



UMASS
EXTENSION



Vegetable Notes

For Vegetable Farmers in Massachusetts

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IN THIS ISSUE:

- Crop Conditions
- Late Blight Update
- Notes on Composting & Late Blight
- Harvest Period, Storage, and Variety Selection to Optimize Eating Quality in Squash
- On-line Course for Organic Transition
- Downy Mildew of Brassicas
- Upcoming Meetings

CROP CONDITIONS

Warm temperatures and drier weather continued this week. Although the dry conditions have forced some to irrigate, it has also allowed for various types of field work to continue which has helped growers stay on top of insecticide and fungicide sprays. Rainfall and cooler temperatures are forecasted for the weekend. Sweet corn harvesting is going well and prices are still holding on both the retail and wholesale market. Corn earworm and fall armyworm pressure is high across southern New England forcing farm crews to carefully inspect ears before shipping even in fields that have remained on a short interval spray schedule.

The hot weather this week helped push harvesting of sweet corn, melons, peppers, onions, and squash and sales are good at farm stands and busy farmers markets. The fallout from early season rain is still showing up in fields, some of which continue to be lost to *Phytophthora* crown and fruit rot, which spreads rapidly once it gets established in any part of the

field. Getting any ripe fruit out of the field as soon as possible is a good idea at this point (see this week's article regarding squash harvest periods), particularly in fields where *Phytophthora* may be present. Downy mildew has been found on winter squash, summer squash, melon and cucumber. Maintain spray schedules on all susceptible vine crops. Pumpkins and winter squash are starting to hit the market, Brassica crops are growing well, and we can all hope for a long and bountiful Indian Summer.

- A. Brown

LATE BLIGHT UPDATE

Late Blight infection is still occurring in remaining susceptible crops (potato and tomato) in both homeowner gardens and commercial acreage (both organic and conventional). There are still reports of new late blight infections just now appearing in home gardens and isolated cropping areas. Although a brief spell of hot weather may have slowed down late blight a bit, it is still sporulating and producing inoculum during our heavy evening dew periods and morning fog. All concerned interests should continue on a regular fungicide program until the crops are finished. Special care must be made in the case of potato to examine harvested tubers to make sure they are free of tuber blight. It is advisable to sell the crop as soon as possible to reduce tuber infections in storage. The other significant reminder is to make sure that all tubers are harvested and that special attention is directed to removing and destroying volunteers that may survive the winter season and have the potential of carrying over late blight to next year. A common problem is encountered when corn is planted as the rotational crop in fields that had late blight this season. Volunteer potatoes are difficult to rogue out when hidden by the emerging corn or other rotational crop. See the following article on composting plant material infected with late blight.

For some organic growers, the good news is that it seems apparent that if the grower had a good spray program of copper started before late blight got into the field, the tomato crop was not totally lost. This means that copper needs to be applied on a 3-5 day schedule and you have to get good coverage of all the plant tissue (especially within the canopy). The problem is that many organic growers are not set up to do regular spraying. Many organic growers do not have spray

equipment and if they do, it is usually just a small back-pack sprayer with limited range. Another factor is that many organic growers are concerned about copper toxicity. Toxicity levels in the soil are in the range of 200 parts per million (PPM). If you apply copper at the recommended rate, 1.5-2.0 lbs./acre you are putting out 1 PPM per application, in theory. In practice it may be even less – we took a soil test in one field where a grower had been spraying a high rate of copper every 5 days for over a month, and the copper level was 0.9ppm. Even if you made 10 applications this summer, you are still way below the toxicity level. If you are worried about copper in your soil, according to Jim Ballerstein at the Geneva Agricultural Experiment Station, sweet potatoes need and utilize copper in production. They may make a good rotational crop next year where you grew tomatoes this summer.

Even though the weather has become hot and dry, continue with your fungicide applications. We are still having heavy dew and fog in the mornings. There is so much late blight around, unprotected plants are an easy target.

- adapted from material by John Mishanec, Cornell University

NOTES ON COMPOSTING & LATE BLIGHT

Late Blight spores are readily spread in the air but do not survive in the soil over the winter. Removal of infected plants is important to limit the spread of the disease. Infected potatoes that survive from season to season can spread the disease when they sprout in the spring.

