**Crop Conditions**

Temperatures have been about average for the past few weeks but with the cloudiness and strong northeast winds resulting from storms off the Carolinas, along with a few extra-cold nights, it’s felt particularly cool and gloomy. The sun and high temperatures over the last few days have been welcome by farmers—and the sunbathers on the UMass campus. The heat even had one Hadley grower concerned about his sweet corn under plastic getting burned. Now we just need a little rain.

People are busy planting, both in the field and the greenhouse, and laying plastic mulch for transplants almost ready to go out. We’ve heard from several growers that are having a hard time finding enough labor. Many farms have received state grant money, including through the Massachusetts Food Security Infrastructure Grant Program. This new program has awarded over $58 million dollars to farms, food businesses, and organizations since 2020 and while it’s helping farms expand or make improvements, these big projects are sometimes adding to growers’ spring workloads as they try to buy supplies and complete projects.

Our Risk Management Program’s Tom Smiarowski doubles as an asparagus farmer in the spring. Here’s an update from Tom about how the Hadley Grass is coming in: Asparagus has been slow coming on this year. At one point it looked like the crop would be ready the last week in April, but cool temps pushed it back to the beginning of May. There were instances of scattered frost on Monday morning (May 9) but damage appears to have been minimal. A frost advisory was issued for Wednesday morning (May 11) but did not appear to affect the asparagus crop. Growers are reporting tremendous demand and are having a hard time keeping up with that demand, though with warmer temps finally arriving this week it appears the crop is ready to take off!

We’re looking forward to seeing folks at the New Entry Farmer Resource Fair tomorrow. Both the UMass Vegetable and Risk Management Extension teams will be there, as well as other agricultural service providers from around the state. Join us for a pest walk at 12:30! See Events for more details.

**Pest Alerts**

Asparagus

**Frost damage** was reported on asparagus last week, as a result of some below-freezing nights in late-April. Frost-damaged spears will appear water-soaked and the damaged tissue will collapse, causing the spears to bend or flop over completely. Any spears that have not emerged on a night of frost should not be affected. Harvest damaged spears
immediately to encourage crowns to continue producing new shoots.

**Alliums**

*Allium leafminer* (ALM) adults are still active throughout the state. The spring flight lasts for 5-6 weeks, so can be expected to be finished around the end of May in eastern MA, 1st week of June in central MA/Pioneer Valley, and mid-June in the Berkshires. Alliums being planted out in the field now can be protected with row cover as long as you’re not planting into a field that had ALM-infested alliums last fall and there’s no sign of ALM in your transplants. Seal edges of row cover well. Scout uncovered alliums now for oblong, white oviposition/feeding marks on the tips of allium crops in the field and greenhouse. Allium tops in the greenhouse may remove oviposition/feeding marks but larvae may have moved down into the plant before trimming took place. Effective control can be achieved with applications of dinotefuran (e.g. Scorpion, Venom), cyantraniliprole (e.g. Exirel), and spinetoram (e.g. Radiant), starting up to 2 weeks after feeding/oviposition marks are detected. All of the above materials have systemic or translaminar activity and will be effective against larvae. Contact pyrethroids including Mustang Maxx and Warrior will be effective against adults but not larvae. Include a surfactant unless labels prevent it. Organic growers can achieve effective control with 2 applications of Entrust + M-Pede, 2-4 weeks after detecting ALM. Surfactant is not needed if applying M-Pede.

**Brassicas**

*Cabbage root maggot* flight is occurring now throughout the state. Scout now for oblong, white eggs laid at the base of brassica plants. If eggs are present, a pesticide application is warranted. *Chlorpyrifos* (e.g. Lorsban) was widely used to control CRM in the past but is banned for use on food crops as of February 2022, even to use up existing stocks. Radiant (spinetoram) and Entrust (spinosad) can be used effectively for transplanted and direct-seeded brassicas—consult the labels for specific use directions for applying to soil to control CRM. Other labeled materials include bifenthrin (Capture, Sniper LFR, Brigade – head and stem brassicas), diazinon (specific crops only), Mustang Maxx (root brassicas), and Azera (all brassicas). Soil drenches of Coragen (chlorantraniliprole) or Verimark (cyantraniliprole) are labeled for leafy and root brassica crops and may be applied at planting and will provide residual control of CRM and other pests including flea beetles for ~3 weeks. See the maggot article in this issue for more photos and information.

