UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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Crop conditions

Two weeks of hot weather gave a badly needed boost to all crops and helped catch up from the cold, gray May. Growers are reporting that most crops are still a week behind. As is typical, the Connecticut Valley is ahead of cooler and higher locations in the central part of the state and coastal areas, and that effect may be more pronounced this year than usual. Harvest has started for lettuce, strawberries, early zucchini and summer squash (set out early under plastic or row cover), early broccoli, greenhouse tomatoes. Harvest of bunched greens, salad mix, green onions, vegetable and flower transplants, greenhouse cucumbers, and probably a lot of other crops I'm forgetting to mention, continue. Earliest potatoes are flowering, earliest plastic sweet corn is starting to silk, garlic plants are producing, and earliest summer squash is ready for harvest, and in the warmer areas the insects are right on schedule! With later, cooler areas, all this will commence in one to two weeks. Bare ground corn is a 6-8 inches in central Massachusetts. Asparagus harvest is winding down and we have heard reports of about a 50% yield loss, due to frosts during the early part of the harvest season and high heat and humidity at the end. With a dramatic thirty degree drop from ninety to sixty everything will slow down again for a few days. Greenhouse sales have picked up.

Sweet corn update

Trap counts from the Connecticut Valley show an upswing in flight activity for European corn borer (see Table on page 2). Only one site has reported trap counts from elsewhere in the state: Still River, with no moths captured yet. That is consistent with the growth stage of the crop. Plastic-grown corn is tasseling and even showing silk in the Valley, and ECB development has paralleled the warmer temperatures that made that possible. Cooler areas have whorl only, and ECB has developed more slowly.

In the Connecticut Valley, female moths are laying eggs, and egg hatch has begun in early corn. We have found small borer larvae in emerging tassels (plastic-grown corn) this week, and can expect hatching to increase in the coming week. We have also seen fields still under row cover, with growers waiting for as long as possible to remove the cover in order to keep moths from laying eggs.

For anyone who has corn entering the silk stage this week, sprays are recommended to prevent entry of those newly hatched larvae directly into the ear. You might not see the damage in the tassel, because tassel growth occurred before egg hatch. So, do not wait to see damage in the tassels, for that may be too late! We did see some silk in the earliest corn plantings on June 15. Corn under floating row cover is protected from ECB, but once the cover is removed, this corn will be highly attractive for egg laying. Corn started under plastic is highly susceptible to ECB invasion in the silk stage. Aim to control newly hatched ECB larvae before they enter the young ears.

For corn just reaching pretassel stage, sprays should begin based on scouting for young larvae in the emerging tassel. Scout for ECB larvae at early tassel emergence. Sprays applied earlier (whorl stage) don't result in improved control when compared with one or two well-timed applications at tassel emergence.

The ideal time to spray is just as tassels poke up out of the whorl. Larvae feeding in the whorl are protected from insecticide applications and mortality will not be as high as at tassel emergence, when larvae feeding in the emerging tassel are exposed to the spray. Larvae will leave the tassel as it opens up and no longer provides a moist, protected feeding environment, and move down the plant looking for protected places to feed. Insecticide applications need to be timed to kill larvae before they bore into a new feeding location where they will be again protected from sprays. In fields with uneven development or where pressure is heavy, two applications may be necessary, one when approximately 25-

ECB larva and feeding damage in emerging tassel

50% if the tassels have emerged, and again 5-7 days later or after 75-100% of the tassels have emerged, if the field is still over threshold.

The threshold for ECB at tassel emergence is 15% infested plants. To scout, pull out the emerging tassels to look for tiny black-headed white larvae or frass (white to brown material about the size of fine sand). Or, pull back the leaves to search tassels. Before any insecticides have been applied, scouting is fast and easy because any sign of feeding is an almost sure sign of live larvae, so it's not necessary to spend time finding the larvae. After the initial insecticide application, feeding damage may be from a larva that has already been killed, so finding the critter is more important for an accurate estimate of the number of infested plants.

The first releases of *Trichogramma ostriniae* were made in MA today. If you are interested in making releases in corn, contact IPM Labs (315) 497-2063. It may be late to order for the first generation, but for not for the second generation ECB in corn or peppers.

We appreciate the growers and agency staff that are assisting with our network of trap captures information. We have begun uploading this data to the PestWatch website. Visit http://www.pestwatch.psu.edu/sweet_corn.htm to see progress of corn pests up the Atlantic coast.

