UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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In this issue:

Sue Scheufele and Genevieve Higgins of the UMass Extension Vegetable Program applying row cover to an organic cucumber variety trial. They survived the hot weekend under row cover on white plastic! Photo: K. Campbell-Nelson.

Crop conditions

What the Hail!? A band of fields from CT, through central MA, to Hillsborough Co., NH reported hail this weekend, damaging many crops, snapping younger transplants off, wiping out lettuce ready to harvest, shredding cucurbits, and spreading diseases like early blight in tomato. In general, despite the record rainfall across the state this year, crops seem to be fairing quite well. Early sweetcorn is sizing up nicely, but not much will have been harvested by the 4th of July this year. High tunnel tomato and cucumbers are ripening, with the first harvests coming in. The last few weeks' hotter and dryer weather means that farmers are starting to pull irrigation supplies out of the barn. Field work includes lots of cultivating with hot weather to kill weeds, stringing field tomatoes, and harvesting plenty of veggies for farm stands this holiday weekend.

The recent warmth has pushed some pests along too, with reports of leafhoppers causing hopper burn, striped cucumber beetles defoliating plants, and flea beetles going to town on uncovered eggplant. On one farm that we visited this week, the grower told us that he likes early season potatoes like Red Norland so that he can harvest a decent yield of new potatoes before the leafhoppers totally destroy the crop. Some diseases are spreading too, with cucurbit downy mildew jumping up to Maryland last week (no risk yet in MA), tomato diseases popping up, and more leaf spot diseases in cucurbits. Sprayers have been seen loading up and heading out to protect these and other crops from disease and insect pests. Meanwhile, many acres of potato are in full bloom, corn is tasseling, and beans, eggplant and peppers are flowering; now is the time to be thinking about pesticide exposure to honey bees and native pollinators. Check out the article in this week's issue about protecting pollinators.

Pest alerts

Bean:

The first **Mexican bean beetle** adults are emerging in Hampshire Co., MA. No egg masses have been seen yet. See the article in this issue for information on managing this pest. Hint: if using the parasitic wasp *Pediobius foveolatus* to manage this pest, order them as soon as eggs are seen in your crop.

Brassica:

Cabbage aphids were seen in Hampshire Co., MA this week. Eggs typically hatch in April. Nymphs feed and develop into reproductive females who produce live young without mating. Winged adults disperse with wind and infest new crops. There are multiple summer generations and potential for huge population growth by the fall, especially where long-season crops like Brussels sprouts are infested early. Treat if >10% of the plants are infested with aphids, especially after heads or sprouts begin to form. Coverage of all leaf surfaces, buds and new growth is key.

Cucurbits:

Squash vine borer trap captures increased this week across MA and NH, and some eggs have been seen in MA. See map for trap capture numbers. This pest is emerging earlier than it has in past: males used to emerge around July 1, now eggs are being laid in early July. Treatment threshold is 5 moths per week in the pheromone trap for bush varieties and 12 moths per trap for vining cucurbits. Butternut is a lower preference crop for them.

Powdery mildew is being reported for the first time this season in the region. Protectant sprays are recommended on crops that are about to vine and on squash that is sizing up to get a long harvest season out of them. See updated materials for managing powdery mildew from Meg McGrath of Cornell University in the June 13th, 2019 issue of *Vegetable Notes*.

Squash vine borer adult (right) with eggs (left) laid on the leaf! Usually eggs are laid on the stem base, but when populations are high, SVB may be found laying eggs on all parts of the plant.
Photo: K.Campbell-Nelson

Tomato:

