



VEGETABLE IPM MESSAGE

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CROP CONDITIONS

More rain, more clouds, more wet leaves, more cool soggy soils. As of June 9, most of Massachusetts has received at least five inches of rain in the previous four weeks -- about two of them during the past week. As we go to press, another long, steady rain is falling. On the bright side, greens and lettuce have grown well and harvest is about on schedule. Harvest includes lettuce, spinach, radish, greens of all kinds, baby turnips, broccoli, asparagus, rhubarb, peas, herbs, cut flowers. Community Supported Agriculture farms (CSA's) opened their doors this past week, farmers markets and farm stands are open (although wet weekends have slowed sales). Row covers that have helped early crops, are being kept on longer than usual. The difference between covered and uncovered crops is very dramatic compared to other years. Early summer squash is flowering. Transplants continue to go out: pumpkin, winter squash, late tomatoes, melon, celery, and pepper. Growers are planting between rains as soon as they can get into fields.

However, the wet and cold is taking a toll and gets more serious as the weeks go by. Peppers, tomatoes and eggplant are suffering, and need heat. Plastic needs sun to get the soil-heating effect, and sunshine has been in short supply. Corn growth is slow, some seed has rotted. Perhaps the hardest hit are early-seeded butternut crops. Butternut that was seeded on the usual schedule, beginning around the third week of May, sat in soils that were too cold for germination and rotted. Many crops will have to be replanted. Other growers are waiting for fields to dry out enough to work or for soils to warm up enough to get good germination. As one grower put

it, the well-drained soils make great house lots and farmers are left with the wet fields. Or, the well-drained fields have already been used this spring, and now growers need to get into the wet ones. In the Connecticut Valley, we are seeing good emergence in butternut crops that were seeded at the very end of May, and we can hope for some warmer soils to get the pumpkin crop going.

Growers are doing what they can to help soil drainage. I've been pleased to see several fields this week that had just been sub-soiled between raised beds. This reduces the risk of soil-borne disease outbreaks by releasing standing water. Raised beds by themselves are helpful, but it's also important to drain water between the beds wherever possible.

Weeds are growing great. It's hard to get in to cultivate without getting stuck in the mud, not to mention that the weeds re-root in the moist soils. I tasted the first early local strawberries this week, and they were the sweetest imaginable. Berries are doing well. If it dries out a bit, we could have an excellent strawberry year.

-R Hazzard, with contributions from J Bartlett, R Bonanno, D. Dewitt, D. Rose, D. Kaplan, E. Droescher, J. Golonka.

BRASSICAS

The list of brassica greens being harvested is long -- arugula (not really a brassica, but flea beetles love it just the same), turnip greens, mizuna, komatsuna, mustard, kale, collards, bok choy, yukina savoy, tatsoi. Cabbage is growing well. Early Chinese cabbage is beginning to form heads. Striped and crucifer flea beetles are still very active -- these are still the overwintered beetles that are feeding. Root damage associated with root maggot feeding or root rots (*Rhizoctonia* or wirestem) is bringing some plants down. Once plants are

wilting, there's not much you can do. The first flight of cabbage root maggot should be declining, but conditions are perfect for survival of eggs and maggots so it is important to keep scouting new plantings to check for root maggot eggs.

WEED MANAGEMENT ADVICE

This week brings a couple of thoughts regarding weeds. First, if you are planning to make a delayed application of herbicides in sweet corn, consider the following. Atrazine, Dual, and Lasso are all registered for delayed preemergence applications in sweet corn. Many growers use Bicep (a pre mix of atrazine + Dual) or they mix atrazine with either Dual or Lasso. The corn must be no taller than 5 inches for this application. This treatment, applied over the corn and weeds as a broadcast or banded spray will control most emerged broadleaf weeds but has limited activity on emerged grasses. Because of the cool temperatures so far, grasses have been slow to emerge. For growers with triazine-resistant lambsquarters, this is not a good option. A better option is to use either Prowl or Frontier at planting in combination with 1 lb active ingredient of atrazine. A second option is to follow your normal preemergence treatment with a postemergence application of either 2,4-D or Basagran. See the “sweet corn” section New England Vegetable Management Guide and the herbicide labels for additional information.

