



VEGETABLE IPM MESSAGE

June 21, 2001

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CROP CONDITIONS

Harvest of lettuce, bok choy, Chinese cabbage, mizuna, collards, summer squash and zucchini, and radishes is underway. Crops are growing well in the heat, which was 5-9 degrees above normal last week. Potatoes are starting to flower. Watch for leafhoppers in beans and potato. Sunday's rain drenched the northeastern and central part of the state with 4-5 inches, while other areas received 2 inches or less. Growers are pleased to see that the efforts they have put into raised beds, subsoiling, drainage systems, and other water management tactics are working to reduce standing water and will, hopefully, help reduce *Phytophthora* outbreaks this year.

TWILIGHT MEETING: SEE YOU THERE!

Monday June 25 at Calabrese Farms
6:00 - 8:30 p.m.
257 Feeding Hills Rd., Southwick, MA
Contact: John Howell (413) 545-5307

GREENHOUSE TOMATOES

The most popular method of growing greenhouse tomatoes is in bags or other containers filled with an artificial peat-based mix. With such a system, a fertilizer mixture is injected into a trickle irrigation system every time water is applied. This is called constant feed. A common fertilizer program is to use a 7-11-27 plus calcium nitrate. The 7-11-27 is mixed at a rate of 15 ounces per gallon to make a concentrate stock solution. The calcium nitrate is mixed at 10 ounces per gallon of stock solution. These two stock solutions should be in separate containers. If they are mixed together as a concentrated stock

solution, they will react, causing precipitates to settle out. This changes the character of the fertilizer and can clog the emitters. Every time the crop is watered, each of these two fertilizer solutions is injected into the irrigation water at a dilution ratio of 100 to 1. This provides a final concentration of 200 parts per million (ppm) of nitrogen which is appropriate for tomato plants that are bearing. (You should start newly set plants at half this concentration and gradually work up to 200 ppm.) To do this right requires two injectors; one for each of the fertilizers. They should both inject at the same time, so the two materials are mixed in the water line. This is safe because they are diluted when they are mixed and they are not in the line long before they pass through the emitter into the growing media.

Some growers have only one fertilizer injector and so they alternate fertilizers. This means that each fertilizer material is injected at every other watering and results in the nutrients being applied at half the recommended rate. There are a number of crops showing nutrient deficiencies as a result. It is best to use two injectors so you can inject the materials at the same time. Another option is to move the injector suction tube from one stock solution to the other half way through the irrigation cycle, but make each stock solution double strength. This should apply the correct amount of each material, but be sure to make the switch half way through the cycle or you can over apply certain nutrients.

—John Howell

UNEVEN CROP GROWTH

It is easy to find uneven crop growth this year. This can result from any of a number of factors that are unfavorable for crop

growth such a weather conditions. In some fields, the soil pH in the top inch or two is quite low (acid). This can happen even if a recent soil test indicates that pH is quite good. The reason is that when many common fertilizers such as urea and ammonium sources of nitrogen are applied they have an acidifying reaction in the soil. If such fertilizer is broadcast and harrowed in, it is only incorporated a few inches deep. Incorporation is usually about one half the depth of disc penetration. This results in an acidifying reaction in the top few inches where the roots of small plants are located. This is a serious problem for sensitive plants. If this pH problem is combined with other unfavorable factors, even less sensitive crops can be affected. The result is typically stunted and uneven growth and sometimes leaf discoloration. On most soils it is wise to lime to keep pH at 6.5 to 6.8. This will minimize problems with fertilizer acidification. Some growers even topdress some lime over sensitive crops such as onions.

–John Howell

TOMATO

Tomatoes are growing well in response to the heat and ample soil moisture. They have overcome the setback caused by cold, rainy, windy conditions and delayed planting during the late May rains. Some growers are reporting a gap in fruit set after the initial flower cluster set fruit on May-planted crops. **Early blight** has been observed on plants that have first and second clusters set with first fruit 2-3 inches. Given nighttime temperatures in the 60's and high relative humidity, which produce long leaf wetness periods at night, conditions have been favorable for development of early blight. Fungicide applications for prevention of early blight are recommended. **Late blight** was found in a tomato transplants in a greenhouse in Pennsylvania. This serves as a signal to watch transplants, fields and greenhouses for late blight symptoms and contact the UMass Plant Disease Diagnostic Lab if you suspect late blight (413-545-1045).

