UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

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CROP CONDITIONS

We had March weather in May, and now July weather in June. Crops are growing fast, though for corn and some other crops it will take a lot to catch up to a 'normal year' for the first harvest date. Soils have dried out and warmed up under hot sunny skies. Soaking rains hit some parts of the state on June 6, and a wider area of western and north-eastern parts of the state on June 8; however the southeast is still dry. Transplanting where irrigation is not available should be done carefully, to set the root ball deep enough and settle soil around the roots. Wherever possible, use a water wheel or irrigate transplants in. Transplanting of peppers, tomatoes, squash, Brassicas, eggplant and lettuce continue, and growers are seeding corn, pumpkin, winter squash, cucumber, beans, and many other crops. Harvest of greens, baby lettuce, radishes, and rhubarb is ongoing. Asparagus yields suffered from the too-rapid jump from cold to hot weather. Potatoes are up and being hilled and sidedressed. Growers are also busy with cultivation and sidedressing. Though flower and vegetable plant sales have picked up in recent weeks, greenhouses and farmstands are still overflowing with flowering plants and starts that need a market. We need a big promotion for flower sales in honor of Fathers Day!

Direct seeded pumpkins and winter squash are emerging, and striped cucumber beetles are moving in. Be sure to scout fields regularly, since the time between first arrival of beetles and significant feeding damage can be just one or two days. Where perimeter trap crop borders are in place, spray when beetles first arrive. Otherwise, check frequently to determine if thresholds have been exceeded in the main crop (1 beetle per 2 plants for highly wilt susceptible crops; 1 or 2 per plant for non-susceptible crops.) or to be sure that furrow-applied systemic insecticides are working.

SWEET CORN

European corn borer flights have begun in the Connecticut Valley. Near the Connecticut River – possibly the warmest 'niche' in the state, which often serves as an 'early warning' for the rest of the state and southern Vermont -- early corn started under plastic has taken a leap in growth this week, and is starting to push up green tassels. Even in cooler parts of the state, corn is now growing well and germinating on schedule. We are seeing some frost damage where corn was uncovered when the 27 degree frost hit two weeks ago.

ECB TRAP CAPTURES (WEEKLY COUNTS)

Location	Date	ECB ZI	ECB EII	Total ECB
Hatfield	6-9	2	78	80
South Deerfield	6-9	7	6	13

These early corn fields, scouted this week, showed no sign of borer feeding. It is probably too soon after the start of ECB flight for eggs to have laid and to hatch, no need to spray yet! However, if heat continues there is likely to be some corn entering the silk stage while ECB flight remains high, which may need sprays only at silking. We may see the first tiny larvae in emerging tassels within the next week or two. Scout corn as tassel emerges, and spray if >15% of tassels have one or more borer. Sprays applied earlier (whorl stage) add to your costs but don't result in improved control when compared with one or two well-timed applications at tassel emergence.

PRE-SIDEDRESS NITRATE TEST: NOW IS THE TIME FOR SAMPLING

Many crops have reached or will soon reach the stage when it's time to decide whether, and how much nitrogen to apply as a side dress or top dress. The pre-sidedress nitrate test (PSNT) (also known as the June Nitrate Test) can help you to determine the current level of nitrogen in the soil. If you have a soil probe, the sampling takes about 20 minutes per field. (Probes are available from many ag suppliers for $40 to $75.) The amount of nitrate-N (reported as parts per million N03-N) in the soil is a good indicator of whether more N will be needed to complete crop growth.

To take a sample for nitrate testing, take 15 to 20 sub-samples or cores from the field. Sample slices or cores should be taken to a depth of twelve inches if possible. Avoid sampling fertilizer bands or other areas, which have high concentrations of N fertilizer. Generally the best place to sample is between the rows. If plastic mulch is used, samples should be taken from under the plastic. With a soil probe you can just sample through the plastic, leaving

small holes that cause no problem. Be sure to avoid any trickle irrigation tape under the plastic. Mix all the samples together and submit about one cupful to the UMass Soil Testing Lab, West Experiment Station, University of Massachusetts, Amherst MA 01003. You may contact the soil testing lab 413- 545-2311 or consult their website at *www.umass.edu/plsoils/soiltest*

Cloth bags are ideal for sending PSNT samples to the Soil Testing Laboratory. These bags are more convenient to use because it is not necessary to dry the samples, as long as the laboratory receives them within four days. With plastic bags you should dry the samples unless you can deliver them within 24 hours, and ship overnight, or next-day delivery. The lab will do the PSNT within one working day of receipt and inform you of the results. The charge for this test is $6.00 (include a check made out to the University of Massachusetts). Be sure to request a Nitrate (PSNT) test. Frank Mangan (978-422-6374) and John Howell (413-259-1203) are available to consult with growers about the test results.