**Flea beetles** are starting to be reported around the region in greenhouses and in small numbers outdoors. Flea beetles emerge in the spring from field edges. They prefer non-waxy brassicas (e.g. bok choy, arugula, mustards) but can cause significant damage to tender young waxy brassica transplants as well. Young transplants can be protected with row cover, kaolin clay (e.g. Surround), or an insecticide. Non-waxy brassica crops can be planted alongside waxy brassicas and sprayed regularly to function as a trap crop and reduce sprays to less preferred crops. Many pyrethroids (e.g. Warrior, Baythroid XL, Mustang Max/Respect, Brigade, Asana XL) and neonicotinoids (Venom, Admire Pro, Actara, Platinum) are labeled. Diamides are also labeled (Exirel or Harvanta for foliar applications, Verimark for soil applications) and they have long residual periods and will also control caterpillars, cabbage root maggot, and cabbage aphid. Spinosad (e.g. Entrust) is the most effective OMRI-listed product. Use a spreader-sticker.
Multiple crops

Every year we receive reports of fertilizer burn from liquid fertilizers, including fish emulsion, applied to transplants growing in the greenhouse. If applying liquid fertilizers to transplants, especially on hot, sunny days, it’s recommended to rinse the foliage with clear water after application to avoid burn.

Soil steaming issues: We received a report this week of stunting and marginal leaf necrosis in high tunnel tomatoes planted 1 week after steaming the soil. More growers are beginning to experiment with soil steaming as a way to manage soil-borne pathogens and weeds in high tunnels. To learn more, check out these VT Veg and Berry Growers Association webinars by Becky Madden (UVM Extension). Planting too soon into steamed soil can lead to ammonium toxicity. Soil steaming causes an immediate release of ammonium from decomposing organic matter, and in addition, many soil microbes are killed, some of which are bacteria that convert ammonium (which is toxic to plants at high levels) to nitrate (which is the plant-available form of nitrogen), resulting in a buildup of ammonium after steaming. Additionally, the bacteria that convert nitrate into ammonium are harder to kill and will likely continue adding ammonium to the soil after steaming. For this reason, it’s recommended to wait 2-3 weeks to plant into steamed soil, and even longer if the soil is wet.

Be on the lookout for spring maggot pests

There are three maggot fly pests that are active on Massachusetts vegetable farms in early spring: seed corn maggot, cabbage root maggot, and onion maggot.

These three species look similar and have similar life cycles. Pupae overwinter underground in host crop fields and adults emerge in the spring. Adult flies are small (5-7mm long), gray, humpbacked, and housefly-like. After they emerge, the adults mate and lay their eggs at the base of new host plants or young seedlings. The eggs hatch into larvae (aka maggots), which feed on host roots, causing the plants to collapse. In the case of seed corn maggot, the larvae kill seedlings before they emerge. All three species are attracted to decomposing organic matter, and infestations can be worse in manured, cover-cropped, or composted fields where organic matter is still breaking down. Finally, for all three pests, three to four generations typically occur each year. Because these maggots prefer cooler temperatures, damage from the spring and fall generations are typically worse than the mid-summer generation(s). In fact, for all three species, several consecutive days of soil temperatures above 95°F can kill larvae.

The three species differ in the crops they infest, and the exact timing of spring emergence (Table 1). Seed corn maggots reach peak flight earliest in the spring and have a host range of over 30 crops (including alliums and brassicas). This maggot is a common reason for poor germination of peas or small plantings of sweet corn. Cabbage and onion maggots emerge slightly later and are host-specific, attacking brassicas and alliums, respectively.

The emergence of adult flies from pupae that overwintered in the soil can be predicted using growing degree days (GDDs) with a base temperature of 40°F starting January 1. The base temperature for monitoring the emergence of maggot flies is lower than the base temperature for many other vegetable pests because they are active at fairly cool temperatures early in the spring.

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1Growing degree days (GDD) are the number of degrees that the average daily temperature exceeds a base temperature at which a particular organism is dormant. \[ \text{GDD} = \frac{(T_{\text{max}} + T_{\text{min}})}{2} - T_{\text{base}} \] If the average temperature for a day is lower than the base temperature, then no GDDs accumulate. GDDs accumulate daily, starting on a specific date, by adding each day’s total GDDs to the previous tally.
Preventive measures are generally most effective for managing these pests as chemical treatment options are limited. These may include using floating row covers or insect netting to protect plants from egg-laying adults, delaying planting susceptible crops until the first emergence has largely passed, or waiting to plant until soil temperatures are high enough to kill larvae. Most labeled pesticides for maggots are labeled only for use pre-plant, at the time of planting or seeding, or immediately after setting transplants. Use pre- or at-plant treatments where damaging populations are expected, such as in fields with high organic matter or a history of infestations. Scouting for adults and eggs can help you understand infestation levels and inform management decisions in future plantings.