A second though involves use of herbicides in plasticulture. Be careful not to apply herbicides over the mulch itself unless you are able to wash it off with either rain or irrigation prior to making the plant holes. Well pressed beds with a slight crown in the middle offer the best potential for washing off. It is always a safer bet, though, to band herbicides between plastic only. If weeds are emerged, a postemergence application of either Gramoxone or Roundup can be applied in addition to a preemergence herbicide. Again, the best option is to band spray between the plastic. If Gramoxone is sprayed on the plastic, it will photodegrade within 72 hours with or without the sun. Roundup, however, will not degrade with sunlight and must be washed off the plastic. The danger with any

herbicides on the plastic after the holes are made is the potential of the herbicide to wash into the plant holes and damage the crop. See the “herbicides and plastics” section of the New England Vegetable Management Guide and the herbicide labels for additional information.

-Rich Bonanno

VINE CROPS

Summer squash, zucchini and cucumber transplants are in the field and growing, slowly but surely. In some fields, plants are just starting to flower. Many growers are having trouble getting their winter squash and pumpkins planted into wet fields. Many that have planted already have had to replant seed that rotted due to the cold and wet conditions. Seeds that went out at the very end of May, which have experienced a few days of heat here and there, are emerging well.

Transplants are a big plus this year.

The cucumber beetles are finding plants quickly and are out in force. Because of the heavy snow cover, many areas had little frost in the ground last winter. We've been expecting that the result may be high populations of pests this year -- and the numbers of cucumber beetles seem to confirm this. Beetles waste no time in finding the cotyledons as soon as they pop out of the ground. It takes a bit longer in rotated fields, but beetles are finding them. You might not notice the feeding damage right away because they gouge the undersides of the cotyledons. This is the point when plants are most susceptible to transmission of bacterial wilt, so control is important.

Pumpkins, melons, summer squash, gourds, and cucumbers are all susceptible to wilt -- some varieties more than others. Beetle numbers can jump in just a day or two. Field edges near the woods get hit first, so scout those first.

Flooding is a serious problem in some vine crop fields. If you have crops in areas of flooding, it is probably better to pull those plants up now and not risk an outbreak of phytophthora blight in the field. Clear a buffer area around wet spots with no plants so the rest of the field will be protected. If you have low spots in the field that have not been planted yet, consider

not planting those areas in the first place.

-R. Hazzard, P Westgate, (UMass), J Mishanec (CCE)

LAUNDERING CLOTHING USED DURING THE APPLICATION OF PESTICIDES

Applicators cannot completely avoid exposure to the chemicals that they apply. Exposure occurs during any of the many activities involved in the spraying operation, including transporting the pesticide, tank filling and mixing, container rinsing, spraying, sprayer maintenance, pesticide storage and early re-entry to treated areas.

Exposure can involve contact with pesticide vapors and aerosols, the concentrated pesticide formulation in a liquid, granular, or powder form, and the spray mixture itself.

Workers absorb chemicals into the body through the skin, eyes, respiratory (breathing) or digestive system (swallowing).

Studies have shown that good personal hygiene practices reduce the risk of long-term health effects.

General Recommendations

- Read and understand the product label and material safety data sheet before application.
- Bathe or shower after completion of pesticide application, including shampooing hair thoroughly and cleaning under nails.
- Put on clean clothing.
- Clothing worn during application must be washed daily after each use.
- Launder all clothing used for spraying separately from the family's regular clothes.
- Personal protection equipment should be cleaned daily after use.
- Discard any clothing that is heavily soiled with pesticide concentrate.

Preparation for Laundering

- Remove pesticide granules from cuffs and pockets outdoors (in the field).
- Discard (according to label instructions) any garment saturated with a full-strength chemical.
- Handle soiled clothing with chemical resistant gloves.
- Use disposable plastic garbage bags for temporary storage of pesticide-soiled clothes before washing.
- Pre-treat pesticide-soiled clothes with a laundry stain removal product intended for oily stains when an oil-base (emulsifiable) formulation has been used.

- Pre-treat heavily soiled areas.
- Read the pesticide label for information.
- Pre-rinse pesticide-soiled clothing: on pre-soak cycle of automatic washer or presoaking in a suitable container (dump water on field) or spray/ hose the garment outdoors (away from children and pets).

Laundering

- Isolate pesticide-contaminated work clothes and wash them separately from the regular family laundry to avoid contamination.
- Do not overcrowd clothes in the washing machine.
- Use hot water (140°F) setting.
- Use full water level.
- Use normal wash cycle (about 12 minutes).
- Use more detergent than recommended by product label.
- Use fabric starch. Pesticide residues cling to the starch and are removed in the subsequent wash cycle when the starch is washed away.
- Choose a heavy-duty detergent (liquid or powder).
- Re-wash clothing two or three times.
- Line dry clothing to avoid contamination of the dryer and to allow sunlight to break down pesticide residues.
- Run the empty washer through a full/wash rinse cycle afterward.

