



VEGETABLE IPM MESSAGE

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CROP CONDITIONS

Wet, humid weather has dominated this week. Rainfall of several inches has hit most of the state this week in a series of downpours. Growers need to be concerned about both foliar and soil-borne diseases, as both soils and leaves have been wet for long periods. Harvest of main season vegetables is in full swing, with eggplants and peppers starting to come in – though fruiting and ripening is late in many fields. Planting of fall greens and brassicas is underway. Corn earworm has arrived in force, and European corn borer needs to be controlled in both pepper and corn, and the second round of flea beetles is emerging.

FIELD DAY REMINDER

Join us for our upcoming field day and agricultural trade show at the South Deerfield Research Farm on Wednesday, August 13th. This event is co-sponsored by the UMass Vegetable Extension and CISA (Community Involved in Sustaining Agriculture), and will feature the following:

11:30 am to 2:30 pm Crop-Livestock Field Tours (First round)

2:00 pm to 7:30 pm Agricultural Business Trade Show
Come visit the following exhibitors: Arthur Carroll Crop Insurance, BASF Corporation, Charles W. Harris Company, Crop Production Services, Helena Chemical Company, OESCO Inc., Superior Scale Company, Wellscoft Fence Systems

4:30 pm – 5:30pm Local Foods Buffet

5:30 pm -7:30 pm: Crop-Livestock Field Tours (Second round) and Vegetable Field Tour

Pesticide applicator recertification credit will be given.

Please note that a \$5 to \$20 donation will be requested to help cover the costs of the event.

Directions: From I-91 north take exit 24 and turn right at the end of the ramp onto Rts 5 & 10 North. From I-91 south, take exit 24 and turn left at the end of the ramp onto Rts 5 & 10 North. Go north on 5 & 10 a few hundred yards to the traffic light and turn right onto Rt. 116 (toward Amherst). Proceed about one mile through another light and turn left (north) onto River Rd. just before the bridge over the Connecticut River. Go north on River Rd. past a housing development and left through the gate onto the Research Farm. Look for signs. From the Amherst-Sunderland-Hadley area, cross the Connecticut River on Rt. 116 and turn right onto River Rd. just beyond the bridge.

For more information, contact Nicholas Connor or Ruth Hazzard at 413-545-3696 or by email at umassvegetable@umext.umass.edu

--Nicholas Connor, Assistant Editor

PHYTOPHTHORA WATCH IN PEPPERS AND VINE CROPS...AND OTHER DISEASES OF VINE CROPS

Conditions have been favorable for *Phytophthora capsici* and growers should be on the alert and checking their fields regularly –especially fields with a history of this disease. Look for soft rotted tissue anywhere on the plant, particularly the stem and crown near the soil surface or any fruit. Search low-lying areas of the field first. Recognizing disease due to *Phytophthora capsici* is not always easy; often the only visible symptom of infection, especially for cucumber or tomato plants, is stunting. Because the disease often occurs in low areas of a field where water accumulates, many growers assume that the stunting is due to ‘water logging’ of the roots. Squash or pepper plants may have more obvious symptoms, with plants permanently wilted or collapsed prior to dying. Infected plants often have brown to black discolored roots and crowns. Disease is most obvious on infected fruit, initially as dark, water-soaked lesions which may develop a distinctive white ‘powdered sugar’ layer of spores on the surface of the

fruit. Fruit infection is especially troublesome because the infection may occur days before the symptoms become visible. Use the Disease Diagnostic Lab (413-545-1045) to confirm any suspected outbreaks. Two diseases which can be confused with *Phytophthora* fruit rot are *Pythium* fruit rot, which is characterized by white fluffy growth like fine cotton, and *Sclerotinia* white mold, which has dense cottony growth with black, hard, pea-like structures imbedded in it.

Spread can occur with moving water in the soil, on any soil left on equipment used for tillage or harvest, or with windblown spores moving through the air. *Phytophthora capsici* grows best at 80°F, and can rapidly spread throughout a field under warm, wet conditions. The fungus produces lemon-shaped spores called sporangia on the surface of roots, crowns, and fruit of infected plants. Sporangia may be dislodged from infected plants by irrigation water, drainage water, or windblown rain. In water, sporangia release many smaller swimming spores called zoospores. Swimming zoospores are attracted by root exudates from host crops. One zoospore is all that is needed to infect a plant. Sporangia may also directly germinate and cause infection. Disease occurrence within fields often follows drainage patterns, but windblown rain may allow *Phytophthora* to spread across an entire field.

