or enter ears through the silk channel. At this time of year, signs of ECB infestation will be shot-hole damage in leaves or lodged tassels, accompanied by lots of tan-colored frass. There are two generations of caterpillars per year. There are two strains of ECB – a NY strain and an IA strain – as well as a hybrid of the two strains. All 3 are trapped separately using specific lures.

Corn earworm (CEW) has not historically overwintered in the Northeast, but there are now small overwintering populations that have been detected in parts of NY. None of our trapping sites in MA have detected overwintering populations. Most CEW blow in on storms coming from the South or from overwintered populations in western NY, arriving in mid-July. Eggs are laid in fresh silks and caterpillars enter the ear through the silk channel. There are two generations of CEW per year.

Fall armyworm (FAW) is also blown northward on storms, usually arriving in the Northeast in mid-July. Eggs are laid preferentially in whorl-stage corn, and caterpillars create large, ragged holes in the leaves and drop big clumps of frass.

See our Identifying Caterpillars in Sweet Corn article for more information on each of these pests.

ECB larva and adults.
Photos: Clemson Univ. (L), USDA Cooperative Extension, Bugwood.org (R)

CEW larvae and adults.
Photo: Richard Clark II (L) and E. Burkness, Bugwood.org (R)

FAW larva and adult.
Photos: F. Peairs, Colorado State U. (L) and C.D. Barrentine, Bugwood.org (R)

What is pheromone trapping?

Pheromones are chemicals produced by organisms to communicate with one another. Pheromones from one species can usually only be detected by that species. There are many different types of pheromones that insects use, but the most common type is the sex pheromone. Usually, females will emit a tiny amount of a chemical that attracts the male and increases the likelihood of mating. These sex pheromones are volatile, meaning they easily evaporate into gaseous form at daytime summer air temperatures, so they are carried on air currents and intercepted by receptors on the males' antennae. The males 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 can be synthesized in the laboratory. These synthetic pheromones can be used in conjunction with traps to catch male insects. Extension networks throughout the Northeast use pheromone-baited traps to monitor ECB, CEW, and FAW, as well as squash vine borer, a pest of cucurbits. Traps are set up in active sweet corn fields, and are checked weekly for moths. The pheromone lures are changed regularly.

For all three corn caterpillar pests, pheromone trap captures tell us when each pest has emerged or arrived in that field. For ECB and FAW, the trap captures tell us when to begin scouting a corn crop for eggs and caterpillars, and the decision of whether or not to spray is made from scouting results. For more information on scouting for corn caterpillar pests, see our Managing Sweet Corn Pests Through Scouting & Pheromone Trapping article and the UMass Sweetcorn Insect Management Field Scouting Guide. We publish trap counts from sites across the state weekly in the Pest Alerts section of Veg Notes, so if you aren't trapping on your farm, you can use trap counts from the location nearest to you to tell you when to begin scouting your corn. Once CEW arrives in the region, and trap counts

Table 1. Spray Intervals for Corn Earworm based on moth captures in Heliothis net traps.

Moths/ Night	Spray Interval
0 - 0.2	no spray
0.2 -0.5	6 days
0.5 - 1	5 days
1 - 13	4 days
Over 13	3 days

exceed 1.4 moths/week, spray schedules are determined by CEW trap counts, with higher counts triggering tighter spray schedules (see Table 1 on previous page).

There are two types of traps commonly used for corn pest pheromone trapping:

Scentry Heliothis net traps are used to monitor ECB, CEW, and squash vine borer. (*Heliothis* is a genus of moths that CEW used to belong to – the species has now been reclassified as part of the genus *Helicoverpa* but the trap name remains the same!) Heliothis traps are tied to a pole, with the bottom of the trap drawn wide. The pheromone lure is clipped to a string at the bottom mouth of the trap. Moths are attracted to the lure then fly up into the top portion of the trap, a behavior which would help them find their prospective mate in the field, and are trapped.