CRUCIFERS

Watch for caterpillars. **Cabbage looper** is being reported in several areas of the state, along with **diamondback moth** and **imported cabbageworm**. A summary of identification and scouting procedures for these three pests follows:

Cabbage looper (*Trichoplusia ni*). Cabbage looper usually does not survive the winter in New England, and arrives in migratory flights from farther south. Generally numbers are not significant until late July. However, earlier flights do occur, probably as a result of early migratory flights. Adult moths are mottled gray-brown, about 3/4 inch long, with a distinct round silver-white mark on each fore-wing. Since they fly at night, they are rarely seen unless monitored with pheromone traps. The recommended trap is the rigid bucket type, either a Multiplier or a Unitrap, baited with either Trece or Scentry lures for *Trichoplusia ni*. Place the trap at foliage height, and secure the lure under the lid. Use an insecticidal vapor strip (Vaportape) so that moths die before their wing scales are damaged -- otherwise they can be difficult to identify. Sources for traps and lures include Great Lakes IPM (517) 268-5693 and Gempler's (800) 382-8473. Typically we find a variety of non-target moths in these traps, but the coloration is generally quite different. However, celery looper has only a slightly different wing marking from cabbage looper. Feel free to contact the UMass Vegetable IPM office (413-545-3696) if you have questions on traps or identification.

The cabbage looper caterpillar is light green, with wavy white or light yellow lines down the back and sides. Full-grown larvae reach 1 ½ to 2 inches. At rest or when disturbed, cabbage loopers of any size will raise the middle of their body in a characteristic "loop" shape. Eggs are round, light green or yellow, and laid underneath the foliage. Monitor caterpillar activity by field scouting (below). Feeding tends to create ragged, large holes in foliage, on both frame leaves and heads.

Imported cabbageworm; cabbage butterfly (*Pieris rapae*). This familiar white butterfly can be seen in daytime fluttering around cole crop fields. Each forewing has a dark border and one or two round black spots. Eggs are laid singly on the

underside of leaves, about 1/8 inch in length, light green and slightly elongated, standing upright. The larvae, called imported cabbageworm, is gray-green, slightly fuzzy, and sluggish. Feeding and resting occur on the underside of leaves, and larvae feed more heavily in the head of cabbage or broccoli as they grow. The overwintering stage is the crysalis (pupa), which is green or brown, smooth with three pointed ridges on its back. There are 3-4 generations per year.

Diamondback moth (*Plutella xylostella*) caterpillars are smaller, light green, appear more segmented and more pointed in shape. When disturbed they wiggle vigorously and may drop off the plant on a string of silk. Feeding causes small, round holes and tends to be spread across the foliage and not necessarily concentrated in the head. The adults are tiny (<1/2 inch), light brown, and rest with their wings folded together like a tent. They overwinter in crop residue, but may also enter the region by migrating from southern states.

Field Scouting for caterpillars: It is important to check cabbage or broccoli plantings as they begin forming heads. Greens such as collards, kale, and Chinese cabbage should be scouted earlier, since all leaves are marketed. Check at least 25 randomly-selected plants throughout the field looking for caterpillars on the top or underside of leaves. Feeding damage can be found on the underside of leaves or in the center of the plant where heads are forming. Often it is easier to spot the feeding damage first, then find the caterpillar. Classify plants as infested (has one or more caterpillar) or non-infested, and calculate the percent of plants infested. Spray if the threshold is reached.

Thresholds for Caterpillar Control in Crucifers.