Below is more information about each maggot pest, including additional scouting and management recommendations.

**Seed corn maggot** (*Delia platura*): Seed corn maggot adults have likely begun emerging in many fields in Massachusetts where they will lay eggs on the soil surface. Hatching larvae will burrow into the soil in search of food and penetrate seeds as the seed coat splits open. Other pests and diseases, including wireworms and damping off, can also prevent seedlings from emerging, so check for maggots and feeding tunnels inside seeds or stems to confirm what pest you’re dealing with. Floating row cover is not as effective in managing seed corn maggot because this pest has many hosts and could have overwintered in virtually any field on your farm. If you cover plants in an infested field, the adults will emerge under the row cover. Also note that organic fertilizers containing seed meals can attract this pest. Management tips include:

- Where possible, delay planting for several weeks in the spring after a cover crop is incorporated to allow for organic matter to break down. Warmer soils with more decomposed organic matter will mean fewer problems with seed corn maggot.
- Plant shallowly to promote rapid seed emergence.
- Bean varieties with a dark seed coat sustain less injury than white varieties.
- Preventive chemical treatments include commercially applied systemic seed treatments and in-furrow applications of insecticides. Rescue treatments are not effective.
- If there is enough damage to warrant replanting, wait at least 5 days if maggots are a quarter inch long; if they are smaller than that, wait at least 10 days to make sure they have pupated and will not damage the new seeds.

**Cabbage maggot** (*Delia radicum*): Cabbage maggot flies are either nearing or just past peak emergence across the state depending on the accumulated GDDs in your area. Row covers can be very effective in the spring against this pest as long as crops are rotated into fields without a history of recent infestation. As with seed corn maggot, if there are pupae in the soil from the previous season the adults will emerge under the row covers. Apply row cover as soon as brassicas are

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**Table 1. Maggot Comparative Table**

<table>
<thead>
<tr>
<th></th>
<th>Seed Corn</th>
<th>Cabbage</th>
<th>Onion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Host</strong></td>
<td>40 different plants, large germinating seeds, seedlings (including allium and brassica!)</td>
<td>Brassicas</td>
<td>Alliums</td>
</tr>
<tr>
<td><strong>First emergence</strong></td>
<td>&lt; 360 GDD base 40°F</td>
<td>~ 288 GDD base 40°F</td>
<td>~ 390 GDD base 40°F</td>
</tr>
<tr>
<td><strong>First peak flight (50% emergence)</strong></td>
<td>360 GDD base 40°F</td>
<td>452 GDD base 40°F</td>
<td>735 GDD base 40°F</td>
</tr>
<tr>
<td><strong>Adult</strong></td>
<td>Small: ~ 3mm, 3 stripes on the thorax</td>
<td>Medium: ~5mm, 2 stripes on the thorax.</td>
<td>Large: ~6mm.</td>
</tr>
<tr>
<td><strong>Eggs</strong></td>
<td>Hatch in 2 to 4 days</td>
<td>Hatch in 7 to 10 days</td>
<td>Hatch in 2 to 5 days</td>
</tr>
<tr>
<td><strong>Larvae (maggot)</strong></td>
<td>Active for 3 wks</td>
<td>Active for 2 to 4 wks</td>
<td>Active for 2 to 3 wks</td>
</tr>
<tr>
<td><strong>Pupae</strong></td>
<td>In soil for 1 to 2 wks before next gen adults emerge (last gen pupae overwinter)</td>
<td>In soil for 2 to 3 wks before next gen adults emerge (last gen pupae overwinter)</td>
<td>In soil for 3 to 4 wks before next gen adults emerge (last gen pupae overwinter)</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td>Short, 21-day lifecycle. 3 gen per year. Usually only spring gen is damaging.</td>
<td>Long, 60-day lifecycle. 4 gen per year. Spring and Fall gen most damaging.</td>
<td>Medium, 30-day lifecycle. 3 gen per year. Usually only spring gen is damaging.</td>
</tr>
</tbody>
</table>
seeded or planted out in the field during the spring flight.