The PSNT is a tool growers can use to optimize N application. Research conducted for several years at UMass, along with several years of on-farm experience, indicates that an appropriate threshold for peppers and winter squash is about 30 ppm nitrate-N. Above this level, sidedressing or topdressing supplemental N would be of no value and will likely decrease yield of butternut squash and peppers. Research in Connecticut has shown similar results in pumpkins. There is increasing agreement that a threshold of 30 ppm is appropriate for most vegetables except for sweet corn, for which the threshold is 25 ppm. Using the PSNT can save money and time, improve crop yield, and reduce the likelihood of N leaching and water contamination. Barring unusual weather conditions, PSNT levels in a field tend to be fairly consistent from year to year. Once these values are known for a field, a grower probably does not need to test every year. As a tool, the PSNT should be used along with a grower's experience and knowledge of fields. Interpretation of PSNT results should be made with regard to weather conditions such as leaching rains or soil temperatures.

-John Howell, Frank Mangan, and Ruth Hazzard,
University of Massachusetts

WEED MANAGEMENT THROUGH CULTIVATION; KEY PROBLEM WEEDS

--Editor's Note: the following article was written for organic farmers, but applies to any farmer who depends on cultivation for all or part of their weed management program. Maine, like the rest of New England, faced an extremely cold, wet spring that delayed plowing and cultivating in many fields.

Weed management on organic farms is primarily based on two practices, crop rotation and cultivation. Both of these have the same 3 goals, using up seeds in the weed seed bank, preventing new seeds from going into that bank, and starving out perennial weeds by using up the food in their storage organs while not letting the plants put new food back.

Cultivation is basically the same practice whether you do it with tractor mounted equipment or a hoe. Basically, the goal of cultivation is to scratch the top layer of soil just deep enough to kick up germinated weeds and have them dry out in the sun. If you do not cultivate deep enough then the roots of the weeds remain in contact with the soil and the plant lives. If you cultivate too deeply then you stimulate new weed seeds to germinate by bringing them up to the surface and exposing them to light. Obviously, cultivation works best in sunny dry weather. The goal of cultivation during the cropping season is to use up the seeds in the top layer of soil as soon as possible. Deeper weed seeds will be dealt with later with crop rotation and field tillage.

In order to make these practices work the best they can for you, they should be specifically adapted to the specific life history of the particular species of weeds you are dealing with. Using crop rotation to meet these goals is a longer topic for discussion and something that you need to plan, but cultivation is something that you need to be doing now, even though you are behind on everything else. As an example of how important it is to fit your practices to specific weed biology in order to get best control here is a discussion of 3 weed species that are out there right now.

Shepherd's Purse

For pictures of this weed in different stages see ***http://www.ppws.vt.edu/scott/weed_id/capbp.htm***

Shepherd's purse is in the mustard family. It is usually a winter annual plant. Seeds germinate when the soil is below 60 degrees F, in the fall or spring. Typically, seeds that germinate in the fall form a rosette that overwinters. In the very early spring the rosette resumes growth and sends up flowers that quickly produce seeds. Each plant can produce about 50,000 seeds. Sherpherd's purse becomes a problem on organic farms for two primary reasons. First, organic farmers tend to cover crop their fields in the fall and the Shepherd's Purse may germinate and survive under the cover crop unnoticed. Second, the seeds can continue to mature and become viable even on plants that have been pulled or mowed down before the seeds were mature.

This year there are many fields out there that because they are too wet have not been worked at all. I have seen lots of Shepherd's Purse in these fields happily going to seed and all this seed will be added to the seed bank when the field is finally worked. If this is the case in your fields, I suggest getting out there and hand pulling all of these

plants and taking them out of the field with their seeds still attached. If Shepherd's Purse is a problem already for you, then you will have to time your fall covering to kill the rosettes, or kill them in the spring before seeds begin to form. Shepherd's Purse seeds may live for a while in the soil seed bank before germinating (half the seeds will be gone in less than three years) but not really that long compared to lambsquarters (it takes nearly 8 years for half the seeds to be gone).

Galinsoga

For pictures of this weed in different stages see ***http://www.ppws.vt.edu/scott/weed_id/galci.htm***

Galinsoga is in the composite family. It is a summer annual that is becoming more of a problem on organic farms. It is just beginning to germinate in the fields now. This is the time to kill it by cultivation.