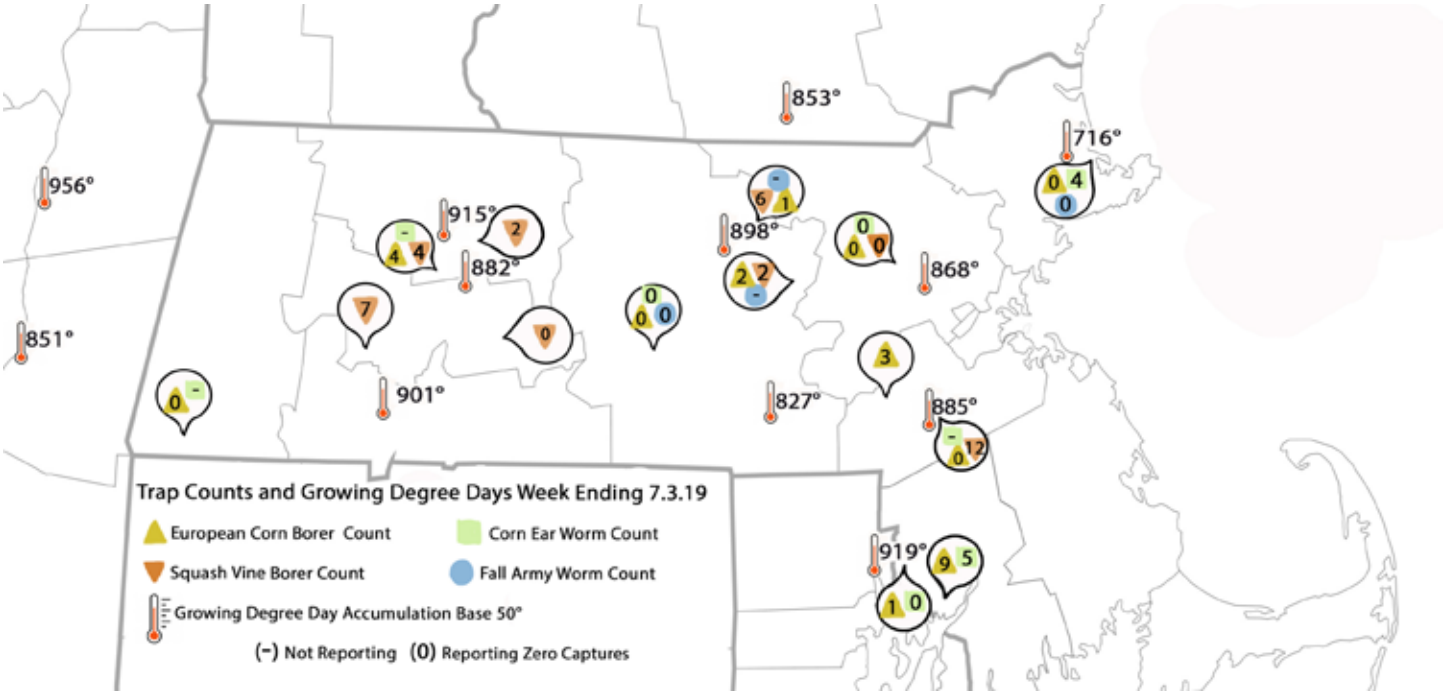
Early blight has been diagnosed on 'Red Deuce' field tomatoes in Hartford Co., CT. This disease usually appears on older leaves first, and as the season progresses can slowly defoliate plants. Varieties vary in tolerance to this disease. This disease can spread easily after hail.

Sweet Corn:

European corn borer **(ECB):** The first generation flight is over, and we await the second generation later in July at around 1,400 GDD base 50°F. Now is the time to be scouting corn for caterpillars getting into the ears. Treat if 15% of the crop is infested with ECB and FAW combined. Caterpillars in tasseling corn is easier to target than caterpillars boring into the ear. Follow scouting procedures here: UMass Sweetcorn IPM Scouting Guide.

Corn earworm **(CEW):** Traps in Essex, and Bristol Cos., MA and Hillsboro Co., NH are capturing CEW now and those farms are on a 5 day spray schedule, other parts of MA do not need to begin targeted sprays for CEW yet.

Fall armyworm **(FAW)** has started to show up in traps in NH (not yet reporting this week). No traps have been set up yet in MA.