Composting of infected plant material, when performed properly, will destroy not only the infectious spores of this disease but most other plant pathogenic fungi. Thus a well prepared compost will not spread disease even if the initial compost pile contained infected plants. During the composting process temperatures in excess of 130 degrees F are obtained over extended periods (at least three consecutive days). These temperatures will destroy human pathogens and will also destroy most plant pathogens.

Compost must be prepared in such a manner as to obtain temperatures necessary to destroy human and plant pathogens. Piles should be turned so that any material on the outside of the piles, (not exposed to high temperatures) must be mixed back into the center where it will be exposed to high temperatures.

The danger with home gardener and on-farm compost piles is that the pile may not reach high enough temperatures to kill all the infected potato tubers. Tubers that survive the winter in an unturned or cool compost pile will sprout in the spring and could begin another epidemic. For this reason we have not been recommending that infected plant materials be composted. Commercial grade compost that is properly prepared should be free of inoculum.

- Adapted from Geoffrey Kuter, Agresource

HARVEST PERIOD, STORAGE, AND VARIETY SELECTION TO OPTIMIZE EATING QUALITY IN SQUASH

The record rainfall in June & July, followed by the recent heat, has led to a boom in fruit rot caused by *Phytophthora capsici*. Given the wet conditions and high disease pressure we've experienced this year, it makes sense to get your winter squash and pumpkins out of the field as soon as possible to help reduce the risk of fruit rots. It can be difficult, however, to assess whether or not the fruit is truly ready for harvest – especially in dark green squash, such as acorn varieties. This article aims to provide some insight into judging the ideal time to harvest squash and pumpkins.

There are three major species of squash that are grown worldwide – *Cucurbita pepo*, *C. maxima*, and *C. moschata*. The species *C. moschata* includes calabaza or tropical squash, round to oval pumpkins grown in the Midwest for pie processing, and the popular butternut varieties, highly regarded for excellent shelf life. The species *C. maxima* includes the large show pumpkins, Golden Delicious type processing squash, Hubbard varieties, and buttercup/kabocha varieties, the latter esteemed for their exceptional eating quality. Lastly, *C. pepo* is the species having the greatest variation in type, including hard-shelled gourds, summer squash, ornamental pumpkins, and squash. In North America, acorn is the most popular *C. pepo* squash, but striped *Delicata* and *Sweet Dumpling* varieties are known for having good eating quality. The demand for acorn squash has been adversely affected by generally poor quality of popular commercial varieties and the practice of

harvesting squash before it reaches maturity.

Components of eating quality:

People differ in their preference for flavor components and degree of moisture in squash. Nonetheless, connoisseurs of squash usually prefer a relatively dry squash that has a pasty, slightly moist texture after cooking and a high level of sweetness. High sugars not only contribute to a desirable sweet taste, but also mask undesirable flavor components associated with certain varieties. Sugar levels can be estimated easily by pressing juice from a small sample of flesh and measuring soluble solids in the juice with a hand-held refractometer. Relative sugar content is given in units of percent soluble solids (or oBrix). Soluble solids levels of 10% are passable, but generally levels of 11% or greater are considered necessary for good eating quality in squash. The pasty texture of squash is attributable to starch. At harvest starch comprises about two thirds of the dry matter of squash, so squash with high dry matter also have high starch content. Starch provides substrate for conversion to sugars during the latter stages of squash maturation and during subsequent storage. Squash with low dry matter, generally less than 16%, lack sufficient starch levels to produce the combination of pasty texture and degree of sweetness desired for acceptable eating quality. In varieties with low dry matter, starch is rapidly depleted during storage by conversion to sugars, and the texture of the squash becomes watery and fibrous.