Production practices that can help prevent outbreaks:

Minimize puddling, whether from irrigation (fix leaks in irrigation systems!) or rainfall. Subsoil, clear pathways for drainage at the end of rows, etc. **Irrigate conservatively**, especially as fruit load increases in the field. If an outbreak occurs, plow under the infected patch including healthy plants that border the diseased areas. **Remove diseased fruit from the field**, but never dump culls or disease fruit from other fields or farms into production fields. If *Phytophthora capsici* is introduced, it may remain indefinitely. **Clean equipment** that has been used in an infected field by washing with a strong water stream or power washer. Fungicides have provided minimal control in efficacy trials in New York State

and elsewhere in the US in vine crops and should not be used alone without cultural practices. In pepper or cucumber, directed sprays of mefenoxam (Ridomil), copper or chlorothalonil may be useful as a preventative program.

Angular leaf spot is showing up in some fields. The symptoms of this bacterial disease are leaf spots (round at first, growing until they are limited by the leaf veins and become angular spots). Initially they look water-soaked or brown, then the tissue becomes translucent and dead, or may fall out as the leaf ages or grows. This disease attacks cucumbers, squash, and watermelon. Warm, humid conditions are favorable for this disease. Generally, this disease has not significantly affected yields in New England. If you think you have a significant amount of angular leaf spot, or it appears to be spreading, then copper applications may be warranted. It is not certain that copper applications are effective in preventing spread of the disease. If you do apply copper, use a boom sprayer. Do NOT use an airblast sprayer, which spreads the bacteria throughout the field. When using copper products -- especially with young vine crops -- avoid higher than label rates and wait for cooler temperatures if possible, as high rates at high temperatures have some risk of phytotoxicity. One caution is that symptoms of bacterial leaf spot of cucurbits (*Xanthomonas campestris* pv *cucurbitae*) are very similar but can result in fruit rot, while angular leaf spot does not. Consult the Disease Diagnostic Lab for assistance in diagnosis.

Belly rot, caused by *Rhizoctonia solani*, has been reported in cucumbers. This begins on the underside of the fruit, where fruit is in direct contact with infected soil. It is most common in cucumbers but can infect other cucurbits. Water-soaked, tan- to brown lesions become sunken and cratered as they enlarge. Temperature is more critical than moisture for disease development, although high humidity under a thick foliage promotes disease. The optimum temperature is 81°F. Mulch or other barrier between soil and fruit reduces disease.

Powdery mildew is being found in butternut and pumpkin

fields, often still at rather low levels. However, we recommend that the first symptoms seen trigger a regular spray program (see July 24 issue for details).

--R. Hazzard, adapted from M. Hausbeck (Michigan State), R. Wick (UMass), M. McGrath (Cornell University)

PEPPERS

Pepper harvest is underway in some fields, but many growers are still waiting for fruit to size up and reach maturity. Fruit set is generally good. **European corn borer** captures rose sharply this week and numbers are above the threshold of 7 moths per week at nearly all locations. It typically takes two weeks from the onset of flight before pepper fruit is attacked by borers. Insecticide applications should begin one week after the onset of flight, which means this week in some locations and next week in others (see charts of ECB captures in this and last week's messages or check your own traps).

Insecticides for ECB should be applied at regular intervals during the second-generation flight period, especially in the next 3-4 weeks during peak flight when flights are well above the 7 moth/week threshold. The recommended interval depends on the material used. Acephate (Orthene, 7dh), methoxyfenozide (Intrepid 2F, 1 dh). or tebufenozid (Confirm 2F, 7dh) can be applied at 10-14 day intervals; spinosad (SpinTor, 1 dh) or permethrin (Pounce, Ambush, 3 dh), at weekly intervals, 2nd-generation pyrethroids (Capture, Baythroid, Warrior, Mustang, 5-7 dh,) may work as a slightly longer interval (7-10 days) and Bt products (0 dh) should be sprayed twice weekly.