Other/Multiple Crops:

Snail/slug damage was seen in one low-till field in Franklin Co., MA on Napa cabbage. Several other crops in the same field mulched with straw are being eaten. The same issue is being seen in NH. This is an increasing issue we are seeing with more growers using reduced-/no-till practices. There are several species of slugs and snails that overwinter as eggs or young juveniles. They usually become active at 40°F in May and again in September, however in cool, wet years like this one, they can continue to be a problem into the summer, especially in moist fields mulched with straw or fields with lots of crop residue. Ground beetles are good generalist predators of slugs and snails (photo).

Ground beetle adult (above) and ground dwelling larva (below). Photos: PennState

Potato leafhopper damage is increasing in potatoes and beans around the state and will likely continue to increase with more hot weather forecasted. Treat potato if more than 15 nymphs are found per 50 compound leaves. In green beans, thresholds are 2 per foot of row at the seedling stage. Use a threshold of 1.5 leafhopper per leaf in eggplant. In potato, some materials registered for Colorado potato beetle adults will also control leafhopper, including neonicotinoids. Other carbamate, synthetic pyrethroid, and organophosphate products are also registered. Often a single application is sufficient. In beans, systemic seed treatment may provide control. However, see the article in this issue for avoiding pesticide poisoning to pollinators, and avoid spraying potatoes and beans if they are in bloom.

Leaf spots of cucurbits

There have already been diagnoses of angular (bacterial) and alternaria (fungal) leaf spot in cucurbits this season. There are several diseases that cause leaf spots on cucurbit crops and they can often be hard to tell apart. Below are descriptions and photos of some the more common fungal and bacterial leaf spots found on cucurbit crops in MA that we hope will help you tease them apart in the field. Of course, a diagnosis from a trained pathologist in the lab is ideal, but we understand it is not always possible to test every spot you may encounter.

Angular leaf spot

This disease can affect all cucurbits, but cucumbers are most commonly affected. It is caused by the bacterium *Pseudomonas syringae* pv. *lachrymans*. This disease is usually among the first to show up because it is seed-borne—we've had two cases of 'Honeynut' squash transplants with angular leaf spot already this year. It will start to appear in the early to mid-season. Small, round water-soaked spots appear on leaf tissue, and expand until they are confined by veins, giving them the characteristic angular look. Under moist conditions a milky white exudate containing bacterial cells may ooze out of the lesion on the lower leaf surface. These wet-looking spots will dry out and turn yellow-brown or the dead tissue may fall out leaving a "shot-hole" appearance. Yellowing of the leaf between lesions may occur where disease severity is high. Similarly, water-soaked spots may appear on stems and petioles, drying out to form a whitish crust. Spots can also appear on fruit, where they begin as tiny and water-soaked, but dry to form whitish, chalky, spots. These spots cause internal decay of fruit. Fruit that is infected early may be deformed. Affected plants will grow poorly and produce less fruit. Affected fruit is unmarketable.

Angular leaf spot on zucchini. Spots will expand until they are trapped by leaf veins. Photo: S.B. Scheufele

As with other bacterial diseases, outbreaks of angular leaf spot are often initiated from infected seed. Bacteria proliferate in warm, moist weather and are spread from plant to plant by splashing rain or runoff, as well as by insects or workers moving through the field.

Use drip irrigation to reduce the spread of bacteria by overhead irrigation. Don't work in wet fields, or work in clean sections of the field first and infected sections last to avoid spreading the disease to unaffected areas or to new plantings.

If you catch the disease early, copper may be effective in reducing its spread. Till in residues quickly after harvest to get infected tissue breaking down quickly. Bacteria survive on residues as long as it is present, up to two years. Resistant varieties are available.