Universal Moth Traps, or **bucket traps** are used for monitoring FAW, among many other insects. The pheromone lures are placed in a compartment beneath the trap lid, and VaporTape (a small PVC strip containing the insecticide dichlorvos) is placed in the bucket. Don't forget to use gloves with the VaporTape! Bucket traps come in green or yellow and white – yellow and white traps have been found to catch load of bumble bees and other pollinators, so we prefer using the green traps for FAW.

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 adult insect to be active. That way you can be sure to catch the first adult flight and get an early warning that adults are present in your field, laying eggs that will soon hatch into larvae that cause crop damage. *See Table 1 for information about when you should set up traps for different pests.*
- Keep lures frozen or at least refrigerated until ready for use. 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 or VaporTape, 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. Contamination of a lure with another pheromone will likely reduce the effectiveness. VaporTape is insecticidal tape and shouldn't be touched with bare skin.
- Make a schedule of when to change lures. *See Table 2 for information about how often to replace lures for different pests.*
- Check traps weekly, on the same day every week.

Table 2. Trapping information for various pests

Pest	Trap # and type	Trap setup	Trapping Dates	Lure replacement interval
ECB	2 white heliothis traps (1 for NY, 1 for IA)	Place traps at least 50 ft apart, in weedy border of field. Opening should be level with top of weeds.	May 15 (even if corn isn't up yet) – September 15	4 weeks
CEW	2 white heliothis traps	Trap in silking corn. Move one trap into a block with fresh silk each week.	July 15, or as soon as you have silking corn – September 15	2 weeks
FAW	1 green bucket trap	Hang trap at plant height on metal stake. Place at edge of field in whorl-stage corn. Place lure in cage and VaporTape in bucket.	July 15 -September 15	4 weeks. Vaportape will last the entire season.
SVB	1 white heliothis trap	Place trap in-row with squash. Opening should be directly above the plant canopy.	June 1 – October 1	4 weeks

Commercial growers: If you'd like to begin trapping for corn pests on your farm, we can help get you started! Contact us at umassveg@umass.edu or 413-577-3976.

Here are some, but certainly not all, suppliers of pheromone trapping materials. Different brands of lures are available for each pest – use the same brand over the course of a season to get consistent trap counts.

Alpha Scents, Inc. 503-342-8611

Gempler's 800-382-8473

Great Lakes IPM 517-268-5693

Insects Limited Inc. 317-896-9300

Pacific Biocontrol Corporation 800-999-8805

Scentry Biologicals Inc. 800-735-5323

Trece Incorporated 866-785-1313

For management recommendations, see the Corn section of the New England Vegetable Management Guide or this article on Corn Earworm Management.

--UMass Vegetable Program

High tunnel soil fertility: pounds per acre vs. parts per million

--Written by Judson Reid, CCE Cornell Vegetable Program; Originally published in Cornell VegEdge, Vol. 19, Iss. 8, May 31, 2023

Soil-based protected agriculture combines hydroponic and field production techniques. We are using greenhouse technology to drive yield and quality. This requires higher nutrient levels, which we can mimic from hydroponic production. However, our delivery must account for existing 'banks' of nutrient in the soil, and others factors including pH, temperature, organic matter, and biology. Additional factors that influence our decisions on source and rates of nutrients include:

- Organic vs conventional
- Bulk vs soluble materials
- Price
- Salts

A common question then becomes how much supplemental nutrients to add? Should we take a quantitative (pounds per acre) or dilution (parts per million) approach? There are valid reasons for both approaches. Here we will use tomatoes and nitrogen to illustrate the practice and principles of soil fertilization calculations in protected setting.

In order to initiate the process, we need three tests to guide our decisions on high tunnel fertility. These include:

1. A standard soil test, to determine nutrient status, organic matter, pH plus a supplemental soluble salts test.
2. An irrigation water suitability test with a minimum of pH, alkalinity, EC [electrical conductivity] and TDS [total amount of dissolved solids]. Further water testing for nutrient values will improve our interpretation.
3. In season foliar tests of the crop serve to cross check our nutrient management and allow for immediate corrections.