Crop & Stage	% Infested Plants
Cabbage & Broccoli, Cauliflower	
pre-cupping (before head formation begins)	35%
Cabbage, & broccoli	
head formation to maturity	15%
Cauliflower	
After heading (before tying)	10%
Kale, collards & other greens	10-15%

It should be noted that these thresholds do not imply that 10 or 15 % of the harvested crop will be infested! They are based on research trials that showed that use of the thresholds produces 98-100% clean heads, the equivalent of weekly sprays but with far fewer insecticide applications.

Caterpillar controls

There are several organophosphate, carbamate and pyrethroid products labeled for control of caterpillars in cole crops (see *New England Vegetable Management Guide*). In addition, there are many biorational products, with various modes of action, that can be used very effectively. These include the following:

Confirm 2F (Tebufenozide) This product from Rohm and Haas was one of the first insect growth regulators (IGR) to be registered for use on vegetable crops. It was designated a reduced risk material and targets caterpillars. It has a general use label, with specific activity against a wide range of caterpillar pests on fruiting vegetables, virtually all leafy vegetables, brassicas, and mint. It has low risk to mammals (rat oral LD 50 > 5000 mg/kg) and a restricted entry interval of 4 hours. Tebufenizode mimics the natural insect hormone (ecdysone) that induces molting in insects. It must be ingested to be effective. Once ingested, feeding stops within 24 hours and a premature molt is induced. Death takes several days. It has a long residual period (10-14 days).

Research trials show excellent efficacy, equivalent to standard pyrethroids, so this product should provide an effective alternative for caterpillar control to allow rotation with other products and conservation of beneficials. The long residual period has advantages, but also means there is a relatively long preharvest interval (7 days on fruiting vegetables).

Bt's *Bt kurstaki* products (Dipel DF, Javelin WG, Biobit, Condor, Lepinox, Crymax, Mattech) and *Bt aizawi* products (Xentari, Agree) are both effective against caterpillars. These are general use materials with a 4 hr REI and 0 days to harvest, safe for applicators and for beneficial insects. Bt kurstaki products have been effective against all caterpillars in crucifers in the past and reports from this year are that they are giving excellent control of loopers and diamondback moths.

Because these two strains of Bt are not cross-resistant, rotating these two strains of Bt can help prevent resistance development to one or the other Bt product -- something which has been shown to occur in diamondback moth if it is repeatedly treated with one type of Bt. Either of these products are recommended where looper or diamondback moth is present and there is the possibility of resistance to synthetic pyrethroids; *Bt aizawi* can be used where there might be resistance to *Bt kurstaki* products. Apply in the morning of a warm day when caterpillars will be actively feeding and will ingest a toxic dose.

Spintor 2SC. This product is effective against all caterpillars that infest cole crops, and works well at the 3 oz rate in crucifers, which keeps cost down. It has very low toxicity to mammals, birds and was registered as Reduced Risk material. Spinosad is derived from naturally-occurring soil organism, and has two modes of action: as a nerve poison (by contact with treated surfaces) and a stomach poison (by ingestion of treated surfaces). Restricted entry interval is 4 hours and days to harvest is one.

Avaunt (indoxycarb). A newly registered, general use product, registered under the EPA Reduced Risk track. It is currently labeled for control of caterpillars in crucifers, peppers, tomato, lettuce, and whorl-stage corn. Indoxycarb must be ingested; once ingested, it is converted to a toxin which inhibits sodium ion entry into nerve cells, causing paralysis and death. Feeding stops rapidly. The restricted entry interval is 12 hours and preharvest interval for most vegetables is 3 days.

Proclaim (Emamectin benzoate) – A selective insecticide for caterpillars, derived from a metabolite of a bacteria (*Streptomyces avermitilis*), hence one of the general category called avermectins. This is a restricted use product active against some of the more difficult-to-control caterpillars and those that have developed resistance to other products such as beet and fall armyworm, cabbage loopers, and diamondback moth. Proclaim is labeled for head and stem brassicas (not brassica leafy greens), head lettuce, and celery.

Mode of action: the product must be ingested and causes worms to become paralyzed and stop feeding quickly. Death occurs in 2-4 days. The product has trans-laminar (but not systemic) activity: treated leaves absorb the material which gives longer residual period.