Scab

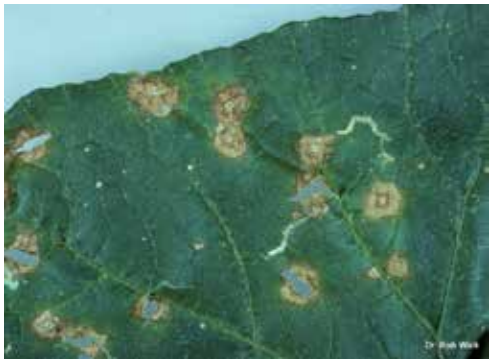
This disease is caused by the bacterium *Cladosporium cucumerinum* and can be a significant problem for summer and winter squash, pumpkin, melon, and watermelon. Lesions may occur on leaves, stems, petioles, and fruit, with fruit spots being the most damaging. Leaf spots are small, pale-yellow to white, and again the dead tissue in the center of the lesion may fall out leaving a "shot-hole" appearance. Leaf lesions may not occur and only stems or fruit are affected. Lesions on stems are elongate and light-colored, and if numerous may cause the internodes to shorten, giving the plant a deformed virus-like appearance. Scab lesions on fruit are sunken, irregular cavities with corky margins, and may produce a golden brown ooze which dries into brown beads. Sporulation on lesions may occur, giving them an olive-green, felt-like appearance.

Scab on zucchini. Photo: T.A. Zitter

This disease usually occurs in mid-summer and is favored by cool, dry days and rainy or dewy nights. The pathogen survives in crop residues, which persist one to two years in soil. Tolerant varieties of cucumber are available. Chlorothalonil, mancozeb, or polyoxin D can be used preventively, at the first sign of disease.

Anthracnose

This disease affects mostly melons, watermelons, and cucumbers; squash and pumpkins are less susceptible. The disease is caused by the fungus *Colletotrichum orbiculare*, which, like other anthracnose fungi, causes characteristic black, sunken lesions on affected fruit. Leaf spots are light-brown or reddish and appear near veins so may cause leaf distortion. These lesions dry out and the dead tissue may fall out, again leaving a "shot-hole" appearance. On stems and petioles, lesions are elongated and tan. Lesions on fruit are large, circular, sunken areas that turn black and may produce a pink ooze under humid or moist conditions.


'Shot-hole' appearance of anthracnose. Photo: R.L. Wick

The fungus can be seed-borne and also survives on crop residue or volunteer plants (maybe in your compost or cull pile). Humid, rainy weather is necessary for disease to occur. There are three races of the fungus that affect different crops. Resistant cucumber and watermelon varieties are available, but there are not resistant melon varieties. There are many fungicides labeled for control of anthracnose, please see the New England Vegetable Management Guide for recommendations.

Alternaria leaf spot

This disease affects all cucurbit crops but is most common on cantaloupe. The disease is caused by the fungus *Alternaria cucumerina*, which, like other *Alternaria* species, can cause a characteristic target-like spot. Usually, leaf spots are small and start out as tan flecks that enlarge and merge together. These larger spots (up to a half-inch) may exhibit the concentric rings common of all *Alternaria* fungi.


Concentric rings make Alternaria *leaf spots look like targets. On cantaloupe. Photo: G. Holmes*

This disease usually occurs in mid-season and can reduce late-season fruit production. Fruit lesions may also occur as sunken lesions with dark, olive-green, felt-like sporulation present in rings. The fungus survives on crop residue in the soil as long as it is present. A two-year rotation away from cucurbit hosts is usually sufficient.

Septoria leaf spot

This disease is less common, occurring in cool summers or late-fall. The disease is caused by the fungus *Septoria cucurbitacearum*, which causes small, almost white, round spots on leaves and superficial, raised tan bumps on fruit. The fun-

gus survives on crop residue in the soil, which persists one to two years. Spores are spread from plant to plant via splashing rain or overhead irrigation.

Septoria leaf spot of cucumber. Photo: R.L. Wick.

Management

The impacts of these bacterial and fungal diseases can all be reduced through sanitation and use of pesticides, whether conventional or organic.

Start with quality seed, and/or fungicide treated seed. If saving your own seed avoid collecting seed from fruit with any defects.

Use a 2-year rotation for cucurbit fields.

Don't work in affected fields when they are wet.

Use fungicides or bactericides when you see the first leaf spots to slow the spread of disease. Submit a sample to the UMass Plant Diagnostic Lab so that you can choose an effective pesticide for the disease you have. Consult the New England Vegetable Management Guide for pesticide recommendations.