Galinsoga is becoming a problem because it so quickly can produce new seeds. It is not day length sensitive and goes from a germinating seed to producing new seeds in a bit over a month. By the time you see the flowers open wide they probably have viable seed in them. Pulling up plants with flowers and leaving them in the garden is just adding to the weed seed bank. Get out and cultivate today.

Galinsoga has no seed dormancy. That means that the seeds produced or laying in the seed bank will germinate as soon as the conditions are right (exposed to light when it is warm and moist enough). This makes Galinsoga easier to get rid of than something like lambsquarters that has a physiological dormancy. Lambsquarters produces two types of seeds. The brown ones are not dormant, but the black ones are dormant and will sometimes sit in the seed bank for many years before being triggered to germinate. All your crop rotations and cultivation will not get these seeds until they are ready to germinate.

Quack Grass

For a picture of quack grass with its rhizome see ***http://www.rce.rutgers.edu/weeds/weed.asp?quackgrass***

Quack Grass is a perennial, native grass in Maine. It is very common in old fields and is a primary reason that farmers and gardeners are advised to get their fields prepared a year in advance before trying to grow crops. Those who do not follow the advice spend years battling quack grass.

Quack grass is often referred to as witchgrass here in Maine. I do not know why because witchgrass is a different weed (see http://www.noble.org/imagegallery/Grasshtml/CommonWitchgrass.html for a picture of witch grass) that does not look like quack grass at all and has a different life history.

Quack grass is easily recognized by its rhizomes, which are underground stems that send up shoots as they spread under the soil surface. If you chop up the rhizomes into small pieces by tilling you have made the problem worse because each piece of the rhizome is likely to have a node and send up a new shoot from that node. And you are likely to have dragged these pieces of rhizomes all over the field.

This year is going to be very bad for quack grass. Quack grass begins growth early in the spring and has become well established in fields that were too wet to work early. A quick tilling and planting in these fields is going to produce a mess later in the year as all the pieces of rhizomes start growing with the crops and a single cultivation does not kill the quack grass. Cultivation tends just to cut off the shoot but leaves the rhizome to send up a new one. Actually, that is the best method left if you do not have the quack grass gone before planting. BUT, you have to stay with it and cultivate off the shoots every time they come up, and if you miss a cultivation you are essentially back to ground zero. The goal of this practice is to starve out the rhizome. The rhizome is a food storage organ and each time it sends up a shoot it uses some food. If you never let the shoot get large enough to replenish this food eventually the rhizome will be starved to death. Good luck.

-- Eric Sideman, Maine Organic Farming and Gardening Association, Pest News, June 3 2005

CLIMATE CHANGE AND AGRICULTURE

Climate change is a daunting topic, maybe that's why so many people joke about it when the subject comes up in conversation. But it's a serious matter when it comes to the future of food production. Not only will climate change affect farming in the Northeast--it already has. To help agricultural service providers better understand this issue, the Vermont Center for Sustainable Agriculture is partnering with Clean-Air Cool Planet, Cornell University, Tellus Institute, and the University of New Hampshire Climate Change Research Center on a project called "**Climate Change and Agriculture: Preparing Educators to Promote Practical and Profitable Responses.**"

The project, funded with a $113,000 Professional Development grant from Northeast SARE (Sustainable Agriculture Research and Education), will offer a training and supporting educational materials to Extension and other agency and non-profit personnel at several locations in the Northeast this coming year. The trainings will be developed by leading climatologists. They will address the science behind climate change, likely impacts on agriculture (on crop and animal performance, soil and water resources, and pest pressure), and possible responses by farmers: both for adaptation to change and mitigation of the problem.

For example, participants will learn that weather station data analyzed by climatologists at the University of

New Hampshire shows that the Northeast's average annual temperature increased by 1.8° F. during the last century. The winters (Dec – Feb) have warmed more (2.8° F) than the annual average, and winter warming in the last 30 years has been even more pronounced (4.4° F). These relatively small changes in temperature have had powerful effects. The frost-free growing season in New England is one week longer than it was a century ago. Lake ice breaks up about 5 days sooner. Across the Northeast, lilacs and apples have been shown to be flowering about a week earlier in the spring than they were in the 1960s.

Such changes present both threats and opportunities to agriculture. For example, it's likely that cool season crops won't do as well in areas that warm too much, so farmers may need to switch to varieties that are more heat-tolerant, or change the kinds of crops they grow. As rainfall gets more erratic, reliable irrigation as well as good field drainage will become even more important. Animals such as dairy cows may need additional environmental management to keep them cool and maintain their productivity. As new pests arrive with changing conditions, scouting will be essential to avoid being taken by surprise. Some current pests are already becoming more frequent problems in the Northeast, especially storm-blown insects like leafhoppers and corn earworm. Warmer winters could mean better survival of other insects, such as flea beetles, and therefore higher populations in early spring. Other pests may diminish in severity.