Stages of squash development:

To understand how harvest period, storage and variety selection can affect eating quality, it is necessary to understand basics of squash development and maturation. This process includes not only the development of flesh quality, but also the effect of seed development on maintaining flesh quality. Small-fruited varieties of squash, such as acorn, reach close to full size within 15 to 20 days after pollination (DAP) and subsequent fruit set. Dry matter and starch accumulation begins shortly after fruit set, but is most rapid between 10 and 20 DAP and reaches a maximum at 30 DAP. Sugar levels, on the other hand, are very low at 25 DAP, but continue to increase until maturation of squash at about 55 DAP (Figure 2). Some varieties, however, lack adequate sugar levels even at mature harvest, and need to be stored to develop sugar levels suitable for good eating quality.

Even though the dry matter of the flesh (mesocarp tissue) peaks at about 30 days after pollination, seed development takes much longer. If a squash is cut open at 20 DAP, the seeds appear to be full size. This is because the seed coat, the leathery covering over the embryo, reaches full size by this time. But if the seed is cut in half, the embryo is actually barely visible at this time, being about an eighth to a quarter of an inch in length. The embryo expands rapidly and largely fills the seed coat cavity by 35 days after pollination. However, dry seed biomass (seed fill) continues almost linearly until about 55 DAP. Thus, a squash fruit can be considered to reach full maturation when seed development is complete at about 55 days after pollination. If fruit are picked immature, seed development continues in stored fruit at about the same rate as in fruit left on the plant. Seed development in an immature, detached fruit occurs at the expense of depletion of nutrient reserves in the fleshy tissue, thereby reducing dry matter (mostly starch) and lowering eating quality.

Post maturation changes occur in stored fruit. There is a progressive moisture loss during storage, so fruit fresh weight decreases. Respiration consumes carbon in the form of sugars, and starch continues to degrade to replace the sugar consumed by respiration. The eating quality of squash varieties with low sugar at harvest will initially be enhanced in storage because sugar levels increase. Eventually, however, long storage time will deplete starch levels to a point where the texture of the squash is compromised. To maximize shelf life, squash should be stored at 55 to 60° F with moderately high relative humidity (50 to 70%).

Because seed maturation is not complete until 7 to 8 weeks after fruit set, it is important to maintain a healthy plant until at least 50 days after fruit set. This insures a continuous supply of photosynthates (carbon source produced from photosynthesis) to the developing fruit. Seeds are the primary sink for assimilates such as sugars, so if photosynthesis is impaired by disease or insect feeding, nutrients for the developing seed are withdrawn from the flesh, depleting starch levels and lowering eating quality.

Harvest period and eating quality:

Because fruit and seed development are similar in all three species of squash, their recommended harvest periods are similar. Butternut squash do not reach their characteristic tan color until late in development, so premature harvest before starch accumulation and seed fill are complete is generally not a problem. With kabocha varieties, it is actually desirable to harvest them before complete seed maturation, about 40 to 45 days after fruit set when the fruit are still bright green.

New Zealand studies indicate that rind hardness is maximum around 40 DAP, so fruit harvested at 40 days suffer less damage to the fruit surface, and in turn, less chance for disease entry during subsequent storage, than fruit picked during later stages. Kabocha squash are also susceptible to sunburn damage and changes in rind color to brownish green, so it is best to harvest the squash before fruit are exposed to direct sun as the vines die down. Kabocha squash have a high dry matter content, usually 20 to 30%, and a small seed cavity, so that any seed maturation following harvest has a minimal effect on depleting starch reserves in the flesh.

Acorn squash present the most difficult problem with respect to determining harvest time. Most modern acorn varieties not only reach near full size within two weeks after fruit set, but also develop a dark green to black mature color. For this reason, acorn squash harvested for the large wholesale markets are often picked immature. This can be easily observed in supermarkets by noting that the rind on the ground side of the squash is light green or light yellow rather than dark orange coloration of mature fruit. If these immature squash are sampled, they are found to have very low sugar levels. If such immature squash are left in storage, sugar content will increase, but the starch will be depleted both by respiration and movement of nutrients from the flesh to the developing seed, and this results in poor eating quality. The problem of poor quality in prematurely harvested squash is further exacerbated because most commercial acorn varieties and many of the newer striped varieties have inherently (genetically determined) low dry matter and starch levels.

How do you determine when to harvest?