Instructions for Cleaning Protective Equipment

- Wear rubber gloves while cleaning equipment
- Wash hard hat or waterproof hat, goggles, face shield, apron, boots with hot soapy water, rinse and dry.
- Wash the respirator face-piece only. Before cleaning, remove the cartridges.
- Wash the respirator in warm soapy water, rinse and air-dry.
- Check seals and valves for signs of damage or wear.
- Store the respirator and cartridges in a sealed plastic bag
- Last, wash your gloves with hot soapy water, rinse and dry.
- Inspect and replace any worn or damaged protective equipment.

Adapted from the Institute of Rural and Environmental Health, University of Saskatchewan by Craig Hollingsworth

POTATO: BE READY FOR COLORADO POTATO BEETLE EGG HATCH



Colorado potato beetle egg mass.

Missing eggs were eaten by an egg predator, the 12-spotted ladybeetle. *Photo by R. Hazzard*

Colorado potato beetles (CPB) are moving into potato fields and laying eggs. Walk your fields and look for CPB adults and eggs. Except for field edges in non-rotated fields, adult beetles do not usually cause enough damage to early potatoes to require control. The economic threshold for adult beetles in potato is 1 beetle per 2 plants (or per 2 stalks, in midseason).

Scouting. Look on the undersides of leaves for the orange-yellow egg masses. The fresher the eggs, the brighter orange the eggs will appear. If eggs have been around for a while, they appear a darker, brownish orange. One way to know when eggs first hatch is to flag the first ten egg masses that you see with bright surveyor's tape or flags, and then check them every couple of days. This will tell you when the earliest eggs are hatching. New eggs will continue to be laid for the next 2-3 weeks.

Timing and thresholds. If you are using Bt's, you want to apply the Bt when 20-30% of the eggs have hatched. If you are using spinosad (Spintor 2SC) or a broad-spectrum insecticide, you can wait till more larvae are hatched, until the oldest larvae reach the beginning of the fourth stage, when they are about 1/3 inch long. Applications made at this time with Spintor, Provado, AgriMek, or synthetic pyrethroids will

kill all the larvae that have hatched up to this point. The threshold for small larvae is 4 per plant; for large larvae, 1.5 per plant (or per stalk in midseason), based on a count of 50 plants or stalks.

With cool conditions, beetle invasion of fields, egg deposition and then hatch can be spread out over a long period of time. This situation is not good as then you can have various stages of larvae as well as adults in your field. Or, if it warms up suddenly, you will have a rapid flush of larval hatch and feeding damage that may seem to explode out of nowhere. Hatched larvae go through four stages instars before they become adults. As the larvae get bigger, they do more feeding. The fourth, or largest, stage does 85% of the feeding damage.

Colorado potato beetles rapidly develop resistance to



Colorado potato beetle larvae just after hatch.

This is the ideal stage for using Bt. Killing larvae at any stage before the 4th instar prevents most of the feeding damage to leaves. *Photo by R. Hazzard*

insecticides. This happens on a field-by-field basis, which means that **you** have control over how resistant "**your**" beetles become to any given product. Management strategies for CPB should use crop rotation and alternate classes of insecticides in each generation of the beetle. Admire resistance has developed to high levels in some fields in the Connecticut Valley where it has been used in successive

years. In the summer of 2000, Mitchell Baker at UMass collected beetle eggs from 26 Connecticut Valley potato fields. Larvae were treated with a range of concentrations of imidacloprid to find out how susceptible they were to Admire. Dr. Baker found that there was a **25-fold range in resistance**, that is, it took 25 times as much Admire/Provado to kill the larvae from the most resistant field compared to those from the least resistant field. There was wide variation among even neighboring fields, suggesting that the treatments that each individual field receives makes a difference in how much resistance develops.

To prevent resistance, alternate among classes of insecticides in each generation, and throughout the season. Classes include neo-nicotinoid systemics for furrow (Admire, Platinum) or foliar (Provado) application, synthetic pyrethroids (Asana XL, Baythroid, Ambush), carbamates (Thionex, Vydate), spinosad (Spintor, Entrust), Bt (Novodor FC), mineral (Kyocide), insect growth regulator (Agri-Mek). Wherever possible, do not repeat the same class in a single generation of the beetle. If you used Admire at planting, *do not* use foliar applications of Provado. Alternate applications of all synthetic pyrethroids with Provado, or with Spintor, or with a Bt. One strategy using all 'biorationals' would be to use spinosad which controls adults and all larval stages for the first spray, followed by a Bt to kill emerging young larvae. Fortunately, there are very effective alternatives to the highly toxic materials that were heavily used 15-20 years ago.