--Written by Susan B. Scheufele, UMass Extension

PROTECTING HONEYBEES AND NATIVE POLLINATORS

Vegetable growers know the importance of insect pollinators for crop production. They also need to control insect pests, which involves using pesticides that are toxic to pollinators. However, there are ways to choose low risk materials and apply pesticides in methods that reduce pollinator exposure. This article lists several steps that growers can take to decrease pesticide risk for wild and managed pollinators.

Bees and butterflies visit crop flowers to collect nectar and pollen, and along the way move pollen (male genetic materials) to unrelated female flowers, resulting in fruits and seeds. Bees are essential for the production of some fruiting crops, including cucurbits. For wind-pollinated crops like sweet corn or tubers like potatoes, crop yield does not depend on insect pollination, but bees still visit these plants to collect pollen and/or nectar. Over the past few decades, populations of wild bumble bees and solitary bees have declined worldwide, while managed honey bees – which are often moved to farms to supplement pollination by wild bees – have experienced elevated levels of yearly colony loss. Research suggests that wild bee declines and managed bee losses are caused by a set of interacting factors: 1) Loss of habitat, including foraging resources and nesting sites, 2) Novel pests and diseases, 3) Low genetic diversity, and 4) Pesticide exposure.

While pesticides applied to crops are only one factors among many that threaten pollinator health, it is one factor that growers can do something about. Decisions made by the farmer or pesticide applicator affect how (and how much) bees are exposed to toxic levels of pesticides. Pesticides applied to protect vegetable crops can affect pollinators through multiple routes of exposure: direct contact with sprays, contact with treated surfaces, pesticide-contaminated dust or pollen particles that are collected or adhere to the body of the insect (and may be taken back to the hive), and ingestion of pesticide-contaminated nectar. Taking precautions to minimize pesticide poisoning of pollinators in all crops is an important responsibility of all pesticide applicators.

Tips to Protect Pollinators from Pesticide Exposure:

Adapted from New England Vegetable Management Guide and 2014 Supplement, Core Training Manual, Pollinator Chapter by Dr. Patricia Vittum and Natalia Clifton, UMass Extension.

1. **Read the label for bee hazard rating.** The EPA recently introduced a label change for insecticides that contain one or more neonicotinoid. The bee icon (right) indicates that the chemical is toxic to bees, and will be placed in the Environmental Hazards section of the pesticide label. You can read more here.
2. **Use the least toxic pesticide.** See Table 27 in the New England Vegetable Management Guide for information on insecticide active ingredients and toxicity. You can also easily look up the toxicity of any compound using the University of California IPM website, or by checking out How to Reduce

Bee Poisoning from Pesticides published by the University of Oregon. The EPA registration includes an acute, single-dose laboratory study designed to determine the quantity of pesticide that will cause 50% mortality (LD50) in a test population of bees. If a pesticide is used outdoors as a foliar application, and is toxic to pollinating insects, a **"Bee Hazard"** warning can be found in the Environmental Hazards section of the label. The EPA bee toxicity groupings and label statements are as follows:

High (H): LD50 = 2 micrograms/bee or less. The label has the following statement: "This product is highly toxic to bees and other pollinating insects exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees or other pollinating insects are visiting the treatment area." If the residues phrase is not present, this indicates that the pesticide does not show extended residual toxicity.

Moderate (M): Product contains any active ingredient(s) with acute LD50 of greater than 2 micrograms/bee, but less than 11 micrograms/bee. Statement: "This product is moderately toxic to bees and other pollinating insects exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product if bees or other pollinating insects are visiting the treatment area."

Low (L): All others. No bee or pollinating insect caution required.

In the New England Management Guide, the bee toxicity rating (H, M or L) is listed for each active ingredient in the Insect Management section for each crop. The University of California IPM site uses the following rating system:

3. **Do not treat plants in bloom.** In crops that bloom over long periods, make applications late in the day or at night when pollinators are not foraging, so that there is sufficient drying time before foraging begins. Control weeds to keep pollinators from foraging near treated crops.
4. **Consider drying time and weather conditions before exposure**. Some products are highly toxic when wet, but

I Do not apply or allow to drift to plants that are flowering including weeds. Do not allow pesticide to contaminate water accessible to bees including puddles.