Most acorn varieties are semi-bush and set most of the crown fruit within about a week period. Modern hybrids tend to produce some female flowers before male flowers appear and these usually abort unless there are other varieties of *C. pepo* nearby supplying pollen. But this is shortly followed by a period of both male and female flowering and fruit set. Some later fruit sets will occur on runners, but these fruit are usually undersized and lack quality, and so should not be harvested and sold. These late set fruit are a drain on photosynthates, and pruning these fruit off of the plant can actually increase quality of the crown set fruit.

By noting the initial flush of male and female flowers on a semi-bush squash cultivar, a grower can estimate the approximate time when fruit set occurred, and delay harvest until about 50 days or more from the fruit set period. Another approach is to check the ground spot on the fruit, and not harvest fruit until the spot turns orange. Some of the newer striped varieties of *C. pepo* will show some color changes with maturation, but the color change, say from white to tan between the stripes or stripes changing from green to orange, may occur well after the fruit are ripe enough to harvest. So with these, I think that it is better to keep track of the approximate date of fruit set. However, if you observe a color change that correlates with maturity in a particular variety, then you can use that as a harvest indicator.

How about variety selection? That is a tough call. I have found that most modern hybrids being commercially sold lack the eating quality of a good Sweet Dumpling or Delicata squash. UNH has developed some high quality acorn and sweet dumpling type varieties that are being released to the seed industry. High Mowing Organic Seeds offers a UNH-developed, sweet dumpling hybrid, Sugar Dumpling, which also has intermediate resistance to powdery mildew. Johnny's Selected Seeds is in the process of producing one of my PMR mini-acorns, and currently sells an acorn hybrid, Tip Top, that has good eating quality. Cornell Bush Delicata is another variety in this class with good eating quality and powdery mildew resistance. There are several other varieties available that have reasonably good eating quality, so growers will just have to evaluate them to determine if they fit into their particular farm and marketing situation.

- Brent Loy, Department of Plant Biology University of New Hampshire

ON-LINE COURSE FOR ORGANIC TRANSITION

If you are thinking of transitioning your farming operation to the organic system, an online course designed by the Rodale Institute provides a useful learning resource. The course can be accessed from any location via the Internet: <http://www.tritrainingcenter.org/course>. It provides a good introduction to what it means to convert to organic farming in terms of production and marketing. It is available 24/7, so it can fit any schedule. You can go at your own pace as you work through the several modules that cover a range of subject areas:

- The fundamental principles of organic agriculture
- Practical details about organic crop and livestock production
- Marketing opportunities available to organic producers
- Record keeping and other specific requirements of organic certification

- Joseph Heckman, Ph.D., Specialist in Soil Fertility, Rutgers

DOWNY MILDEW OF BRASSICAS

Downy mildew caused by *Hyaloperonospora parasitica* (formerly *Peronospora parasitica*) occurs on broccoli, Brussels sprouts, cabbage, Chinese cabbage, cauliflower, kale, kohlrabi, radish, rutabaga, and turnip. Symptoms can appear at any stage of plant growth and vary with host plant. Infection of cotyledons of seedlings results in discolored spots, yellowing, shriveling, and death of the cotyledons. Infections at this stage can become systemic and dormant. Dormant infections can become active later in the crop cycle or in storage if environmental conditions become favorable, and the residue from a crop with a dormant infection can leave overwintering oospores in the soil. Initial foliar symptoms on true leaves consist of angular, yellow lesions on the tops of leaves with fluffy, white mycelial growth on leaf undersides. Lesions enlarge in wet conditions and become tan and papery. In cabbage, invasion of the lower leaves can lead to systemic infection of head leaves and sporulation of the pathogen in storage. Invaded tissues may turn black and necrotic with the fungus causing many sunken, black spots on the head. On cauliflower, curds may become blackened with fungal sporulation and invasion of secondary organisms following discoloration. Brown to black streaks appear in the stalks and branches leading to broccoli florets and Brussels sprouts along with sporulation and secondary invasion by soft rotting organisms. Root crops exhibit an internal brown to black discoloration extending down from the crown, with russetting and cracking of the skin.