There can be up to 4 generations of cabbage maggot per year. A good indicator of the first cabbage maggot peak flight is blooming of the common roadside weed yellow rocket or wintercress (Barbarea vulgaris). There is a model for tracking the emergence of cabbage maggot on the Network for Environmental and Weather Applications (NEWA) website: NEWA Cabbage Maggot Model. On the left-hand side of the page, choose a weather station that is close to you.

When GDDs indicate peak flight, or when adult flies are found on sticky cards placed in the field, begin scouting every 3 to 5 days. A pencil point or knife helps stir the soil to look for eggs. Field scout by checking 25 plants, in groups of 2 to 5 plants, scattered around the field. Eggs may be more abundant in wetter areas of the field. There are no chemical treatment options at this stage, but scouting will help you determine the extent of infestations and whether an at-plant treatment should be applied in subsequent plantings. After egg-hatch in an infested crop, you may find the legless, white maggots feeding around the root area; the small brown, oblong pupae; or tunnels from maggot feeding. In brassica root crops such as turnips, radishes, and rutabaga, maggot feeding tunnels make the crop unmarketable.

There are more pesticide options for control of cabbage maggot than the other maggot pests. Available products can be found in the New England Vegetable Management Guide. Apply a soil drench 2 to 3 days after finding an average of one egg per plant. Coragen (chlorantraniliprole) or Verimark (cyantraniliprole) may be applied at planting, and Radiant (spinetoram) or Entrust (spinosad) may be applied at planting and in up to two additional applications. Other management tips include:

- Delay planting until after first flight is done (usually mid-May, depending on GDDs) or when soil temperatures are high enough to kill eggs (95°F). Planting in late-May into June is generally safer than in the first half of May.
- Cultivate vigorous brassica crops so that soil is brought up around the stem to encourage adventitious root formation. This can help compensate for root loss even if maggots are present.
- Natural enemies: Soil-dwelling beetles, including carabid ground beetles and staphylinid beetles, feed on cabbage maggot eggs, larvae, and pupae and can cause high levels of mortality. One staphylinid species, Aleochara bilineata, also parasitizes maggot larvae and has been shown to respond to chemicals given off by plants that suffer maggot damage. Because these soil-inhabiting beetles are susceptible to insecticides, broadcast soil insecticide treatments should be avoided. Other natural enemies include parasitic wasps and predatory mites.
- Nematodes for biological control: Soil application of the entomopathogenic nematode Steinernema feltiae has shown efficacy against cabbage maggot in trials even at low soil temperatures (50°F/10°C). Apply by suspending juvenile nematodes in water and treating transplants prior to setting in the field (as a spray or soaking drench), in transplant water used in a water wheel transplanter, or a combination of pre-plant and post-plant applications. Post-plant treatments are likely necessary if maggot flight begins >1 week after transplanting. Rates of 100,000 to 125,000 infective juveniles per transplant have been shown to be needed to achieve reduction in damage. Nematodes need a moist soil environment to survive.
**Onion Maggot** (*Delia antiqua*): This pest begins its flight when cabbage maggots are at peak flight (so yellow rocket bloom is also a good indicator of the beginning of onion maggot flight). NEWA also has a pest forecast model for onion maggot emergence: [NEWA Onion Maggot Model](#). Delaying planting is not a practical method of avoiding this pest because onions are typically planted very early in the spring and are in the ground about a month before the onion maggot becomes a problem. In onions, newly hatched larvae crawl behind the leaf sheath, enter the bulb, and feed on the roots, stem, and developing bulb. Feeding damage also allows for entry of soft rot pathogens. Some tips specific to managing onion maggot include:

- Minimize mechanical and chemical damage to onions throughout the season. Onion root systems are not as hardy as brassicas, so hilling them will not encourage more root production or recovery from root feeding. However, hilling leeks can be a recommended practice for developing longer stalks.
- Gather culled bulbs into deep piles as opposed to deep plowing or harrowing after harvest. This will limit fly reproduction to the surface layers of the cull pile.
- Naturally-occurring fungal diseases occasionally will reduce onion maggot numbers, particularly when flies are abundant and relative humidity is high. During a fungal epidemic, dead flies can be seen clinging to the highest parts of plants along field edges.
- As with cabbage maggot, predaceous ground beetles and entomopathogenic nematodes may help reduce maggot numbers. Avoid broadcast insecticide treatments to protect beneficial insects and follow nematode applications recommendations above.
- See the [New England Vegetable Management Guide for pesticide options](#).