Once we have these tests, we can make decisions on nutrient additions and pH management. Nitrogen is generally assumed to be a blank slate each spring. We know that organic matter makes significant contributions throughout the season, so these levels can be factored into a total nitrogen budget. What is a nitrogen budget for a high tunnel tomato crop in the Northeast?

Cornell estimates a minimum of 100 lbs/ac demand for the full season, whereas University of Florida recommends 200 lbs/ac (both field levels). [*Editor's note:* The New England Vegetable Management Guide recommends 140-160 lbs/ac N

for field tomatoes and 100-400 lbs/ac N for high tunnel/greenhouse tomatoes, depending on yield expectation.] Since high tunnels have different start and end dates, soil types and varieties grown, a middle value of 150 lbs/ac is a common recommendation, potentially more for high yielding crops, or less for high organic matter soils.

To continue with the quantitative approach (using 150 lbs/ac), the next question we must ask is-will there be a preplant application? Certified Organic growers will often choose to apply some pre-plant nitrogen for several reasons.

- Many certified sources of nitrogen are in bulk form, that cannot easily be applied in season, such as alfalfa, soy, and feather meals.
- Certified Organic sources of nitrogen that are soluble are often prohibitively expensive to use as a sole source.
- Using slower release forms of nitrogen is more consistent with organic principles than fast release.

How much nitrogen should be applied pre-plant? We recommend no more than 50% of the total nitrogen budget, in this case 75 lbs/ac. This is to prevent excess levels at the wrong stage of crop growth. If too much nitrogen is mineralized too quickly, the crop can become excessively vegetative, delaying maturity and reducing yield. The excess foliage promoted can also become breeding grounds for foliar diseases such as Botrytis gray mold.

Excess nitrogen can keep plants in a vegetative stage and delay maturity. Photo: J. Reid

Having made a decision on pre-plant applications, we now turn our attention to in-season applications of nitrogen. Assuming that drip irrigation and an injector are in place, crop demand is now estimated on a weekly basis. Taking the remainder of the nitrogen budget (either 75 or 150 lbs/ac), we can divide the amount of nitrogen desired by the anticipated number of weeks the crop will be in the ground.

For example, a high tunnel tomato crop transplanted on May 1 would easily have a 20-week lifespan if terminated on October 1. The arc of growth and harvest descends rapidly in the last month, so we could estimate supplying the budget over 15 weeks. This is easy math: 150 lbs/ac/15 weeks = 10 lbs/ac N per week, or in the case of a pre-plant application, 5 lbs N/ac/week.

To calculate how much fertilizer is needed to achieve this rate we need a couple key values.

- Acreage of the high tunnel (divide the square feet of tunnel growing area by 43,560)
- % nitrogen in the fertilizer by weight (for both dry or liquid forms)

Next, we divide the weekly desired rate by the % nitrogen in the product. For example, if we want 5 lbs N/ac and have a 20-20-20 fertilizer, 5 divided by 0.20 = 25 lbs of fertilizer. However, we need to multiply that value by the actual acreage being fertilized. A high tunnel that is 0.1 acres would need 2.5 lbs of 20-20-20 to achieve a weekly rate of 5 lbs actual N/ac. Alternating with clear water irrigations, growers will further divide this rate into 2-3 applications per week to create a more uniform soil status.

Uniform soil nitrogen status is also the motivation for the parts per million (ppm) approach to high tunnel fertility. In this case we are borrowing knowledge from the hydroponic world, where precise rates have been determined for tomatoes at various stages of growth. The major advantage of a parts per million approach is a precision level application that allows us to get a proper ratio of nitrogen into the route zone, regardless of water demand. This contrasts with the lbs/ac approach that requires we apply sufficient water to safely deliver the N package. In heavy soils or cool, cloudy weather the crop may have a low water demand, but still need sufficient nitrogen. Applying a known ppm allows us to keep the crop fertilized properly during times of low water demand. Many sources suggest around 150 ppm pushing upward to 200 ppm N during peak demand. To calculate how much fertilizer is required to achieve this rate we need several key values.