Weekly Trap Captures for European Corn Borer Moths

Location	Date	ECB EII	ECB ZI	TOTAL
South Deerfield	6/15	24	3	27
Deerfield	6/15	46	50	96
Still River	6/15	0	0	0
Hatfield	6/15	108	33	141
N. Hadley	6/15	27	128	155
Hadley	6/15	47	118	165

--R.Hazzard Trap Data: A.Duphily, P.Willard, B.Hunsdorfer

BRASSICA PEST UPDATE

Cabbage root maggot flight (first round) is down, and the hot soil surface of the past two weeks most likely killed any new eggs. However, many growers have reported heavier losses than usual from root maggot this year – in some cases >50% of the crop. This is most likely the result of such a cool, wet May. Symptoms of root maggot damage are wilting of all or part of the plant, followed by lower leaves turning yellow or reddish. In some cases, the plant will recover at this stage, and grow on. Or, it will continue to wilt and die. A wilted plant will have brown, decayed roots, with white maggots or brown pupal cases.

Some early cabbage is reaching cupping stage where feeding damage from caterpillars can injure leaves that will

healthy cabbage plant (right) and wilting from root maggot damage (left)

form the head. Scout undersides of leaves for diamondback moth and imported cabbageworm larvae or their feeding injury. We have observed these in Rhode Island and in the Ct Valley so they are probably widespread; however, numbers are low. Threshold for cabbage at cupping/heading is 15% of plants with one or more caterpillar. More details next week.

Flea beetles continue to be active. Their preference for the non-waxy Asian greens type (*Brassica rapa*, eg bok choi, Chinese cabbage) and arugula is obvous in fieles with both these crops and the waxy types (cabbage, cauliflower, broccoli).

A note on eggplant: Eggplant seedlings can be severely injured by flea beetle feeding. Although it is also all black, small, and jumps like a flea, this is a different species, Potatoe flea beetle (not the same as crucifer flea beetle). The potato flea beetle attacks tomato and potato. See ***New England Vegetable Management Guide*** for insecticides. Note that Italian eggplant (purple petiole type) is more attractive than other eggplants, and can be used as a perimeter trap crop.

INSECT MANAGEMENT: GENERAL GUIDELINES

A successful insect management program can best be accomplished by combining IPM techniques such as accurate pest identification, scouting, monitoring and action thresholds, with biological and alternative (preventative) control practices and selective insecticide applications. Use scouting and monitoring techniques to help assess and quantify insect populations over time.

Insecticides should be used only when action thresholds have been exceeded or damaging insect populations are present. Action thresholds help minimize insecticide use and crop damage. Avoid making routine insecticide

applications to crops without evidence of insect activity and damage. All insects have natural enemies which, if conserved, can help regulate pest populations. Whenever possible, use selective insecticides that spare beneficial organisms and target the pest you wish to control. Broad-spectrum insecticides should be used as a last resort. All insecticide applications should be made with ample water and with nozzles directed so that they provide thorough coverage of the plant parts where insects hide. Alternate between insecticide classes or families to help manage insect resistance and extend the life of available products.

INSECT IDENTIFICATION

Growers should become familiar with the biology and life-cycle of the major insect pests that attack crops on an annual basis. Understanding some basic insect biology often reveals when the pest is most vulnerable to control measures and helps lead to successful management efforts. Insects usually have either a simple life-cycle, where they grow from egg to nymph to adult, or a slightly more complex cycle, where they mature from egg to larva and then go through metamorphosis in the pupal stage, before becoming adults. Insects damage plants either as nymphs/larvae or as adults, or in both immature and adult stages. Growers should not only recognize the important life-stages of major insect pests, but should also recognize the crop injury or damage they produce to help determine when control efforts are needed. You should also be able to identify common beneficial insects and their immature stages (i.e. lady bug larvae) to avoid accidentally targeting natural enemies with insecticides. There are dozens of minor and secondary insect pests that may attack crops on a less frequent basis. Growers should have unknown insects and minor pests identified when they are suspected of causing crop damage. Misidentification often leads to the application of an ineffective pesticide and extensive or chronic crop damage. The application of ineffective or unnecessary pesticides can often reduce the populations of beneficial organisms or natural enemies and lead to secondary insect or mite outbreaks. An accurate diagnosis of the problem early-on, can often avoid years of frustration and needless expense.

SCOUTING AND MONITORING

Crops should be inspected or scouted for insects or damage in a systematic fashion, on a regular basis, throughout the growing season. For many crops and pests, this may mean walking fields weekly, or even more frequently, especially during critical or vulnerable plant development stages. Crops should be scouted in a systematic fashion by walking in an “M” or “W” pattern as you criss-cross the field. Select plants (i.e. 25 or 50) at random and quantify the pest damage or count the individual insects. Record the average number of insects or damage per plant for each field. Scouting crops always saves money in the long run by allowing for early pest detection, by reducing crop damage and by helping to maintain consistent quality. Sometimes scouting duties can be performed by other farm members or by hired consultants.