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**FOOD SAFETY IN HIGH TUNNEL CAN HAVE CO-BENEFITS**

--Written by Robert Hadad, Cornell Cooperative Extension, Vegetable Program, Originally published in *VegEdge 18:5*, on April 27, 2022

We talk a lot about reducing risk of bacterial contamination for produce inside of wash/pack facilities at great length. There is also discussion on reducing risk in the field. Let’s not forget to mention reducing risks in high tunnels.

**Manure:** Bacterial contamination can enter the high tunnel in several ways. First there is bringing in manure or manure-based compost that hasn’t gone fully through the composting process. These get tilled into the soil but depending on how “fresh” the manure is and how thoroughly these soil amendments are turned into the soil can pose a threat. Touching the soil then the crops, especially before harvest can pass contaminants.

**Solutions:**
- Use manure that has gone through a composting treatment.
- Use manure only for long season crops like tomatoes or peppers or with staked/trellised crops like tomatoes, peppers, eggplant, and cucumbers.
- Use fully composted soil amendments.
- Use mulch to reduce the chances of hands touching the soil and then plants. Avoid fresh manure when growing short season crops or crops close to the ground like greens.

**Co-Benefit:** Reducing touching the soil then touching crops can reduce plant diseases.
**Contaminated dust:** Soil preparation when using fresh manure or manure-based products can spread contamination under certain conditions. If the soil and the soil amendments are dry, tilling can kick up a lot of dust. The dust could carry contaminants that can land on food contact surfaces inside the tunnels (much more of a problem if harvest containers are stored inside tunnel or if there is a wash/pack set-up in the tunnel).

**Solutions:**
- Cover harvest bins and other food contact surfaces before tilling.
- Wetting down soil a day or two before tilling might also reduce the dust kicking up.
- Do the soil prep earlier in the morning or later in the day when it isn’t too hot out and keep the tunnel sides rolled down to prevent wind from blowing dust around.
- Rinse off tunnel interior plastic with hose or power washer to remove dust after soil prep.
- Spraying on a sanitizer after the water rinse might be helpful too.
- Removing algae is also helpful.

**Co-Benefits:**
- Reduces organic matter on plastic which might be less attractive for snails to eat climbing up on the tunnel walls and ceilings.
- Removing algae can reduce slug/snails from climbing sides/ceiling and also lets more light in when late season sun is less intense already.

**Dripping condensation:** If soil preparation occurs later in the year, such as getting ready for late season/winter greens production, contaminated dust can stick to the tunnel plastic (interior). There is concern that condensation dripping from the ceiling can carry contamination onto the greens below.

**Solutions:**
- Hose down interior tunnel plastic with hose or power washer.
- Removing algae is helpful.
- Spraying a solution of sanitizer can be an extra step.

**Co-Benefits:**
- Reduces organic matter on plastic which might be less attractive for snails to eat climbing up on the tunnel walls and ceilings.
- Removing algae can reduce slug/snails from climbing sides/ceiling and also lets more light in when late season sun is less intense already.

**Slugs and snails:** Reducing snail and slugs inside the tunnel. Snails and slugs that comes into contact with manure may carry contamination onto plants and spread it onto tunnel plastic. From the plastic, contamination may fall off possibly contaminating crops below.

**Solution:**
- Remove vegetation from around outside/inside perimeter of high tunnels.
- Don’t store anything on the perimeters of the tunnels where snails/slugs can hide.
- Use slug/snail bait along the perimeter of the tunnel.
- Remove mulch from the inside perimeter of the tunnel.
- Be sure to pull away any manure from the tunnel edges and incorporate into the soil.

**Co-Benefits:**
- Snails and slugs feed on crops causing damage. This opens crops to disease.
- Feeding damage reduces the quality of the crops lessening the market value.

**Rodents:** Prevent contamination from rodents entering the tunnel and taking up residence. Rodents can carry a variety of pathogens. Especially in the late fall through the winter when food is scarce, a high tunnel can be attractive to rodents.
FOLIAR FERTILIZATION FOR VEGETABLE CROPS, REVISITED

--Written by Gordon Johnson, Extension Vegetable & Fruit Specialist; gcjohn@udel.edu. Originally published in Delaware Weekly Crop Update 30:6 on April 29, 2022

It is recommended that growers apply most (>90%) of their plant nutrients for vegetable crops as soil applications (preplant, sidedressed, fertigated) based on soil tests and crop nitrogen needs.