1. The proportional ratio of our injector. Many models are fixed at 1:100, and we'll use this ratio for ease of calcula-

tion.

2. Desired ppm N. 150 ppm is a safe figure.
3. The % N in our fertilizer.

Now we can use a simple formula to reach a weight of fertilizer to apply. Here we are solving for US ounces (by weight) and gallons of stock, the most common units amongst Northeast US high tunnel growers. Other units require different formulas. Our equation represents:

(ppm desired x injection ratio) ÷ (%N of fertilizer x 75) = ounces per gallon of stock solution.

For example, we desire 150 ppm N, our injector is set at 1:100 and our fertilizer is 20-20-20.

(150 x 100) ÷ (20 x 75) = 10 ounces of fertilizer per gallon of stock.

Now we can apply 150 ppm N regardless of how much water we irrigate by formulating our stock solution properly. More good news! There are many online calculators that will do this math for you, and even easier, greenhouse grade fertilizers will often have a simple chart to help achieve desired ppm for a known injection ratio and %N in the bag.

Either a ppm or lbs/ac approach requires a proportional injector. Photo: CCE Cornell Vegetable Program

Parts per million helps us avoid over fertilization and elevated electrical conductivity levels in the soil. It is particularly useful for recently transplanted seedlings with low water demand. A ppm approach does not make sense for sandy soils that leach water quickly. In this case we are wasting and losing nitrogen if we continually irrigate at 150 ppm. The same comments apply to large crops during high temperatures. The combination of water and nutrient demand can push us back to the lbs/ac approach.

So, now that we know how to use these two approaches, which makes the most sense for high tunnels? I suggest that both have a role. Parts per million is particularly valuable early in the season, and the precision approach can be important when looking at nutrients besides nitrogen, which can easily be applied at toxic levels. The lbs/ac approach is useful in mid-season when both nitrogen and water demand is high. By understanding both approaches we can back-calculate how many lbs/ac N we are applying in a ppm approach and vice versa. This quick math can reduce over applications and compare our progress at meeting a total nitrogen budget for the crop year. Finally, foliar samples reveal sufficient (or excess) nitrogen levels in the living crop. Now that we understand calculating daily and weekly application rates, we can fine tune adjustments based on the foliar results.

BABY, LIGHT MY FIRE—BUT NOT MY BACKYARD, PART 1

[Editor's Note: Here's a guest article from a colleague at Cornell Cooperative Extension, discussing a topic that we don't hear much about - the effects of light pollution on plants. Enjoy!]

--Written by Tamson Yeh, Pest Management & Turf Specialist, Cornell Cooperative Extension of Suffolk County. Originally published in Cornell Cooperative Extension of Suffolk County Agricultural News, Vol. 107, No. 6, June 2023.

Ahh yes, the 1950s prison break movie…baying of the dogs, the shouting of the guards, and the giant crossing spotlights as Charlie tries to go over the wall. Unfortunately, this now happens to me as I try to take out my garbage, get my mail, or go scouting before sunrise or try to look up at the night sky, search for bats, owls or nocturnal insects, or even go for a midnight snack inside the house. Welcome to the era of excessive night lighting. If I wanted to be caught in the bright lights, I could go try out for Broadway.

Bright night lights affect pests, plants, wildlife, and beneficial insects. Artificial lighting at night is unaffectionately

known as “ALAN.” It is well established that ALAN disrupts insect and wildlife behaviors. Light-emitting diode (LED) lights with their blue-rich tones especially have been shown to disrupt natural sleeping and eating patterns in wildlife. The use of LED lights is growing. They are cheaper, save energy, and are considered better for public safety because of their brightness; however, half of the millions of known insect species on Earth are nocturnal and insects can see blue light.