The mammalian toxicity is low (considered slightly toxic to mammals, rat oral LD50 = 1516 mg/kg). The restricted use designation may be the result of high toxicity to aquatic organisms (Rainbow trout 96-hour LC50 = 174 parts per Billion) and bees. Avoid drift into aquatic areas (a 25 ft border required). Highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. The restricted entry interval is 48 hours and preharvest interval is 7 days.

SWEET CORN

Corn that was grown under row cover or on plastic is silking. Everyone is looking for that 4th of July corn, but many growers are more likely be ready for the weekend following the 4th. Reports on transplanted corn are that it is ahead of plastic corn by at least a week. The low **corn earworm** flight in the southeast appears to have dissipated. However, *getting a corn earworm trap set up in your silking corn is about the best investment you can make to be sure you will harvest clean corn all season!* Nylon net traps placed in corn that is coming into fresh silk will provide you with an immediate and early warning on newly arrived flights. It's better than anything you can get from this newsletter, which will always be a bit delayed! We recommend Hercon lures which have proved reliable for years now. Three sources of traps and lures are:

--Gempler's (general supplier) P.O. Box 270, Mt. Horeb, WI 53572 (800) 382-8473

--Great Lakes IPM (general supplier) 10220 Church Street, NE, Vestaburg, MI 48891 (517) 268-5693

--Trece, Inc. (manufacturer of pheromone lures and traps), P.O. Box 6278, Salinas, CA 93912 (408) 758-0204

Scout your fields! Scouts are reporting unexpectedly low infestation rates of **European corn borer** in pretassel stage corn, even where there are high trap captures – some fields below the 15% thresholds, but as you see below, some are above. So – scout and find out! See last week's message for

scouting details. Floating row covers removed in the past two weeks appear to have delayed ECB infestations. We may be at or passing the peak flight period for the first generation. Some sites had lower captures this week compared to last week.

Watch for **common armyworm** in whorl or pretassel corn, which causes ragged feeding damage similar to fall armyworm and may be especially noticeable at field edges.

Trap Captures and Scouting Data June 14 - 20

Town	Date	ECB Z1	ECB E2	TOTAL ECB	CEW	% PT**
N. Bennington, VT	16-Jun	7	11	18	--	1%
Plainfield, NH	15-Jun	0	0	0	--	--
South Deerfield	18-Jun	22	8	30	--	--
Hadley	17-Jun	24	21	45	--	12-14%
Southwick	17-Jun	75	35	110	--	1%*
Millis	18-Jun	0	26	26	0	whorl
Hopkinton	18-Jun	22	13	35	0	whorl
Seekonk	19-Jun	11	30	41	0	10%*
Swansea	19-Jun	5	25	30	1	18%
Rochester	20-Jun	12	38	50	0	--
Rehobeth	19-Jun	17	39	56	0	24%

*Row cover removed within past two weeks; uncovered corn may have higher infestations.

** % infestation in unsprayed corn at the pretassel stage (tassel visible in the whorl)

-- Information not available.

-R Hazzard, R Cook, M Yates, D Riggs, R Pestle, D. Dumaresq.

CUCURBITS

Crops are growing well wherever **striped cucumber beetle** is being controlled. Cucumber beetles are still active. Scout fields, especially those that are just emerging and are particularly susceptible to feeding injury and transmission of bacterial wilt.

Watch for low spots or drainage problems that could lead to **Phytophthora**. Standing water in any area of the field can initiate infections which can then spread to other areas of the field. Scout frequently in low spots, subsoil between raised beds, avoid catchments at the ends of rows or raised beds that can hold water. If water stands in a low spot and plants are waterlogged for a period, consider tilling those plants in to

prevent an outbreak from starting. If you are working fields that were infected last year, wash soil off tillage equipment and tractor tires before entering new, non-infected fields. These cultural practices do make a difference! Where susceptible crops are planted in infected fields, Ridomil Gold applications through trickle in raised beds can reduce the crown rot phase of the disease in vine crops or peppers.