To monitor vegetable nutrient status during the growing season, tissue testing is recommended just prior to critical growth stages. Growers can then add fertilizers to maintain adequate nutrient levels during the growing season or correct nutrient levels that are deficient or dropping.

Foliar fertilization is one tool to maintain or enhance plant nutritional status during the growing season. Often quick effects are seen and deficiencies can be corrected before yield or quality losses occur. Foliar fertilization also allows for multiple application timings post planting. In addition, there is reduced concern for nutrient loss, tie up, or fixation when compared to soil applications.

However, foliar fertilization has limitations. There is the potential to injure plants with fertilizer salts, application amounts are limited (only small amounts can be taken up through leaves at one time), multiple applications are often necessary (increasing application costs) and foliar applications are not always effective, depending on the nutrient targeted and plant growth stage.

Where foliar fertilization does have a good fit is for deficiency prevention or correction, particularly when root system function is impaired. This commonly occurs when there is extended rainy weather and soils are waterlogged. Foliar fertilization is also necessary when soil conditions, such as low pH, causes the tie up of nutrients so that soil uptake is limited. Foliar fertilization can also be used to target growth stages for improved vegetable nutrition thus improving color, appearance, quality, and yield.

Foliar fertilizers are applied as liquid solutions of water and the dissolved fertilizers in ion or small molecule form. Foliar nutrient entrance is mostly through the waxy cuticle, the protective layer that covers the epidermal cells of leaves. Research has shown that there is limited entrance through the stomata. While the waxy cuticle serves to control water loss from leaf surfaces, it does contain very small pores that allows some water and small solute molecules to enter into the underlying leaf cells. These pores are lined with negative charges. Fertilizer nutrients in cation form or with neutral charges enter most readily through these channels: this includes ammonium (NH₄⁺), potassium (K⁺), magnesium (Mg²⁺), and urea (CH₄N₂O). In contrast, negatively charged nutrients including phosphate (PO₄³⁻), sulfate (SO₄²⁻), and molybdate (MoO₄²⁻) are much slower to move through the cuticle (they must be paired with a cation). Movement through the cuticle is also dependent on molecular size, nutrient concentration, time the nutrient is in solution on the leaf, whether the nutrient is in ionic or chelated form (complexed with an organic molecule), and the thickness of the leaf cuticle.

Another factor in foliar fertilizer effectiveness is what happens once the nutrient enters into the leaf area. Some smaller molecules or those with less of a charge are readily transported in the vascular system to other areas of the plant (NH₄⁺, K⁺, Mg²⁺, urea). Other larger molecules and more strongly positive charged nutrients stay near where they enter because they bind to the walls of cells in intercellular areas that contain negative charges. Tightly held nutrients include calcium (Ca²⁺), manganese (Mn²⁺), iron (Fe²⁺), zinc (Zn²⁺), and copper (Cu²⁺). Therefore, when applied as foliar fertilizer, calcium does not move much once it enters plant tissue, the negatively charged nutrients such as phosphorus and sulfur are very slow to enter the plant, and iron, manganese, copper, and zinc are slow entering and do not mobilize once in the plant.
The following is a list of the major plant nutrients that are effective as foliar applications, fertilizer forms best used for foliar applications, and recommended rates:

- Foliar applications of nitrogen (N) can benefit most vegetables if the plant is low in N. Urea forms of N are the most effective; methylene ureas and triazones are effective with less injury potential; and ammonium sulfate is also effective. Recommended rates are 1-10 lbs/A.

- Foliar potassium (K) is used on fruiting vegetables such as tomatoes and melons. Best sources are potassium sulfate or potassium nitrate. Recommended rate is 4 lbs/A of K.

- Foliar magnesium (Mg) is used on tomatoes, melons, and beans commonly. The best source is magnesium sulfate and recommended rates are 0.5-2 lbs/A of Mg.

- Foliar calcium (Ca) is often recommended, but because it moves very little, it must be applied at proper growth stages to be effective. For example, for reducing blossom end rot in tomato or pepper fruits, foliar calcium must be applied when fruits are very small. Best sources for foliar calcium are calcium nitrate (10-15 lbs/A), calcium chloride (5-8 lbs/A) and some chelated Ca products (manufacturers recommendations).