Photo: T. Yeh

Humans may suffer from exposure to blue-rich LED lights as well; LED lights may impede secretion of the hormone melatonin, which regulates the body’s circadian rhythm and helps balance the reproductive, thyroid, and adrenal hormones. Hmmm, where have I recently seen tons of commercials relating to this…

Artificial lighting is enough to trick the red to far-red receptors in plants and therefore it can “convince” trees that the days are longer than they actually are. Thus, scientists found that trees living near streetlamps retained some of their leaves longer than normal, and this was one of the first observations of the effects of light pollution on plants. Additional photosynthesis may not seem that bad, but holding onto leaves longer makes trees more susceptible to ice and cold damage. The effects of artificial lighting continue into spring as well; trees growing near lights tend to break dormancy earlier in the spring, thus making them susceptible to frost damage. Early-flowering plants run the risk of losing their entire reproductive effort by blooming before the threat of frost is gone and this can really mess up their relationship with pollinators.

The effects of artificial lighting can even influence the way in which plants grow. Research has found that plants growing near streetlights had larger leaves with more stomatal pores and these pores remained open for considerably longer than plants growing under unlit night conditions. This made them more susceptible to pollution and drought; two stressors that are all too common in urban and suburban environments. Issues are made much worse if the artificial lighting NEVER turns off throughout the night.

What are we doing to the environment with all these light-happy gadgets??? Changes in the timing of flowering or bud break can disrupt insects and birds that rely on these events for food and shelter. Research even suggests that forest regeneration is being altered by artificial lighting. Seed dispersers such as bats often will not fly into well-lit areas at night, therefore reducing seed dispersal.

Street lighting has detrimental impacts on local insect populations. Street lighting strongly reduced moth caterpillar abundance compared with unlit sites (47% reduction in hedgerows and 33% reduction in grass margins) and affected caterpillar development. A separate experiment in habitats with no history of lighting revealed that ALAN disrupted the feeding behavior of nocturnal caterpillars. Negative impacts were more pronounced under white light-emitting diode (aka LED) streetlights compared to conventional yellow sodium lamps. This indicates that ALAN and the ongoing shift toward white LEDs (i.e., narrow- to broad-spectrum lighting) will have substantial consequences for insect populations and ecosystem processes.

Moth (and other) Murders

Moths are functionally important for terrestrial ecosystems and as pollinators; they are also prey for both vertebrates (e.g., birds and bats) and invertebrates (e.g., spiders and social wasps), and hosts for parasitoids. So, ALAN-induced changes are expected to have substantial cascading negative consequences for ecosystems. Even LED headlights wreak havoc on moth activities.

ALAN has wide-ranging negative effects in general on insects across their life cycles, including inhibiting adult activity, increased predation, and disrupted reproduction. Studies suggest that narrower-spectrum lighting (e.g., sodium lamps, which emit mostly yellow light) may be less harmful to insect biological processes. Experiments also suggest that the number of adult insects attracted to different lighting technologies may NOT serve as a suitable measure for their ecologi-

cal impact, as has often been previously assumed.

ALAN of any kind can indirectly affect insects by causing the food plant (e.g., grasses) to become physically tougher in night-lit areas. This has actually been observed with vegetable gardens too. Hedgerow caterpillars appeared to be more adversely affected by ALAN compared with those in grass margins. Some studies have suggested that populations of less mobile insects would have greater sensitivity to ALAN.

There are other potential fixes: LEDs can be modified more easily than sodium lamps by adjusting their intensity (dimming) and spectral output (custom colors and filters). This offers the opportunity to minimize negative impacts if only these modifications are implemented. So, as a commercial landscaper, could you develop a service offering this? Probably.

We have been citing moths as a proxy for all insects but excess light makes it difficult for some species, like fireflies, that rely on bioluminescent cues to find mates. Some insects use polarized light to find bodies of water where they breed and reflections from outdoor fixtures confuse their sense of direction. For instance, mayflies, which only live and breed for a day, can be confused by light bouncing off asphalt and lay their eggs in the street instead of a lake or stream. Insects are also attracted to the headlights of moving cars. Artificial light also interferes with the way some insects hunt at night.