Monitoring insect populations with various types of traps (black light, pheromone, sticky, baited) can supplement or sometimes substitute for information normally gathered during crop scouting. Insect traps can help you quantify pest pressure that is difficult to see, such as the number of night flying (i.e. corn earworm) moths present. The number of insects captured in traps are often used to time scouting activities, predict future pest levels, or are used in conjunction with action thresholds to time sprays and help avoid crop damage.

ACTION THRESHOLDS

Action thresholds tell you when to spray to prevent economic damage to the crop. They also help you avoid applying insecticides to crops when insects populations are low or no pests are present. Thresholds can be based on the number of insects found per plant, the amount of injury or damage per plant, or the number of insects captured in a trap. Using action thresholds helps improve insecticide timing and effectiveness, helps minimize the number of applications and associated costs, and helps reduce crop damage. Use action thresholds whenever possible to help you decide if and when a spray is needed. Some insect thresholds are provided in the ***New England Vegetable Management Guide***, and are frequently mentioned in other publications.

PREVENTATIVE CONTROLS

There are many preventative management options; such as cultural, mechanical, physical, genetic and biological controls. These should be used whenever possible to help avoid insect pest problems. Preventative insect control options can be used alone or in combination to provide a complete management program. For example, plant inspections, eliminating weeds in the greenhouse, using screens, avoiding excess nitrogen applications, using plastic mulch and preserving natural enemies, can combine to produce a very effective aphid management program. If the distance between fields is great enough, crop rotation (alone) for Colorado potato beetle and cucumber beetles can often keep these tough pests from reaching damaging levels for the entire season. However, if only nearby fields were available, CPB could be effectively controlled by the use of a combination of two or more alternative controls, such as; short-distance crop rotation, intervening trap crops or plastic-lined trenches, row covers, organic mulches, flaming, and microbial controls. Many preventative controls are mentioned in crop-specific IPM manuals, individual pest fact sheets or on IPM web sites.

--adapted from T. Jude Boucher, University of Connecticut Cooperative Extension System, New England Vegetable Management Guide, 2004-2005

POTATO, BEANS: SCOUT FOR POTATO LEAFHOPPER

Potato leafhoppers migrate each year from the South and are now just beginning to appear in potatoes and other crops. These pests can cause significant injury – often before many growers realize they have a problem. The key to preventing crop damage is to control the adults early, before they have time to feed and produce offspring.

Scouting- Now is the time to start scouting beans and potatoes. Walk out into the crop and brush the leaves with your hand. If you see small white things darting around, you've got potato leafhopper adults. Adults are about 1/4 inch long, light yellow-green, and fly up from foliage when it is disturbed or shaken. They can also be monitored with sweep nets. Adults lay eggs inside the stems and petioles of host plants. The eggs are whitish, elongated and are about 1/24-inch long.

Potato leafhopper injury in snap bean can easily be mistaken for a disease

Once you have seen adults, look closely at several leaves. You may see small, elongated light green insects scurrying to hide from you-these are potato leafhopper nymphs. Nymphs are found on the underside of leaves, light green, wedge-shaped and very fast-moving.

Damage- Adults and nymphs feed by inserting a needle-like beak into the plant and sucking out sap. They also inject a toxin into the plant, which interferes with the vascular system of the plant and causes yellowing, browning, and curling of leaves. In potato, leaf margins turn brown and brittle first, followed by death of entire leaves. In beans, the leaf turns mottled brown as if infected with a disease before dying completely. Both adults and nymphs cause damage. Plant injury and yield loss can be significant, especially if leafhoppers arrive when plants are young. (Photo:)

Varietal resistance- Later-maturing potato varieties including Katahdin, Elba, Green Mountain, Kennebec, and Blossom have some resistance, and may tolerate PLH infestations with less yield loss. Yukon Gold, Red Norland and other red potatoes, and many other varieties, are very susceptible. Snap bean variety Labrador is reported to be more tolerant. Long bean, a popular Asian variety, seems quite tolerant as well.

Thresholds- Potato: A threshold of 1 adult per sweep of the net, or 1 nymph per 10 leaves, is used to determine if a spray is needed in potato. Check 25 compound leaves throughout the field to determine numbers per leaf. Beans are more susceptible when they are young than at later stages; threshold is one nymph per two trifoliate leaflet during pre-bloom. Eggplant: Although eggplant is not a favorite host, damage can occur if PLH numbers build up to high levels. University of Connecticut has established a threshold of 1.5 leafhopper per leaf in eggplant.