Permethrin products will cause aphid outbreaks by destroying beneficials which keep aphids in check. Orthene provides good aphid control. Spinosad, while not having activity against aphids, has the advantage of conserving beneficial insects such as ladybeetles, which can reduce resurgence of aphids in crops such as peppers and sweet corn. The one-day pre-harvest interval and four-hour re-entry interval makes it particularly useful in peppers where harvest periods coincide with heavy pest pressure and the need for regular sprays.

Scout for **green peach aphids** by checking 4 leaves per plant on 25 plants. Natural enemies generally keep aphids under control. If numbers exceed an average of 10 aphids per leaf, controls are needed to prevent an outbreak that could impact plant growth and cover fruit with honeydew and sooty mold. Insecticides with good efficacy against aphids include Orthene, Provado (0 DH), Dimethoate, Horticultural oil, insecticidal soap, Metasystox-R. Of these, only Orthene also controls ECB.

We are seeing **bacterial leaf spot** in some fields (including in some resistant varieties). Hot, moist conditions favor bacterial leaf spot infections, so scout for this disease and apply copper products if it is present. Messenger may also help plants resist the disease.

Pepper maggot fly, is still active and more oviposition stings were found this week, compared to previous weeks, on cherry and bell pepper fruit in scouted field in southeastern Mass. If this is a problem on your farm, use one or two sprays about 10 days apart during this peak period of oviposition, to reduce adult activity.

BRASSICAS: FLEA BEETLE AND CATERPILLAR UPDATE

Flea beetle populations are again high on field brassicas. At the University of Massachusetts agronomy farm, flea beetles are feeding heavily on a wide range of brassica crops, from older cabbages and collards to newly-planted turnips and Asian brassicas. The flea beetles currently feeding are the offspring of the adult beetles that were present on crops in the spring. During warm weather, it takes one to one and a half months for beetles to progress from egg to adult (longer in the cool spring weather). Weekly dissections of field-collected flea beetles indicate that the females are still laying eggs, which means that new beetles will be emerging from now through September. Results from our spring field trials of pesticides indicate that, while row cover is the most effective method of reducing damage, both spinosad (in either Entrust

or Spintor 2SC formulations) and carbaryl (Sevin XLR Plus) significantly reduce damage when applied as weekly foliar sprays. Join us at the South Deerfield Field Day for more details on current research on this pest.

A new generation of **imported cabbageworms** are hatching out, **diamondback moth** is going strong. **Cabbage looper** is present in the Connecticut Valley, which probably means it can also be found in other parts of the state. Keep a close eye on brassicas – *especially underneath the leaves*. Diamondback moths were found in a hoop house with mesclun greens in southeastern MA. These are not the preferred host, but they were causing small round holes in the leaves.

--Caryn Andersen, R. Hazzard

TARNISHED PLANT BUG

Tarnished plant bug (TPB) adults and nymphs are active in high numbers during early August. Adults are about 6 mm long (1/4 inch), brown or tan or greenish with darker markings on their wings and back. Nymphs are bright green and progress through 5 molts (instars) from first hatch to the adult stage. They can be mistaken for aphids, but move much faster when disturbed. Overwintered adults lay eggs in spring, depositing eggs in stems and leaf ribs in host plants. A new generation of adults (which is what we are seeing now) will produce another brood in the late summer, for a total of 2 or possibly 3 generations per year.

Feeding: Adults and nymphs have piercing sucking mouthparts (stylets) which are used to penetrate plant tissues and suck up cellular contents. TPB select succulent, nutritious tissues such as new growth or newly forming fruits (just after blossoming). While feeding, the bugs secrete a toxic substance from their salivary glands which kills cells surrounding the feeding site. Usually the first signs of damage are small brown spots on young leaves. As the tissue grows, healthy tissue expands while dead tissue does not, which results in holes and distorted, malformed leaves, buds or fruit. Terminal shoots and flowers may be killed. Ribs and stalks may be discolored or die.