II Do not apply or allow to drift to plants that are flowering including weeds, except when the application is made between sunset and midnight if allowed by the pesticide label and regulations. Do not allow pesticide to contaminate water accessible to bees including puddles.

III No bee precaution, except when required by the pesticide label or regulations.

Common name / Trade name → All types → IMIDACLOPRID Add to list

Common name (Example trade name)	Type	Mode of action	Rating	Other effects on bees	Toxic to honey bee brood	Toxic to other bee species
IMIDACLOPRID (Admire, Provado)	Insecticide	4A	I	FRAC3	✔	✔
IMIDACLOPRID bait liquid‡ (Vitus Liquid Ant Bait)	Insecticide	4A	III	FRAC3	—	—

much less so after the pesticide is dried. Spinosins have this characteristic. Apply when there will be adequate drying time (usually 2-3 hours, depending on weather conditions and crop canopy) before pollinator activity. Honey bees can become active and forage at temperatures as low as 55°F. If temperatures following treatment are unusually low, residues on the crop may remain toxic to bees up to twenty times longer than following normal temperatures. Conversely, if abnormally high temperatures occur during late evening or early morning, bees may forage actively on the treated crops during these times. Stop spray applications when temperatures rise and bees begin foraging.

5. **Avoid drift on non-target areas near the field where blooming plants may be located.** Windspeed and applica-

tion equipment both influence drift.

6. **Use liquid rather than powdered formulations.** Wettable powders, dusts and microencapsulated products have a greater toxic hazard than emulsifiable concentrates (or other liquid formulation with active ingredient in solution). Products that do not have acute toxicity but could cause injury to immature bees if carried back to the hive should not be applied in particulate form; this includes insect growth regulators.
7. **Make use of some soil and seed applications**, which reduce exposure compared to foliar applications, unless plant uptake of the active ingredient produces residues in pollen or nectar. In the case of neonicotinoids, there is evidence that foraging bees may receive sub-lethal doses in pollen and nectar when cucurbit crops were treated with a systemic at early growth stages. This effect appears to be reduced by using lower rates and applying as early as possible, but may not be entirely eliminated by these methods. A sub-lethal dose may make bees more vulnerable to other stressors, or may combine with doses from contact with other treated plant material.

Resources

Many of the following links and information can be found on the UMass Extension pollinator page.

- Bee Precaution Pesticide Ratings (University of California): Use this resource to look up the bee toxicity of any compound. ***highly recommended*
- How to Reduce Bee Poisoning from Pesticides: This 2006 publication from several universities in the Pacific Northwest provides a good overview on reducing pesticide exposure for bees, and also contains a list of commonly used pesticides and their toxicity (see image, right).

- Decision-Making Guide to Protect Pollinators in Tree Fruit Orchards (Cornell, 2018) has the latest information about pesticide synergies (the way that combinations of pesticides, herbicides and fungicides are toxic to insects). *Note: this publication is geared towards apple growers, so product names may be different for vegetable growers.*
- Toxicity of Pesticides to Pollinators and Beneficials (New England Small Fruit Guide): Contains information about reducing risk to honey bees, as well as a list of commonly used pesticides and their toxicity. *Note: this publication is geared towards apple growers, so product names may be different for vegetable growers.*
- Pollinator Protection (Pesticide Environmental Stewardship)
- Pesticide Task Force of the North American Pollinator Protection Campaign (NAPPC)
- EPA Actions to Protect Pollinators
- Xerces Society for Invertebrate Conservation

Disclaimer -*The most reliable information was included that was available at time this information was compiled. Due to constantly changing laws and regulations, UMass Extension can assume no liability for recommendations. The pesticide user is always responsible for the effects of pesticide residues on their own crops, as well as problems caused by drift from their property to other properties or crops. Always read and follow all instructions on the label.*

References:

Potts, Simon G., Jacobus C. Biesmeijer, Claire Kremen, Peter Neumann, Oliver Schweiger, and William E. Kunin. "Global Pollinator Declines: Trends, Impacts and Drivers." *Trends in Ecology & Evolution* 25, no. 6 (June 1, 2010): 345–53. https://doi.org/10.1016/j.tree.2010.01.007.