There are many ways that farmers will cope with climate change. This could be with a different mix of crops or animals, modified production systems, and changes in pest management. The important thing is to anticipate change and be ready to cope with it.

Besides planning for adaptation, farmers can also work to mitigate their contribution to the problem. Although agriculture is a relatively small contributor of greenhouse gases (on the order of 2% of New York's total production, according to Cornell estimates) farmers, like everyone else, should do what they can to address the problem. The good news is that many agricultural actions that can reduce greenhouse gas emissions also enhance profitability and stewardship.

According to a recent CAST (Council on Agricultural Science and Technology) report on climate change, agriculture has a role to play in reducing greenhouse gases by:

* Taking CO_2 from the atmosphere and sequestering it in biomass and soils. This could be done through increased use of cover crops, green manures and permanent pastures that 'tie up' carbon and build up soil organic matter.
* Decreasing the rate of land clearing for agriculture, and taking marginal lands out of production, thus allowing the native plant cover to grow and sequester carbon.
* Using farm inputs such as fuel, fertilizers, and pesticides more efficiently, thus reducing consumption of fossil-fuel energy required to produce them.
* Increasing production of bio-fuels (renewable biological-based energy fuels) to replace fossil energy, thereby recycling carbon that is already 'above-ground.'
* Using nitrogen fertilizer more efficiently in order to decrease nitrous oxide emissions that can result from excess applications. Nitrous oxide is a powerful greenhouse gas.
* Decreasing methane emissions by capturing or preventing methane loss from animal manure storage and by increasing livestock production efficiency.

Other actions that farmers can take to address the issue of climate change include: using alternative energy sources like wind, hydro, solar, and fuels made from waste vegetable oils; planting windbreaks to reduce energy use in adjacent buildings while capturing carbon in trees; replacing old vehicles with more energy efficient models, and increasing local markets for products which reduces the energy needed for transportation.

These actions suggest a win-win approach to a very big problem. Through innovation, and implementation of more sustainable technologies, farmers can enhance their stewardship of natural resources, reduce their contribution to climate change, and improve their bottom line.

--Vern Grubinger,
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MANAGING COLORADO POTATO BEETLE

Colorado potato beetles (CPB) are moving into potato and eggplant crops, and will soon be laying eggs. Some adult beetles overwintered in the fields where the larvae completed development in the fall, but most spent the winter in the undisturbed habitats adjacent to these fields, where they burrowed into the soils below tree foliage up to a depth of 12 inches below the soil surface. In spring the beetles have to regrow their flight muscles before they are able to fly. At first they search for food plants by walking from the field edges where they overwintered. This is why field edges of non-rotated fields are attacked first. If beetles do not find host plants via walking they will engage in migratory flight, searching for host crops.

Once host plants are found adult begin to feed and lay eggs. Some beetles mated the previous fall or late summer; hence they have no need to mate in the spring to produce viable eggs. They continue to mate in spring. The bright yellow eggs are laid in clumps that average 30-35 eggs, generally on the undersides of leaves.

Crop Rotation. The single most important tactic for CPB management is to rotate potatoes or eggplant to a field

that is at least 200 yards from previous year's fields. Barriers such as roads, rivers, woodlands, and fields with other crops are helpful. Rotated fields tend to be colonized 1-4 weeks later in the season. Also, the total population of adult beetles is lower, producing fewer larvae to control. The next (summer) generation beetles will emerge later, possibly after August 1st, in which case they won't produce a second crop of eggs.

Now is the time to scout for adults, eggs and egg hatch. 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 direct 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 mid-season). Damage to eggplant seedlings from adult feeding could be severe enough to warrant control of the adults even before eggs hatch, especially on field edges. Spot treatments may be warranted.

Look on the undersides of leaves for the orange-yellow egg masses. The fresher the eggs, the brighter orange the eggs will appear. Eggs hatch in 7-10 days, depending on temperature. If you want to know when the earliest eggs are hatching, you can flag the earliest egg masses you find with bright tape or flags, and then keep an eye on them until they hatch. Hatched larvae go through four stages before they become adults. In the first stage, the larvae are about the same size as the eggs and second stage, they are about an eighth of an inch long. As the larvae get bigger, they do more feeding. The fourth, or largest, stage does 85% of the feeding damage. It's a good idea to prevent beetles from ever reaching the fourth instar!

After larvae complete their growth, they drop to the ground and burrow into the ground to pupate. About 10 - 14 days later the next generation of adults emerge.