Damage. In strawberry, this distorted growth of fruits is known as cat-facing. In lettuce, TPB causes scars on ribs, which allow entry of pathogens and render heads unmarketable. In celery, feeding on tender stalks produced large, brown colored wilted spots and blacking of joints, known as “black-joint”. In beans, feeding on flowers causes them to drop, and feeding on seeds in young pods causes pitting and blemishing of pods. In tomatoes, eggplants and peppers, feeding may occur on flowers and stems, causing flower drop. Fruits may also be attacked leading to indentations, bumps, or yellowing of the flesh where the fruit is “stung” by the piercing mouthparts of nymphs or adults. These could be confused with stink bug damage, but they do not have the white pithy areas beneath the skin that is typical of stink bug damage. It is not common to see this damage, but if the damage occurs it may help to determine the cause. In pepper and in basil, feeding in emerging leaves causes distortion and browning of leaves. In apples, adults feed on fruit buds and cause fruit dimpling and scabbing, or dropping off (abscission) of the buds. In water spinach, we see distortion of leaves and dieback of tips or leaf internodes.

Tarnished plant bugs attack a large variety of crops, weeds, flowers, and orchard crops. Weed hosts include wild carrots and other umbelliferous crops, redroot pigweed (and other amaranths), lambsquarters, mustards, shepardspurse, rocket, goldenrod, and mullein. Alfalfa is a favored host, and harvesting alfalfa often stimulates major lygus migrations. Other legume hosts include vetch, lupine, and fava beans.

Management: Whole farm management should include removing sources of infestation outside the crop. Disk or rototill weeds along field borders to reduce weed hosts, or keep them mowed all season. However, disturbing non-crop areas by mowing can encourage movement of TPB into your crop, so it should be avoided at critical periods when the crop is vulnerable. There are natural enemies of TPB, including a parasitic wasp which was released for control of TPB in alfalfa (*Peristenus digoneutis*). This was released in New Jersey and has spread throughout the northeast, and can cause

up to 50% mortality. However, it currently does not reduce the numbers sufficiently to prevent damage in key crops. Many vegetable crops can sustain a small population of TPB without economic injury. Consult the *New England Vegetable Management Guide* for insecticides; watch preharvest intervals.

--Ruth Hazzard

Tomato: Tom-cast Update

Tomato quality is good, and fruit is ripening. Leaf wetness periods have been seemingly endless this week – logging 13-24 hours at a stretch at our weather datalogger at South Deerfield. Nights have also been warm, resulting in temperatures ranging from 62-76 degrees F during the leaf wetness period. As a result, we've been logging daily DSV's of 3 this week. It's time to be on a fungicide schedule of not more than 7 days. Growers with large plantings of tomatoes may also be battling bacterial canker, which tends to hit larger acreage more heavily. In that case, you are probably already on a weekly application of copper along with fungicides.

Table 1: TOM-CAST DSV's for Summer 2003

Month	Day	DSV/ Day	Accumulated DSV	Avg. Wet Temp F	Wet hrs/day
July	23	0	73	73	4
	24	3	76	68	17
	25	2	78	65	14
	26	0	78	72	2
	27	0	78	65	1
	28	1	79	61	8
	29	1	80	61	13
New Data Set					
	30	1	81	62	9
	31	3	84	64	24
August	1	1	85	62	8
	2	0	85	76	1
	3	3	88	75	19
	4	3	91	74	13
	5	3	94	72	16

SWEET CORN

Its bug time in corn. Corn earworm moths numbers have reached serious levels throughout the state (see Table 2) including the Berkshires and southern Vermont. In southeastern Mass, growers need to be on a tight 3-day schedule. The rest of the state needs to be on a 4-day schedule. **European corn borer** flight counts jumped this week and new hatch can be expected in the next week. And **fall armyworm** infestations in whorl and pretassel corn are above threshold in many fields. Plus, frequent rains cause growers to wonder if the residual from sprays will last. **Sap beetles** and **aphids** are showing up. This kind of pest pressure requires best performance from your spray equipment, the materials you use, and your attention to timing. Here's some suggestions for coping with the situation.