Reducing the Light Pollution Issue – Best Management Practices (BMP)

- Install directional covers on outdoor lights so they only illuminate the areas where they are needed.
- Make lights motion-activated so they're only on when "something" is around is another solution (but can still bother wildlife/insects).
- Pay attention to the color of the light bulbs used in urban settings. Insects are most attracted to blue and white light, though shades of orange, yellow and red also draw them in. Use amber lights near homes to reduce negative light impact. As a general best practice, do not continually have lights on throughout the night. Use lights only as necessary and/or on motion detection.
- Time of year also impacts night light effects. The quality and intensity of artificial or supplemental light may impact the foraging behavior of natural enemies during winter when natural daylight levels are low. If you have a greenhouse, light produced by high-pressure sodium lamps attract *Encarsia formosa,* a commercially available parasitic wasp, thus interfering with foraging behavior and decreasing its effectiveness. Again, in a greenhouse setting, continuous illumination can negatively impact the activity of natural enemies that forage at night such as the two-spotted spider mite predator *Feltiella acarisuga*, a predatory midge.

According to scientific literature, artificial or supplemental light may increase the incidence of whiteflies and thrips. Additionally, the reproductive rate of female two-spotted spider mites is much higher when exposed to periods of light than when exposed to darkness. Have you been having more pest problems after that lighting was installed???

Nature reported that pollinators are less likely to visit plants that are under artificial lighting at night. Consequently, the plants produced less fruit. "When plots were located beneath mobile streetlamps, insects visited 62% fewer times than when plots were situated in darkness, and those that did visit were more homogenous. Artificially lit plants also saw 29% fewer pollinator species." Sadly, daytime pollinators could not make up for this because nighttime pollinators transfer pollen more effectively.

Reference: Daley, Jason. 2019. *The Devastating Role of Light Pollution in the 'Insect Apocalypse'*. Smithsonian Mag. https://www.smithsonianmag.com/smart-news/lightpollution-contributes-insect-apocalypse-180973642/

News

UMass Extension is Hiring!

The **UMass Extension Fruit Team** is currently hiring one **Extension Educator III (MS-level)**. The successful candidate for the Educator III position will have expertise in tree or small fruit crop and pest management and will work with other members of the Fruit Team to provide science-based educational programming and technical assistance to commercial fruit growers in MA and conduct applied research on relevant crop and pest management topics. Special consideration will be given to candidates with expertise in plant pathology and/or small fruit production.

The default location for this position is the UMass Amherst campus, with opportunities for hybrid work arrangements.

This position will remain open until filled. For more details please see the full position descriptions linked below.

Priority deadline: Next Monday! June 12, 2023

For more details and to apply: **Fruit Extension Educator III:** https://careers.umass.edu/amherst/en-us/job/518181/fruit-extension-educator-iii-umass-extension

EPA Releases Risk Assessment Showing Significant Risks to Human Health from the Herbicide DCPA

The Environmental Protection Agency is accepting public comment on its Occupational and Residential Exposure (ORE) assessment on pesticide products containing DCPA (dimethyl tetrachloroterephthalate), an herbicide registered to control weeds in various vegetable crops. The assessment was conducted as part of the 15-year re-evaluation cycle of registered pesticides and showed that, based on the currently allowed uses of DCPA, there is potential for some people to be exposed to DCPA at levels approaching those that are expected to result in adverse effects in humans. The Agency is considering whether cancelation of all uses and registrations for products containing DCPA is necessary. The ORE assessment and other relevant documents, and opportunities to comment, can be found at the DCPA docket EPA-HQ-OPP-2011-0374 at www.regulations.gov.

NOFA/Mass Recruiting Mentor Farmers for USDA Transition to Organic Partnership Program

Recently the USDA launched a 5-year investment in TOPP: Transition to Organic Partnership Program. NOFA/Mass is the state's core partner that will coordinate a mentorship program this fall. Imagine having an experienced organic farmer as a consultant for a year. We will be partnering with many organizations throughout the state including UMASS extension to bring Organic Foundations to the broader community. NOFA/Mass is currently seeking potential mentors and mentee farmers and partners for this exciting project.

For more information, see https://www.nofamass.org/organic-certification/.