Spray timing and thresholds. If you are using Bt's (Novodor), you want to make the first application when 20-30% of the eggs have hatched, or when the oldest larvae reach the third instar. If you are using spinosad (Spintor 2SC or Entrust, the organic formulation) or a broad-spectrum insecticide, you can wait till more larvae (grubs) are hatched, when the oldest larvae reach the beginning of the fourth stage (instar), when they are about 1/3 inch long. Applications made at this time with Spintor, Provado, AgriMek, or synthetic pyrethroids will kill 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.

Thresholds established in the Northeast for eggplants from seedling to fruiting stage include: 15 CPB per 10 plants (Rutgers) or 2 small/1 large larvae per plant (<6 inches) or 4 small larvae /2 large per plant>6 inches) (Cornell). In eggplant, in addition to defoliation, beetles sometimes clip the stems of flowers or flower buds. This directly reduces fruit formation and marketable yield. On the other hand, potatoes can tolerate 20% defoliation without reduction in yield (or even more, depending on time of the season and cultivar).

Pesticide Resistance

Colorado potato beetles have a phenomenal ability to develop resistance to insecticides. In the Connecticut Valley, there are fields where CPB resistance to imidacloprid (Admire) is 300 times that of susceptible populations. Control requires higher rates, does not last as long, or does not happen at all. There is a correlation of resistance between Admire and other products of the same neo-nicotinoid group, such as Platinum (thiamethoxam). Using Platinum as a substitute for Admire is a short-lived strategy that will cause loss of both materials. The cost of resistance is high – in higher rates required, or additional sprays of other materials.

To a large extent, resistance develops on a field by field basis. That 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.

To prevent resistance, alternate among classes of insecticides in each generation, and throughout the season. If you used Admire at planting, do not use foliar applications of Provado. Classes (different modes of action) include synthetic pyrethroid (Asana, Pounce, Baythroid or Ambush) (some populations already have some resistance to these); carbamates (Thionex, Vydate), neonicotinoids (Admire, Platinum, Actara, Provado); spinosad, (Spintor, Entrust); *Bacillus thuringiensis* (Novodor), and abamectin (Agri-Mek). One low-risk strategy would be to use a material such as spinosad, which controls adults and larvae for the first spray, followed by a Bt to kill emerging young larvae or Agrimek to control all stages of larvae. The following three insecticides each have a different mode of action. They have not shown field resistance in this area (yet) and provide good options for alternate insecticides that provide effective control:

Spinosad (SpinTor 2SC, a liquid formulation or Entrust, an organic formulation, dry powder) gives excellent control of all stages of CPB at the 3.5 to 4.5 fl oz rate. For a heavy population, two applications about 10 days apart with the initial application when third instars occur, should control the first generation. Spintor has the advantage that it will control adult CPB and also European corn borer if a grower has that pest on early potatoes. Entrust is currently the only effective CPB insecticide approved for organic growers. It can also be used on brassica and sweet corn pests.

adult colorado potato beetle feeding on eggplant

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. Curently there are no formulations of Bt tenebrionis products that are approved for organic use under the National Organic Program. You can check with the Bay State Organic Certifiers for more details (978297-3644)

Perimeter treatments or perimeter trap cropping can be applied to potato. One approach is to plant a barrier crop between overwintering sites and this year's crop and get it in earlier than the main crop; then control early-arriving beetles with a systemic or foliar insecticide. Another is to plant three to five rows of potatoes treated with a systemic insecticide (for example, Admire or Platinum– assuming resistance is not a problem) in a perimeter around the field to be planted to potato, tomato, or eggplant; this treated crop will kill up to 80% of the colonizing beetles. In eggplant or tomato, the perimeter border can be an Italian eggplant type, which is more attractive to both CPB and flea beetles. Treat only the border, as soon as beetles arrive.

Natural enemies and cultural controls

Straw mulch placed around potato plants has been shown to reduce the number of beetles that colonize and feed in the crop, and reduces subsequent larval damage. Heavy mulches are more effective than a light mulch.

There are numerous beneficial insects that have an impact on CPB, including larvae of the green lacewing, two-spotted stink bug and spined soldier bug, lady beetles especially the 12-spotted ladybeetle (slightly pink and elongated), and certain ground beetles especially Lebia grandis. The parastic tachinid fly, Myiopharus doyphorae, which lays its eggs in the larvae, also causes mortality. While these natural enemies are often not sufficient to keep CPB populations below damaging levels, their effects add up. Using insecticides that are less toxic to these natural enemies helps conserve this benefit that comes free of charge.

- R Hazard; thanks to source including: D Ferro, J. Mishanec, J Boucher

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