- Iron (Fe), manganese (Mn), or zinc (Zn) are best applied foliarly as sulfate or chelated forms. Rates are: Fe, Mn, 1-2 lbs/A, and Zn ¼ lb/A. While these metal micronutrients are not mobile, foliar applications are very effective at correcting local deficiencies in leaves.

- The other micronutrient that can be effective as a foliar application is boron. Boron in the Solubor form is often recommended at 0.1 to 0.25 lbs/A for mustard family crops such as cabbage as a foliar application. Boron is very toxic to plants if applied in excess so applying at correct rates is critical.

For foliar fertilizers to be most effective they should remain on leaves or other targeted plant tissue in liquid form as long as possible. Urea and ammonium nitrogen forms, potassium, and magnesium are normally absorbed within 12 hours. All other nutrients may take several days of wetting and re-wetting to be absorbed. Therefore, it is recommended that foliar fertilizers be applied at dusk or early evening when dew is on the leaves, in high volume water, and using smaller droplets to cover more of the leaf. Applications should also be made when temperatures are moderate and wind is low. While foliar fertilizers are sometimes applied with pesticides, for best effectiveness and reduced phytotoxicity potential it is recommended that they be applied alone. Use only soluble grade fertilizers for foliar applications (many are already provided in liquid form) and adjust water pH so it is slightly acidic.

Foliar fertilizers are most effective when applied to younger leaves and fruits. Research has shown that as leaves or fruits age, cuticles thicken, and these thicker cuticles absorb significantly lower amounts of nutrients such as potassium. However, younger plant tissue is also the most susceptible to potential fertilizer burn.

Because foliar fertilizers are in salt forms they can damage plant tissue if applied at rates that are too high. Generally a 0.5-2% fertilizer solution is recommended. Certain vegetables are more sensitive to fertilizer salt injury than others. Vegetables with large leaves with thinner cuticles (such as muskmelons) have greater risk of salt injury when compared to crops, such as cabbage, that have thick cuticles. Apply foliar fertilizers at recommended rates and dilutions for each specific vegetable crop.

In addition, some fertilizer sources are much more likely to cause injury than others. In the past, this was given as the salt index for a fertilizer; the lower the salt index the less osmotic stress the fertilizer would place on the plant tissue. A better index would be the osmolality values for the fertilizer material. For foliar nitrogen materials, osmolality values (mmol/kg) for common N sources are as follows: Urea = 1018, UAN-28 = 1439, Ammonium sulfate = 2314, Potassium nitrate = 3434. This shows that potassium nitrate has over 3x the osmotic stress potential compared to urea when applied as a foliar fertilizer. This means that potassium nitrate has much more potential to cause salt injury to plants than urea and must be used at lower rates.

**NEWS**

**MDAR’S CLIMATE SMART AGRICULTURE PROGRAM GRANT NOW OPEN**

MDAR is now accepting applications from agricultural operations who wish to participate in the Department’s Environmental & Energy grant programs. Grants are available to help agricultural operations make farm improvements...
that enhance their economic viability while working to prevent negative impacts to environmental resource, adapting to and mitigating climate change, improving energy efficiency, and adopting renewable energy technologies.

The Climate Smart Agriculture Program (CSAP) links MDAR’s water, energy and climate grants together into one application. This includes the Agricultural Climate Resiliency & Efficiencies (ACRE) Program, the Agricultural Environmental Enhancement Program (AEEP), and the Agricultural Energy Grant Program (ENER). This combined program continues the goals of the three individual grants by implementing projects that help the agricultural sector adapt to climate change, mitigate climate change, reducing or preventing impacts to natural resources that may result from agricultural practices, and that improve energy efficiency and facilitate adoption of alternative clean energy technologies. The CSAP grant is broken into two sections:

- **Section I**: Environment - for environmental projects such as soil health, water use efficiency, or other projects working towards reducing or limiting greenhouse gas emissions.
- **Section II**: Energy - Ag-Energy projects to improve energy efficiency or to facilitate clean energy adoption.

**Applicants can apply to either, or both sections.** Participants selected for funding under either section are provided with reimbursement grants for 80% of total project costs up to $50,000.