Fruit and Vegetable Grower Feedback Needed on Produce Safety Costs, Needs, and Barriers

The Produce Safety Alliance (PSA) Team and personnel from the Northeast Center to Advance Food Safety (NECAFS) at the University of Vermont would like to understand the costs and the barriers of beginning or expanding food safety practices on farms and in packinghouses to make educational materials more relevant to fruit and vegetable growers and packers. To do this, we have developed a survey to collect food safety information from fruit and vegetable growers across the country.

What are the Goals of this Survey?

To understand:

- what steps growers have taken toward adopting food safety practices on their farm,
- the costs of adopting food safety practices (both one-time and reoccurring), and
- where growers have questions about food safety.

Why Should You Participate?

The detailed information that is provided will allow future educational materials to be tailored to specific challenges that growers are facing.

Who Should Participate?

We are looking for feedback from people involved in fruit and vegetable production and packing, including those who have and who have not adopted food safety practices. This survey should be completed by someone who has knowledge about the operation's produce safety practices (e.g., equipment, finances, supplies, training, market distribution, third-party audits).

Participation is voluntary and anonymous. It will take 10 – 30 minutes to complete the survey, depending on the farms' food safety practices.

By completing this survey, you can choose to be entered into a raffle to win a $75 prepaid credit card. Ten participants will randomly be selected to win. The raffle will be held when the survey closes, approximately June 1st. If selected,

you will be contacted to confirm your mailing address and acknowledge acceptance of the $75 prepaid credit card.

English-language survey: https://qualtrics.uvm.edu/jfe/form/SV_agW9o6VWOUCivCC

Spanish-language survey: https://qualtrics.uvm.edu/jfe/form/SV_agW9o6VWOUCivCC?Q_Language=ES

Events

SEMAP Twilight Meeting: Wash-Pack Facility Best Practices

When: TODAY! Thursday, June 8, 5-7 pm

Where: Langwater Farm, 215 Washington Street, North Easton MA 02356

Registration: Free! Click here to register.

Join Southeastern MA Agricultural Partnership (SEMAP) for a twilight meeting on best practices for wash-pack facilities at Langwater Farm in North Easton, MA. Together with **MDAR's Produce Safety Team,** Langwater staff will walk us through their facilities, talk about how they got there, and identify what works & what doesn't. All are welcome; commercial farmers are especially invited.

Eastern MA CRAFT Meetings with UMass Extension

Pest and Disease Control Field Walk

When: Wednesday, June 21, 4-6pm, Pest and Disease Control with UMass

Where: High Road Farm, 186 High Rd., Newbury, MA. Please drive down the private driveway and you'll see parking options near the barn and greenhouse.

Join Sue Scheufele of the UMass Extension Vegetable Program and Eastern MA CRAFT (Collaborative Regional Alliance for Farmer Training) for a pest walk at High Road Farm in Newbury, MA. We will tour the farm and discuss pests that are currently active, how to scout for them, and how to manage them.

2023 UMass Extension Vegetable Program Twilight Meetings

Save the Dates!

Parlee Farms: Automated irrigation systems, pumpkin varieties, and sweet corn IPM

When: Tuesday, August 15

Where: Parlee Farms, 95 Farwell Rd, Tyngsborough, MA 01879

South Deerfield Research Farm Field Day

When: Wednesday, August 16

Where: UMass Amherst Crop and Animal Research and Education Farm, 91 River Rd., South Deerfield, MA

Come hear about active research going on at the farm, including Vegetable Program trials on heat mitigation strategies, cucumber and basil downy mildew resistant varieties, sprayer technology, and more! We'll also have a presentation on automated irrigation systems from Toro.

Heart Beets Farm: Sweet potato production and fall pest management

When: Thursday, September 21, 4-6pm

Where: Heart Beets Farm, 181 Bayview Ave, Berkley, MA 02779

A light dinner will be provided at each event. Come to learn and connect with other growers! Stay tuned for more info, and see you there!