--Original article by Ruth Hazzard and Tina Smith, UMass Extension. Updated for 2019 by Hannah Whitehead, UMass Extension Honey Bee Educator.

Mexican bean beetle management

We have just begun seeing the first Mexican bean beetle adults in bean fields. No eggs have been seen yet, but now is the time to start scouting fields for this pest, especially if you plan to use the biological control agent *Pediobius* for control. Mexican bean beetles may be pests on snap beans, lima beans, and, more recently, soybeans. While they are not a pest on

every farm, some farms report significant damage from these insects and have to take action to prevent crop loss. Populations often build up when beans are grown in the same location every year—often close to the farm stand for PYO customers or CSA members. Using a combination of cultural and biological controls can reduce the need for insecticides in these sensitive areas.

Top to bottom: Mexican bean beetle eggs, larva, and adult Photos: J. Baker, NC State University, Bugwood.org (top), UMass Vegetable Program (middle and bottom).

Mexican bean beetle (MBB) adults are coppery brown with black spots. They look very much like large ladybeetles and in fact are closely related—but unlike ladybeetles, which feed on other insects, MBB adults feed on leaves. Adults spend the winter in hedgerows and usually move into fields in June. This year, with the cool spring and slow start to summer, we're just now seeing the first adults in bean fields in the first week of July. Shortly after adults arrive in a bean field, they lay yellow-orange egg masses on the underside of leaves in clusters of 40 to 50. These hatch into bright yellow, spiny, oval larvae, which feed, molt several times as they grow, and pupate on the underside of leaves. Feeding damage from adults and larvae can reduce yield and injure pods if numbers are high. There are 2-3 generations per season, usually increasing in numbers with each generation. Populations are usually less abundant on early plantings and may not build to damaging levels until August.

Cultural Control

Promptly destroy crop residues after harvest to reduce overwintering populations.

Maintain wide, clean headlands and brushless wood edges.

Avoid sequential plantings in close proximity.

Row covers can be used to exclude beetles until harvest, or for as long as it is practical.

Reflective metallic and white plastic mulches have been shown to significantly reduce beetle densities and feeding damage relative to black plastic or bare ground.

Biological Control

MBB 'mummies'--larvae that have been parasitized by the parasitic Pediobius *wasp. Photo:UMass Vegetable Program*

Pediobius foveolatus is a commercially available biological control agent for MBB and has a good track record in the mid-Atlantic states and among New England growers who have tried it. *Pediobius* (pronounced "pee-dee-OH-bee-us") is mass-reared and sold by the New Jersey Department of Agriculture and is also available from other beneficial insect suppliers (see contact information below). This small (1-3 mm), non-stinging, parasitic wasp lays its eggs in MBB larvae. Wasp larvae feed inside the MBB larva, kill it, and pupate inside it, forming a brownish case called a 'mummy'. About 25 adult wasps emerge from one mummy. The parasitoids are shipped to farms as mummies or as adults. Adult wasps will emerge from mummies within 2-3 days of receipt.

Pediobius is suited to our succession-planted snap bean crops. The first bean planting serves as a 'nurse crop' to establish the population of *Pediobius* that will be hard at work in successive plantings all summer. Control continues and in fact gets better as the season progresses and successive generations of the wasp emerge and search out new bean beetle larvae. Planning 2-3 releases at 7-10 day intervals will help ensure good timing and coverage on several plantings. After a release in the first planting, it is advisable to leave that planting intact for a while, until the new generation of wasps has emerged from their mummies.