Town	Date	Iowa	NY	TOTAL ECB	CEW	FAW	% PT
		ECB Z1	ECB E2				
Brandon, VT	8/6/03				0		
Walpole, NH	8/5/03	2	7	9	12	2	
Plainfield, NH	8/5/03	5	2	7	2	0	7%
Westminster, VT	8/4/03	12	2	14	0	0	1%
South Deerfield	8/5/03	9	29	38	-	-	
Sunderland	8/5/03	19	77	96	9	7	
Hatfield	8/6/03	62	48	110	21		8%
Hadley	8/5/03	30	167	197	2		
Feeding Hills	8/5/03	11	17	28	22	5	15%
Tyngsboro	8/4/03	3	6	9	14	0	36%
Sheffield, MA	8/6/03	3	4	7	13		
Lancaster	8/7/03	4	22	26	27	3	34%
Still River	8/7/03	0	3	3	62	2	
Concord	8/4/03	6	23	29	29	6	18%
Leicester/Spencer	8/6/03	4	7	11	6	2	32%
Northbridge	8/6/03	11	17	28	25	4	33%
Sharon	8/6/03	3	13	16	141	7	
Dighton	8/6/03	1	0	1	68	3	
Rehoboth	8/6/03	15	28	43	263	9	

*Note: Counts in **bold** represent an average count from two traps.*

Before silk:

Scout each block for corn borer and fall armyworm, starting in the whorl stage. At whorl stage, you are likely to see fall armyworm damage only – ragged holes, lots of frass. Whorl-stage corn is the where adult FAW moths prefer to lay their eggs, so that's where the numbers are highest. In emerging tassels, you will find both new ECB larvae and fall armyworm. Direct sprays into the whorl, if FAW infestation is >15%. Otherwise, spray as the green tassel emerges from the whorl if FAW+ECB infestation is > 15%. FAW is best cleaned up before ears develop. Once they have burrowed into the ear – usually from the side, but also down through the tip – you won't reach them. The most effective FAW insecticides include Avaunt, Lannate, Spintor and Warrior. Avaunt is labeled for presilk application.

Moths/Night	Moths/Week	Spray Interval
0 - 0.2	0 - 1.4	No spray
0.2 -0.5	1.4 - 3.5	6 days
0.5 - 1	3.5 – 7	5 days
1.0 - 13.0	7 – 91	4 days
Over 13	Over 91	3 days

Silking corn:

Coverage is key: spray as often as you like, it won't give you good control unless the ear zone receives thorough coverage. The best coverage comes from a boom with one nozzle over the row, and double drops between rows (two nozzles on each drop, about 24 inches apart, directed at the ear zone from above and below). These soak the ear zone on both sides of the plant more effectively than a spray from above. Use higher water volume for single drops (36-54 gal/acre) and for double drops (60-90 gal/acre) than you might

use for a simple boom sprayer. If you are using a mist blower, spray when there is virtually NO air movement (you might need your headlights) so that the cloud of mist will settle down between the rows. Don't try to blow through the corn because each successive row serves as a very effective filter, blocking the spray. Instead, direct the mist over the top and down. Trying to reach further than 6-7 rows from each side (blocks of >12-14 rows in all) usually means poor control in the center, so most growers cut their late corn blocks to 14 rows. Clip some water-sensitive cards to silk to test your coverage.

Timing and silk growth: Ear-directed sprays should begin when 10-30% of the ears are showing silk. Remember that this fresh silk is the most attractive egg-laying site for CEW moths. Silk growth on each ear is complete in 2-3 days, but not all stalks produce silking ears at the same time, so the period when new silks are growing can extend for 4-5 days (or more in a very uneven stand). CEW and ECB caterpillars can continue to hatch and enter ears throughout the three weeks from first silk to harvest, so it is important to continue sprays until 3-5 days before harvest. However, remember that the first week of silk is especially critical because there is a combination of high egg deposition and new silk growth.

Timing, CEW pressure and temperature: Tighten spray schedules according to CEW trap captures (see table). These schedules are based on expected summer temperatures where daily highs exceed 85. CEW eggs hatch more rapidly at higher temperatures. From lab studies, we know that CEW eggs hatch in 4.6 days at a constant temperature of 70 °F; 3.6 days 75 °F; 2.9 days at 80 °F; and 2.5 days at 85 °F. In the past week, daily highs have been in the 80's and **daily average generally in the mid 70's**. Thus eggs would be hatching in about 3.5 days. CEW control depends on maintaining a residual on the silk so that newly hatched larvae encounter a toxic surface before they enter the ear.