Eastern MA CRAFT Meeting: Geothermal Water Use and Good Agricultural Practices at Farmer Dave's

When: Saturday, October 21, 4-6pm

Where: Farmer Dave's, Dracut, MA

UNH Extension and New Hampshire Vegetable & Berry Growers' Association Wash and Pack Shed Twilight series

The Day in the Life of a Wash Pack Shed: Part 1

When: Thursday, June 22, 5:30 - 7:45pm

Where: Wilson Farm, 144 Charles Bancroft Highway, Litchfield, NH 03052

This meeting will touch on the daily flow of product through the pack shed, record-keeping systems, water management, and daily sanitation. A special focus will be on Wilson Farm's SOPs and the process for maintaining and cleaning its brush wash conveyor.

Attendees will also get a chance to see the farm's newly constructed Pesticide Storage facility. Join extension specialists in a conversation about facility construction, and pesticide mixing and loading considerations. See firsthand how a well-designed pesticide storage shed can help prevent accidental exposure to pesticides, protect the environment, and maintain the quality and effectiveness of the chemicals.

For the full agenda, see: Wash and Pack Shed Meeting Part 1

The Day in the Life of a Wash Pack Shed: Part 2

When: Tuesday, July 11, 5:30 - 7:30pm

Where: Longview Farm, 175 Quincy Rd, Plymouth, NH 03264

Longview Farm finished construction on a new wash pack shed in 2021. The owners will discuss the construction, design, and flow decisions that went into re-modeling a dairy barn into a working wash pack shed. We will also discuss the farm's process and equipment for washing vegetables and practical factors to consider when adding sanitizer to the wash water. Bring your questions and experience!

For the full agenda, see: Wash and Pack Shed Meeting Part 2

Upcoming CISA Events

Irrigation Systems and Management at Warner Farm

When: Thursday, July 13, 4:00 pm - 6:00 pm

Where: Warner Farm, 23 South Main Street, Sunderland, MA, United States

Registration: Free! Click here to register.

Warner Farm, a CSA and wholesale farm as well as the home of Mike's Corn Maze, located in Sunderland, MA, has been developing its irrigation capacity since the late 1970s. The farm's rich sandy loam has been growing fruit and vegetable crops for centuries and as a changing climate brings changing precipitation patterns to New England, Warner Farm is poised to respond effectively in times of drought.

Join CISA, the UMass Extension Vegetable Program, and Dave Wissemann of Warner Farm on July 13th at 4:00pm for an up close look at how they are optimizing their water resources and water distribution systems to ensure the sustainable production of crops throughout the season and in the face of increasingly uncertain growing conditions. The workshop includes a farm walk to see irrigation equipment and set up and a detailed explanation of how the farm's systems are designed and maintained. Following the farm walk, join us for further discussion and some locally produced drinks and snacks.

Sawyer Farm Reduced-Till Perennial Clover Trials

When: Thursday, July 20, 4:00 pm - 6:00 pm

Where: Sawyer Farm, 19 Sawyer Road, Worthington, MA, United States

Registration: Free! Click here to register.

Over the past several seasons, farmers at Sawyer have been experimenting with different ways to plant row crops into perennial white clover and reduce tillage using a series of innovative practices. Join Sawyer Farm's Lincoln Fishman for a close look at transplanter shoe adaptations designed to reduce soil disturbance and weed competition in perennial clover and cash crop production. Berkshire Conservation District will also display their no-till drill seeder, which is available for rentals and can be used for mixed or single species applications from clovers

and orchard grass to rye and soybeans.

This in-person workshop will be followed with an on-farm networking opportunity. The workshop will take a close look at the system and the research underway with UMass through a SARE Partnership Grant, and is part of CISA's 2023 Adapt Your Farm to Climate Change Webinar and Workshop Series: On-farm Climate Change Adaptation Case Studies from western Massachusetts.

These events are co-sponsored by CISA and the UMass Extension Vegetable Program.

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Vegetable Notes. Genevieve Higgins, Lisa McKeag, Maggie Ng, Susan Scheufele, Hannah Whitehead co-editors. All photos in this publication are credited to the UMass Extension Vegetable Program unless otherwise noted.

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