Squash bugs (*Anasa tristis*) are present in many fields, usually in low numbers. Adults are a plain dark brown, mottled with gray on the back and yellow underneath. They are hardened, longer than they are wide (about 3/4 inch long), flat on the back, and give off a disagreeable odor when crushed. Like all the true bugs, they have needle-like mouthparts. Adults overwinter in debris near the field, and have now entered cucurbit fields, are mating and laying eggs. Eggs are laid in orderly groups on the underside of leaves, often in the angle of the veins, and are orange-yellow at first, turning bronze as they age. Nymphs will hatch in 7-14 days. They will be light gray, with black legs.

Squash and pumpkin are preferred hosts for laying eggs and can support high rates of nymph survival. However, survival is poor on watermelon and very poor on cucumber and cantalope. Waltham Butternut and other butternut varieties, and the pumpkin variety 'Green Striped Cushaw', are reported to be resistant.

Generally squash bugs are not regarded as a seriously damaging pest of cucurbits, especially in our larger fields. However, they can cause wilting of leaves as a result of interruption of xylem transport to leaves caused by blockage of xylem vessels with their salivary secretions or severing of xylem vessels by their mouthparts. Foliage wilts, becomes blackened, and dies following feeding, a malady sometimes called "anasa wilt". Also, squash bugs have recently been shown to be capable of transmitting the bacteria that cause **cucurbit yellow vine disease** from infected plants onto non-infected plants. This disease was confirmed at one location in Massachusetts last summer, in zucchini. Late in the season, squash bugs can cause direct damage to pumpkin fruit.

Adults are difficult to control with pesticides; the best stage to target is the young nymphs. There is no specific threshold for treatment. Asana XL, Pounce, Thiodan, and Sevin are registered for this pest in cucurbits. In small plantings, placement of boards or other shelter induces adults to congregate during the day, where they are easily found and crushed.

PEPPER

Peppers are growing well and beginning to flower. With heavy rains in some areas, combined with warm temperatures, conditions may have been right for **Phytophthora** development in some fields. See above for suggestions.

Although **European corn borer** is active, field-grown peppers are not at risk because fruit has not formed yet. First generation larvae occasionally bore into a stem or branch of a young pepper plant, but damage is minimal and does not warrant control. Direct damage to fruit is the main concern. Larvae may enter any fruit that is larger than one inch in diameter. This could possibly occur in greenhouse grown peppers that are setting fruit at this time, if moths have access to greenhouse plants.

CORRECTION : LAVENDAR DAY FESTIVAL WILL BE JULY 7 AND 8

We published the incorrect date for the third annual LAVENDAR DAY FESTIVAL in Franklin County. This year's festival will be Saturday July 7th & Sunday July 8th

9:00 a.m. to 4:00 p.m. (NOT July 9 as published). For more information on the tour or on lavender production, contact the UMass Extension Floriculture program (Tina Smith 413-545-5306) or the Lavender and Herb Growers of Franklin County, (Ellen Kaufmann, (413) 625-0078, e-mail kaufmann@crocker.com, or web site lavenderland.com.)

YEAR 2002 DFA AGRICULTURAL CALENDAR PHOTO CONTEST

The Massachusetts Department of Food and Agriculture in its continued efforts to promote local agriculture is announcing its 3rd annual photo contest. The Department requests submissions of photographs depicting Massachusetts agriculture through the seasons. The goal is to select thirteen photos, one for each month and one for the cover, depicting the diversity of agriculture and horticulture in the state. Winners will have their name in the calendar (free advertising!) along with recognition at the Big E. Calendars are widely distributed by DFA. Deadline for submissions is July 1, 2001. For details on submission of photos, contact Rick LeBlanc at (508) 792 - 7711 x17 or (617) 626-1759.

--from Rick LeBlanc, Massachusetts Dept. of Food and Agriculture

Vegetable IPM Message, Ruth Hazzard, Editor. The *Vegetable IPM Message* 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. Send comments or questions to rhazzard@umext.umass.edu, 413-545-3696

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