Adults have piercing mouthparts and inject a toxin into the plant
Photo: Dave Ferro

Controls- In potato and snap beans, there are several synthetic pyrethroids, carbamates, and neonicotinoids that are labeled for control of PLH (See *2004-2005 New England Vegetable Management Guide*). In Potato, furrow treatments with neonicotinoids (Admire or Platinum) may control leafhoppers; however, crop should still be monitored. For resistance management, DO NOT use foliar neo-nicotinoids following a furrow treatment with the same class of insecticides (Actana, Provado).

PLH controls are not often used on organic farms, perhaps because growers don't realize how much yield loss this pest can cause. Pyganic EC, an approved organic pyrethrin product, has been shown to be effective against PLH adults and nymphs especially at higher rates. Two to three sprays of Pyganic, 7-10 days apart, beginning as soon as you find significant numbers of adults in your planting, should halt their damage and prevent a buildup of nymphs. This is not a long-lived material, and will decay under sunlight; apply in the evening for greater efficacy. Other organic products that have been tested have shown little or no efficacy, with the exception of Diatect, which is a mixture of diatomaceeous earth and Pyrethrin

– R Hazzard, adapted from Brian Caldwell, Farm Education Coordinator , Northeast Organic Farming Association of New York; Brian Schultz, Hampshire College

WHAT'S THE BUZZ ABOUT PELLETIZED LIME? (Part 1of 3)

As an instructor of soil science here at the University of Massachusetts-Amherst, my opinion is frequently sought to provide soil-related management recommendations and to evaluate the scientific merits of nontechnical studies sometimes found in industry trade publications. In recent weeks, I have fielded numerous questions regarding the relative merits of pelletized and pulverized (agricultural) lime, and two repeating questions have emerged. Does pelletized lime work as fast as agricultural lime? And do the neutralizing effects of pelletized lime last as long as those of agricultural lime? In order to meaningfully answer these questions, it might be helpful to review some basics about soil pH and why we are concerned about managing this important soil property.

What are the sources of soil acidity?

Many people often wonder why we need to keep adding lime to our soils. What makes our soils acidic in the first place? Why do we need to add lime more than once? There are many factors that naturally contribute to soil acidity. Four of the most important factors are listed below.

1) Most New England soils start out somewhat acidic because the soil has formed from the weathering of acidic parent materials (like granite and schist bedrock), and weak acids are released as this material breaks down.

2) The New England climate is very humid, and the region typically receives much more precipitation than the soils can "hold" and store for plant use. Consequently, leaching occurs in the soil when this "excess" rainfall/snowmelt percolates down past the rooting zone. The percolating water strips away dissolved constituents in the soil water (including plant nutrients like calcium, magnesium, potassium, etc.). As these non-acid ions are stripped away, the resulting soil solution becomes more acidic.

3) As plants grow, they take in nutrients through their roots, and most nutrients are positively charged (including potassium, calcium, magnesium, ammonium, etc.). For this up-take process to occur, the roots must naturally excrete (release) acidic hydrogen ions into the soil water. This process is necessary to maintain the proper ion balance inside the roots. So, over the course of a growing season, the soil will naturally become more acidic as plants are actively growing.

4) Certain microbial reactions release hydrogen ions and thereby increase soil acidity. This is especially true of nitrification reactions that convert ammonia forms of nitrogen into nitrate. Therefore, fertilizing with ammonia-based nitrogen fertilizers will lead to increased acid production in the soil.

It is easy to see that acid is constantly accumulating in our New England soils as a combined result of geologic, climatic, and biologic factors, as well as certain fertilization/management practices. So, it is logical that we would need to keep liming our soils to neutralize this added acid and re-adjust the soil pH.

Why do we care about soil pH?

Soil pH is a relative measurement of how acidic or alkaline a soil happens to be. When we measure soil pH, we are actually measuring the acidity level of the soil water, also known as the "soil solution." The relative acidity of a solution is determined by the balance of acidic hydrogen (H+) ions as compared to alkaline hydroxyl (OH-) ions present. A solution with an equal abundance of H+ to OH- is said to be "neutral."

The pH scale typically extends from 0 to 14, with values below 7.0 being acidic and values above 7.0 being alkaline, with 7.0 being neutral. At pH values less than 7.0, the amount of hydrogen ions present is greater than the amount of hydroxyl ions present; and as pH values go farther and farther below 7.0, this imbalance increases. So decreasing pH values represent increasing amounts of acidity.