Downy mildew on Brassica leaves

Hyaloperonospora parasitica cannot live outside of a host, but does produce resting structures, called oospores, that can survive and overwinter in soil and plant debris. The pathogen exhibits some host specificity and is favored by cool, moist conditions and abundant leaf moisture from dew, fog, or drizzling rain. Active infections produce sporangia, which are spread by wind and splashing rain.



Downy Mildew causing head rot on Broccoli

Management:

- Control disease in the seedbed by the use of clean soil that has been free of crucifers for two years.
- Avoid excessive overhead irrigation to keep leaf surfaces dry.
- Regulate plant density to promote good air circulation.
- Remove crop debris promptly from seedbeds.
- Resistant cultivars of broccoli are available.

See the New England Vegetable management Guide for up to date chemical control recommendations. Available free on-line at www.nevegetable.org.

- adapted from material prepared by M. Bess Dicklow,

Location	Z1	EII	Total ECB	AVG CEW	FAW AVG
CT Valley					
South Deerfield	19	28	47	-	-
Deerfield	10	29	39	23	1
Deerfield (2)	9	33	42	-	-
Sunderland (1)	13	10	23	22	-
Sunderland (2)	6	1	7	95	-
Hadley (1)	0	1	1	25	-
Hadley (2)	-	-	-	42	-
Granby	9	5	14	-	-
Easthampton	0	0	0	100	-
Berkshire County					
Sheffield	-	-	-	-	-
Central & Eastern MA					
Lancaster	5	0	5	7	1
Tyngsboro	4	1	5	26	6
Concord	1	0	1	44	1
Northbridge	1	6	7	16	3
Spencer	1	0	1	60	0
Dracut	6	0	6	8	3
Rehobeth	2	12	14	86	2
NH					
Litchfield, NH	0	30	30	231	21
Hollis, NH	0	7	7	160	4
Mason, NH	0	4	4	195	11
VT					
Brandon	-	-	-	1	-

Corn Trap Counts

CORN REPORT

ECB counts seem to be hit or miss in the valley, while central and eastern trap counts are steadily declining. Continue monitoring with pheromone traps through the month of September and continue scouting tasseling fields for damage. Remember European corn borer survives the winter in the larval stage, protected inside the stalks of wild plants and corn stubble. Destruction of corn stubble in the fall, or in early spring before emergence of moths, is important for controlling overwintering populations of ECB.

Corn earworm flight is still very high throughout the state with many growers catching moths in the hundreds per week! Harvests show fields with heavy pressure have a lot of damage to ears and high trap counts tell us that eggs are still being laid. Each female CEW has the ability to lay as many as 1000 eggs, usually laid on the silks, and they can hatch in 2-6 days depending on temperature. Once the eggs hatch they will travel down the silk channel and bore their way into the ears. Once they get into the ears there is no effective control. This is what makes the CEW the most destructive of all the sweet corn pests. Chemical controls work best if you have the right timing and equipment.

Growers who are catching over 13 CEW moths per night should be on a 3

day spray schedule (see table below). Traps should be in fresh silk at all times. Monitoring this pest is critical to achieving good control. Using two traps per field is recommended. To determine when to start insecticide sprays and how often to spray, use the average moth counts per trap then divide by the number of nights since the last count was taken. Late summer infestations are keeping a lot of growers on a short interval spray schedule. If you think you are too late to control CEW that has already entered below the silks, do a selective harvest. Because damage is usually found in the tips of the ears you may still be able to salvage infested.

Fall armyworm If using chemical controls try to configure a control method that will cover all of your pest problems in one spray. Along with CEW pressure, many fields have a lot of fall armyworm damage in later plantings, so taking care of both pests at once is beneficial. Warrior although the standard control for CEW, is not as effective against FAW. Other materials recommended for FAW are Avaunt at 2.5-3.5 oz/acre (in whorl stage corn only due to the 14 days to harvest indicated on the label) and Radiant SC at 3-6 oz/acre in silking corn

Location	Z1	EII	Total ECB
CT Valley			
Hadley	0	31	31
Deerfield	2	24	26

Pepper Trap Counts

where sprays are warranted. Organic control options include Entrust .5-2 oz per acre or Dipel DF at .5-1 lb per acre and have been shown to be effective against small caterpillars in fields with low pressure.