As with any biological control, make releases as soon as the pest is present, not after it has built up to damaging numbers. The New Jersey Dept of Agriculture Beneficial Insect Rearing Laboratory recommends two releases, two weeks in a row, coinciding with the beginning of Mexican bean beetle egg hatch. Wasps will lay their eggs in larvae of any size, but it is best to target the newly-hatched young MBB larvae. This will give control before damage has been done. Thus, timing is important. Watch for eggs and time the shipment for the first hatch of eggs into larvae. If in doubt about the timing of the hatch, release as soon as you see the eggs—if you wait for the larvae, you may be playing catch-up. The release rate should be at least 2,000 adult wasps per field for less than an acre, or 3,000 per acre for fields of one acre or more.

Mummies are frequently shipped in screen bags. Simply secure to the underside of a bean plant. IPM Laboratories recommends 160 mummies/A, split between 2 releases for light infestations, 640 mummies/A, split between 2 releases for heavy infestations and for the home garden, a minimum of 10 - 15 mummies. Like beans, *Pediobius* wasps are killed by frost so annual releases are necessary.

Plan ahead by contacting a supplier to inform them of your expected release dates (based on what you're seeing when scouting for eggs and larvae) and acreage.

Contact information for New Jersey State Dept of Agriculture: Tom Dorsey, Philip Alampi Beneficial Insect Rearing Lab, (609) 530-4192. You'll also get advice on how to use the wasps from this office.

***Pediobius* is also available from the following suppliers:**

Beneficial Insectary Inc., 800-477-3715

IPM Laboratories, NY, 315-497-2063. Call to place orders early in the week (Mon-Wed)

ARBICO Organics, 800 -827-2847. Order online; orders ship on Wednesdays ONLY, minimum 7 day processing.

Chemical control

Treatment with an insecticide may be warranted to prevent economic losses. A suggested treatment threshold is >20% defoliation during pre-bloom or 10% during pod formation. Several conventional and organic insecticides are labeled for use against MBB, including several products that also effectively control potato leafhopper, which we are also seeing now in potato fields. Be sure to get coverage of lower leaf surfaces. Kaolin clay (Surround) may be used on seedlings and young plants to deter feeding and egg laying. For more information on chemical control options, see the New England Vegetable Management Guide and the Cornell Resource Guide for Organic Insect and Disease Management.

Controls for potato leafhopper may also be needed in many bean crops, and could have harmful effects on *Pediobius*, especially on adult wasps. If releasing *Pediobius*, avoid sprays shortly before or after releases; apply treatments to a succession planting 5 days before release.

--Written by Susan B. Scheufele, Amanda Brown, & Ruth Hazzard, UMass Extension. Updated for 2017 by Lisa McKeag.

Events

Sustainable Water Management Practices for Nursery & Greenhouse Operations

When: Wednesday, July 10, 2019, 9am to 3:30pm

Where: University of Massachusetts, Amherst

Registration: Pre-registration required. $60 per person. Includes lunch, morning coffee, and parking. See event page, linked to in title, for registration forms.

Increasing production sustainability is of growing importance for all types of plant production. Improving irrigation practices, understanding water quality, and monitoring nutrients are integral to increasing sustainability. Better management of water and nutrients can improve environmental stewardship as well as your bottom line. Join water and nutrient management specialists from around the country for this exciting workshop. See event page, linked to in title, for detailed agenda.

Vermont Vegetable & Berry Growers Association On-Farm 2019 Workshop Series

The Vermont Vegetable & Berry Growers Association is holding a series of nine on-farm workshops from June through November this year. For more information on all workshops in this series, please click the linked event title above.

Attendance at these events is free for members of the Vermont Vegetable & Berry Growers Association. The cost is $10 per-person for non-members, payable on-site. Refreshments will be served. Membership in the VVBGA costs $55 per farm, per calendar year. The VVBGA works with University of Vermont Extension to deliver education and applied research for its growers.

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RIMOL Greenhouse Systems

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

Where trade names or commercial products are used, no company or product endorsement is implied or intended. Always read the label before using any pesticide. The label is the legal document for product use. Disregard any information in this newsletter if it is in conflict with the label.