Rain: Drying time is important. If you have sprayed 5-6 hour before rain hits, so that the spray has time to dry, it will be more rain fast. If rain comes less than 5 hours after application, repeat application when corn is dry if label allows.

Stickers: Select adjuvants that provide rain fastness and extend the residual. Its difficult to find good studies on the additional efficiency provided by these materials, but they don't cost much per acre and may be helpful.

Month	Date	Avg. Temp	Max Temp	Min Temp
July	26	78	87	70
	27	73	80	63
	28	70	84	56
	29	71	87	56
	30	72	86	58
August	1	64	65	62
	2	71	84	61
	3	77	85	74
	4	76	85	73
	5	75	84	71

Choice of insecticides: Select materials with a long residual. Ovicidal activity is also helpful. The following recommendations are based on research results and reports from grower experience that I have noted over the years. For high corn earworm pressure, second-generation pyrethroids (Baythroid, Capture, Warrior) give the best control, because of the combination of knock-down and residual activity. Methomyl (Lannate) may be useful against aphids but tends to be a quick knock-down, short residual material, may cause crop burning, and has resulted in some failures for growers who depended on it for corn earworm. First-generation pyrethroids (Asana, Pounce) may also have mixed results. Thiodicarb (Larvin) has proved effective in high CEW pressure situations; growers have reported concerns about a residual odor and cost but not about poor control. Comparison studies of Spintor vs. Warrior have shown equivalent control against earworm a when CEW pressure is moderate but is not as good at high pressure.

Organic, biorational controls: Use the oil/Bt direct silk application at 4-6 days after silk initiation, when silk is starting to wilt (see

July 24 for more details). This will control insects entering through the tip but not those that burrow through the side of the ear. As ECB activity increases, and where FAW is active (which includes most of the state), sprays of BT or Spinosad are recommended to prevent side damage to the ear. These should target infestations prior to silking, but while ECB flight is high we recommend a spray in early silk as well.

Sap or picnic beetles. There are several similar species that attack corn, known as sap beetles and picnic beetles. These beetles are black, 4-7 mm, with reddish orange spots on each wing. Beetles overwinter as adults in many types of plant cover near the soil surface. Once temperatures reach 60 to 65 degrees F in the spring, they become active and feed on fungi, pollen, or sap from many kinds of plants. Adults seek out fermenting fruit or decaying vegetable matter, such as berries, melons, cracked tomatoes, discarded corn ears, etc, to feed and lay eggs. In corn crops, these beetles often infest ears with previous damage from worms or birds, or ears with open tips. Adults lay eggs in the tips, which hatch in about 2 days. The larvae, which are small, white and maggot-like, feed near the tip and are certainly not appealing to customers. Full grown maggots leave their feeding sites to pupate for about a week in the soil. In warm weather, the life cycle is completed in 3-4 weeks.

If you are struggling with the pest on your farm, look for where you might be helping create the conditions they need to reproduce. Finding an effective spray material won't solve the problem, if they are able to build up somewhere on the farm and move into your corn crop. Perhaps you are unwittingly creating a terrific site for larvae to grow and pupae to survive! **Sanitation is key.** What are you doing with discarded or culled corn ears? (Are they lying on the ground for a period of time?) How quickly do you disk under your harvested blocks? What do you do with any vegetable waster from your farm stand or packing shed? Do you grow fruit and if so, what do you do with the dropped or culled fruit? Corn varieties with more exposed tips or short, loose husks (e.g. Sensor) are more susceptible. If damaging numbers are present, using Warrior or Karate for caterpillar control should also control sap beetles. Other materials used for caterpillar control may be less effective against sap beetle.

Chemical controls: Studies in New York and Maryland found best control with Warrior (3.2 oz/A rate was used); other labeled products (Lannate, Asana XL) were tested and found not nearly as effective. These studies did not include other 2nd-generation pyrethroids such as Baythroid or Capture. Carbaryl is labeled but should not be used at pollen shed due to bee toxicity.

-R Hazzard

Vegetable Notes, Ruth Hazzard, Editor. Nicholas Connor, Assistant Editor. Vegetable Notes is published weekly from May to September and includes contributions from the UMass Extension Vegetable Program faculty and staff, growers, and private IPM consultants. Authors of articles are noted; author is R. Hazzard if none is cited.

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