Both monitoring trap counts and scouting fields are important in determining if FAW is an issue. This season, even in fields where there are low trap counts, growers are finding a lot of damage in the field. It is easy to spot FAW feeding, with ragged holes and a lot of frass in tasseling corn. We have also seen lots of caterpillars feeding in both the tassels and silk. Make sure that you are correctly identifying what is causing feeding damage in your fields before choosing what materials to spray. FAW caterpillars are often confused with CEW caterpillars. FAW Caterpillars are smooth, (unlike CEW), and dark

green or brown with lengthwise stripes and dark spots. The head capsule is dark with a distinctive light colored marking in the form of an upside down Y. This is contrast to CEW, which has a plain head capsule. Continue monitoring for all sweet corn pests, we can expect FAW and CEW populations to stick around for the next few weeks.

- A. Brown & C. Huffman

Corn Earworm Threshold		
Moths/Night	Moths/Week	Spray Interval
0-0.2	0-1.4	no spray
0.3-0.5	1.5-3.5	every 6 days
0.6-1	3.6-7	every 5 days
1.1-13.0	7.1-91	every 4 days
Over 13	Over 91	every 3 days

UPCOMING MEETINGS

Redesigning a Garden Center and Farm Stand for Future Growth

September 2, 2009

Volante Farms, Inc., 226 Brookside Rd., Needham, MA

4:30 PM to 7:00 PM

Program details: www.umass.edu/umext/floriculture/upcoming_events/index.html

Volante Farms, farmstand and garden center recently redesigned and constructed their garden center featuring a new, state-of-the-art 16,000 square foot gutter-connected greenhouse with rainwater collection, ebb and flood benches, heated floor, shade curtains and more. Join us for pizza and an evening learning about their renovation.

Cosponsored by University of Massachusetts Extension Greenhouse Crops and Floriculture Program and Massachusetts Flower Growers Association.

For more information, contact: Tina Smith 413-545-5306 – tsmith@umext.umass.edu, Paul Lopes 508-295-2212 ext. 24 – lopes@umext.umass.edu or Bob Luczai 781-275-4811 - bluczai@ballseed.com

New England Vegetable and Fruit Conference

Tues-Thurs Dec 15-17.

Center of New Hampshire Radisson, Manchester, NH

Three days of informative sessions and farmer-to-farmer networking! More details to come. Mark your calendars now! Get the latest info at <http://www.newenglandvfc.org/>.

Wed Sep 2. New Hampshire Vegetable & Berry Twilight Meeting. UNH Woodman Horticultural Research Farm, Durham NH. 5:30-7:30 pm. Ag Experiment Station Research on Horticultural crops. For info, please contact Becky Grube at becky.grube@unh.edu or 603-862-3203..

Wed Sep 2. Soil and Soil Health. Wellspring Farm CSA, 182 LaFirira Pl, Marshfield VT. 5-7 pm. Sponsored by NOFA-VT. \$10 for NOFA members, \$15 for non-members. For info, please contact NOFA VT at 80-434-4122 or info@nofavt.org.

Thurs Sep 17. Biological Control for Ornamentals in Greenhouses – Putting it all together. Tolland County Extension Center, Vernon, CT. 9:30am-3:30pm. For info, see http://www.umass.edu/umext/floriculture/upcoming_events/index.html.

Mon Dec 14. GAP Training for Vegetable Growers. Center of New Hampshire Radisson, Manchester NH. 1:00 pm-5:30 pm. This meeting will introduce the basics of USDA/FDA's GAP (Good Agricultural Practices) Certification Program for wholesale fruit and vegetable growers. For info, contact Shirley Mietlicki-Floyd at 413-545-4420 or mietlicki@umext.umass.edu or Becky Grube at 603-862-3203 or becky.grube@unh.edu.

If you would like to become a Vegetable notes sponsor, please contact Jessica Dizek at jdizek@outreach.umass.edu or 413 545 1445

Vegetable Notes. Ruth Hazzard, editor and Amanda Brown and Andrew Cavanagh, assistant editors. 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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