**Applications due: 4:00 pm on Friday, June 10, 2022** – [Details here.](#)

**For more information contact:**
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- Section II: Energy - Gerry Palano at 617-626-1706, [Gerald.Palano@mass.gov](mailto:Gerald.Palano@mass.gov)

**Applications Open for MDAR’s HIP Vendor Notice of Opportunity & SNAP Equipment Grant**

**2022 Healthy Incentives Program (HIP) Notice of Opportunity (NOO):** MDAR is now accepting applications to strategically onboard new agricultural vendors and access points for the Healthy Incentives Program.

- Application period: April 21 to June 8, 2022.
- Both new HIP-eligible vendors and existing HIP vendors may apply.
- To apply and read more information, visit: [www.mass.gov/hipnoo](http://www.mass.gov/hipnoo)
- Questions? Email [DTA.HIP@mass.gov](mailto:DTA.HIP@mass.gov)

**SNAP Equipment Grant, Spring/Summer Application Round 2022:** Free mobile SNAP processing equipment from Novo Dia Group is available to direct-marketing farms and farmers’ markets through DTA, in collaboration with MDAR and with financial support from the United States Department of Agriculture (USDA).

- Application period: April 20 to September 23, 2022, or earlier if funds run out.
- Eligibility is limited to SNAP-authorized farms and farmers’ markets that do not currently have working equipment received through previous federal grants.
- Applications will be evaluated on a rolling basis.
- To apply and read more info: [www.mass.gov/snapequipmentgrant](http://www.mass.gov/snapequipmentgrant)
- Questions? Email [David.Webber@mass.gov](mailto:David.Webber@mass.gov)

**Additional resources**

- Looking for SNAP processing equipment but not eligible for the SNAP equipment grant? Learn about other options [here.](#)
- Farmers and farmers market managers can learn more about accepting SNAP benefits on MDAR’s [website.](#)
- Information on the Healthy Incentives Program can be found on the [HIP website.](#)
- One on one assistance with the SNAP retailer application is available through MarketLink.
EVENTS

NEW ENTRY FARMER RESOURCE FAIR

When: TOMORROW! Friday, May 13, 2022, 10am-2pm

Where: New Entry Sustainable Farming Project Moraine Farm, 733 Cabot St., Beverly, MA

Registration: Advance registration encouraged! Click here to register.

The New Entry Sustainable Farming Project in Beverly, MA is hosting a Farmer Resource Fair to gather service providers at a single event. There will be several workshops, included in the list below, and representatives from several state agencies will be available to answer questions throughout the day.

- **Soil Health**: New Entry farmer training team will be conducting a hands-on soil health workshop.
- **USDA Farm Service Agency**: Representatives from FSA will be signing farmers up for farm tract numbers - your gateway to USDA programs and services.
- **NRCS** representatives will be leading a field walk and discussion of conservation practices and programs to support conservation goals.
- **UMASS Extension Vegetable Team** will be conducting a pest-scouting workshop/walk.
- **UMass Risk Management Team** will have information on crop insurance.
- **USDA Food and Nutrition Service** will be available virtually to register farmers for their FNS number to accept SNAP-EBT payments at farmers’ markets or farm stands. Click here to reserve a time slot to meet with USDA.
- **MA Department of Transitional Assistance (DTA)** will be on hand to register farmers for the Healthy Incentives Program (HIP) and SNAP equipment grants.
- **MDAR** will be registering farmers on-site to accept Senior Farmers Market Nutrition Program and WIC coupons.

Other agricultural service providers and organizations will be available to share information - visit the New Entry website for an updated list of all vendors.

MDAR SPOTTED LANTERN FLY: QUARTERLY UPDATE

When: Wednesday, May 18, 2022, 10-11am

Where: Zoom

Registration: Free. Click here to register.

This webinar has been approved for 1 pesticide license recertification credit for all license types as well as several other licensing credits. See registration page for details. To receive credits, you must individually register with your license information, stay for the duration of the course, and answer all poll questions.

SAVE THE DATE! SOIL HEALTH DEMOS AT THE UMASS RESEARCH FARM

When: Tuesday, June 21, 2022, 1-4:30pm

Where: UMass Crop & Livestock Research & Education Farm, 91 River Rd., South Deerfield, MA

Demonstrations will include:

- New York Soil Health Trailer demonstration
- No-till transplanting vegetables into a crimped cover crop
- Cover crop residue management
- Using tarps to terminate cover crops
- More details coming soon!
Thank you to our 2022 Sponsors!

Become a sponsor!

Vegetable Notes. Genevieve Higgins, Lisa McKeag, 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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