The pH scale is logarithmic; that means that there is a ten-fold increase in acidity (H+ ions) for every whole unit drop in pH. For instance, a soil with a pH of 6.5 is ten-times more acidic than a soil with a pH of 7.5. And a soil with a pH of 5.5 is 100-times more acidic than a soil with a pH of 7.5. Soil tests usually report pH to the nearest tenth of a whole unit (for example: 5.8, 6.2, etc.).

We seek to manage soil pH to maintain the soil within an optimum pH range that is dependent on the crop species being grown. In New England, most of our soils are naturally acidic and we manage this condition by liming to raise soil pH. In geographic regions with much drier climates, soils can actually be too alkaline for optimum crop growth, and in these soils it is necessary to increase the acidity present.

Adjusting soil pH can produce dramatic benefits for almost any crop species, because pH strongly affects so many soil properties that are important to healthy plant growth. For instance:

1) Soil acidity affects the availability of most plant nutrients in the soil. Plants can only absorb nutrients through their roots if the elements are in a dissolved form. It may not seem completely logical that fertilizer elements are not always dissolved and available for plant uptake even when both fertilizer and water are present - but it happens all the time. Certain elements will only dissolve under very specific pH conditions.

** Phosphorus, for example, will only dissolve to any measurable degree when the pH is between approximately 6.0 and 7.0.

** Elements like calcium and magnesium start to be-come less available when pH levels drop below 6.0.
** Potentially toxic elements, like manganese and aluminum, become overly abundant when pH drops below 5.5.

2) Most beneficial soil microbes prefer pH levels of 6.0 and above. As pH drops below this level, microbial breakdown of organic matter diminishes as does the concurrent release of nutrients through mineralization processes.

3) Certain plant diseases tend to increase under prolonged acidic soil conditions. This may be due, at least in part, to decreased plant health caused by nutrient deficiencies induced by acidic conditions. It may also be due in part to an increase in populations of fungal plant pathogens in the soil. As populations of beneficial soil microbes diminish under acidic soil conditions, soil fungi become more abundant.

It is clear that management of soil pH is vital to all agricultural and horticultural endeavors. Although less than vigorous plant growth can clearly be equated with nutrient deficiencies, you cannot assume that too few nutrients are present in the soil. It is often tempting to try to solve horticultural problems by "adding more fertilizer," but you may just be throwing good money away if you haven't had a soil test done first and managed the pH accordingly.

--Next two issues: How liming works and the relative merits of pelletized and pulverized (agricultural) lime.

--Deborah Picking - Dept. of Plant, Soil, and Insect Sciences, University of Massachusetts Amherst

COLORADO POTATO BEETLE

CPB adults have been busy laying eggs and feeding in eggplant and potato. Beetle eggs hatched quickly in the heat, and larvae have reached third instar (about ½- 2/3 full size) in the warmer parts of the state. Central highlands of Mass reports eggs only, no hatch yet; Rhode Island had third instar

Given the famed, and truly remarkable capability of CPB to develop resistance to insecticides, it is critical to have a management plan that includes several insecticides. Use alternatives to insecticides that no longer work well as a result of resistance, or to insecticides that DO work well, if you want to keep them working! See last week's newsletter for more detail, but note that AgriMek, Spintor/Entrust and Novodor all can be used effectively as alternatives to neonicotinoids, carbamates and pyrethroids.

CPB egg mass

The neonicotinoid group should be used only once per season (and not at all if resistance has developed from continuous use). That includes the soil treatments as well as foliar treatments. These products can be confusing because soil-applied and foliar insecticides with the same active ingredient have different names – as do the seed treatments. See table for trade names

Newly hatched CPB larvae

Table 1. Common Neonicotinoid Insecticides Registered for Vegetable Crops

	Mode	**Of**	**Application**
	Soil	**Foliar**	**Seed**
Common name	Trade name	Trade name	Trade name
Imidacloprid	Admire	Provado	Gaucho
Thiamethoxam	Platinum	Actara	Cruiser

If you are using Bt (Novodor), apply when larvae are no bigger than third instar (about 2/3 grown) as it does not work well against the large grubs. Agrimek and spinosad work well against all larval stages.

Correction: photo caption in previous (June 9th) Vegetable notes should say: Colorado Potato Beetle larvae in the 4th (last) instar.

Vegetable Notes, Ruth Hazzard, editor and Ben Hunsdorfer, Assistant Editor. Vegetable Notes is published weekly from May to September and at intervals during the off-season, and includes contributions from the faculty and staff of the UMass Extension Vegetable Program, other universities and USDA agencies, growers, and private IPM consultants. Authors of articles are noted; author and photographer is R. Hazzard if none is cited.

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