Here are three 'biorational' products – that is, they are quite safe to handle (“CAUTION” label) and easy on natural enemies, which help to keep aphids and CPB in check.

Spinosad (SpinTor 2SC, Entrust) gives excellent control of all stages of CPB at the 3.5 to 4.5 fl oz rate of Spintor or 1 to 1.5 oz/acre Entrust. For a heavy population, two applications

about 10 days apart, with the initial application when third instars occur, will control the first generation. Spintor has the advantage that it will control both adult and larval CPB, including large larvae. European corn borer, which can cause tunneling damage in stalks, will also be controlled. Entrust is a wettable powder formulation that is allowed by the National Organic Program for use in certified organic crops.

Abamectin (AgriMek 0.15EC) is mainly a contact material, which controls larvae. It may be best used early in the season, when good coverage is easier to obtain. Rates of 5-6 fl oz rate per acre gave effective control in commercial fields in trials on Long Island. The lowest labeled rate is 8 fl oz.

Bt tenbrionis (Novodor FC) controls small larvae, through the third instar. Time applications to begin when 30 percent of the eggs have hatched. Where fields are densely populated and eggs are hatching continuously, reapply every 5 to 7 days. According to our most recent information, Novodor and other formerly available Bt products (eg, M-Trak, Beetle Beater) are *no longer approved* for organic producers. Check with the MIC (Massachusetts Independent Certification, Don Franczyk (978)297-4171, dfranczyk@starpower.net).

TOMATO AND POTATO GROWERS SHOULD LOOK OUT FOR LATE BLIGHT

Bury cull piles. It looks like we are beginning to have a perfect late blight kind of year. Cool, wet conditions favor late blight (LB). With that in mind, it's a good idea to get rid of any potato cull piles. Late blight can be carried over in cull piles and in volunteer potatoes. It can be carried over from the previous year or unsprayed potato plants will be more susceptible. Bury the pile with at least 2 feet of soil or cover with a black plastic tarp.

Late blight, caused by *Phytophthora infestans*, is much more destructive to potatoes and tomatoes than early blight. The fungus *Alternaria solani* causes early blight. Early blight can be expected to occur every year on tomato, and occasionally on potato. Conventional fungicide programs do a reasonably good job in managing early blight. On the other hand, late blight moves in very quickly and is very destructive during rainy weather when temperatures are between 65° and 70° F.

The temperature range for disease is wide, but is less destructive at the extremes. The late blight fungus is inactive above 85° F. Late blight has occurred occasionally in Massachusetts over the past five years. In a few cases, entire fields of tomato and potato were lost. If you think you may have late blight, bring specimens to Rob Wick in the UMass Disease Diagnostic Lab, Fernald Hall, UMass, Amherst 01003. Call ahead for confirmation (413-545-1045, email rwick@pltpath.umass.edu). Overnight mail can be sent from anywhere in the state.

Adapted by R Hazzard from R. Wick

SWEET CORN

Sweet corn is growing slowly in the wet, cool, cloudy weather. Getting into fields to make the next planting has been difficult. Even corn that was started under plastic is later than usual. Row covers are providing a clear growth benefit this year. **European corn borer** moth counts have risen rapidly this week (see table below). Warmer nights have encouraged emergence and egg-laying. This week we have begun scouting fields where *Trichogramma* wasps are being released and are finding eggs masses present. No larvae were found in Hadley, Sunderland and Rehobeth, MA. ECB eggs require 100 degree days (base 50) from oviposition to hatch. Under the weather conditions predicted for this week, eggs will take 6-7 days to hatch. Its unlikely we will see much corn in early silk by then, but we will likely see some early corn at the pre-tassel stage. Scout fields to look for early signs of feeding damage; if silk stage is reached while flight is still high, sprays are recommended to prevent direct entry of ECB into ears.

Early corn that is under row cover can remain covered until tassels emerge and pollen is shed. This will protect the crop from ECB infestation until just before silk and will save some sprays.

Weekly Trap Captures of European Corn Borer in Sweet Corn				
TOWN	DATE	ECB Z1	ECB Z2	TOTAL ECB
	CHECKED	IOWA	NEW YORK	
Hadley, MA	June 11	49	19	68
Hatfield, MA	June 12	30	13	43
South Deerfield, MA	June 11	9	99	108
Sunderland, MA	June 10	19	49	68
Westminster, VT	June 11	1	20	21

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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