UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

Volume 17, Number 20 October 12, 2006

PUMPKIN CROP 2006: HIGH DEMAND, LOW YIELDS

High quality pumpkins are a precious commodity in 2006. This year pumpkin crops faced one challenge after another. Reporters have picked up this news story with great interest – possibly reflecting the importance that real, live pumpkins have to the public's enjoyment of New England in the fall. Problems began in May; fewer acres were planted, because in many areas of New England, fields were too wet to plant. Some crops failed to germinate; some were planted late; some were flooded after planting. Weed control was more difficult under wet conditions. Late crops set fruit late, and seem to have set fewer fruit than usual. Late fruit failed to ripen well under cool conditions of early fall. Phythophthora crown and fruit rot took down its share of pumpkin fields. Plectosporium blight was widespread. Fruit that looked healthy at harvest developed fruit rot after harvest. Is the list of problems long enough? Did I miss anything? The good news is if you do have pumpkins to sell, you can sell them three times over, at a good price. The other good news is that Columbus Day weekend was bright and sunny, drawing out the crowds for their Halloween purchases. Canada and western New York are reported to have found a good market here.

As I've talked with growers in various parts of the state, it appears that fruit rots are a big problem; fields that

What disease caused this fruit rot?

Pumpkin fruit left in the field

seemed to be producing a decent crop turned out to be too rotten to harvest. If this happened to you, do you know which disease caused the problem? If not, it is worth finding out. Will the disease persist in the soil – and for how long? How could it have been prevented? Could it have arrived on seed, or from other sources? Answering these questions might help you prevent the same trouble next year.

If you live in range of UMass Amherst, bring a sample to the Plant Disease Diagnostic Lab. If you want to mail a sample, find a mostly healthy fruit and cut a sample that includes healthy and diseased tissue. Wrap it in newspaper to soak up moisture, seal it in a plastic bag, put it in a box, and mail overnight to: Plant Disease Diagnostic Lab, 108 Holdsworth Hall, UMass, Amherst, MA 01003. Avoid mailing it next-day on Thursday or Friday, because the lab may not be able to examine the sample the following day. Call Bess Dicklow, Vegetable Disease Diagnostics, at 413-545-3209 or email *mbdicklo@umext.umass.edu*.for more details.

--R Hazzard

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

Introduction

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 a 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 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 and kabocha, reach close to full size within 15 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 (Figure 1). 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 dry matter of the flesh (called mesocarp) 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 immature, detached fruit occurs at the expense of depletion of nutrient reserves in the fleshy tissue, thereby reducing dry matter (and starch) and lowering eating quality (Figure 1).

Fig. 1. Changes in %dry matter of flesh in 'Tip Top' acorn squash harvested at different times, with and without 10-day storage at 70 °F.

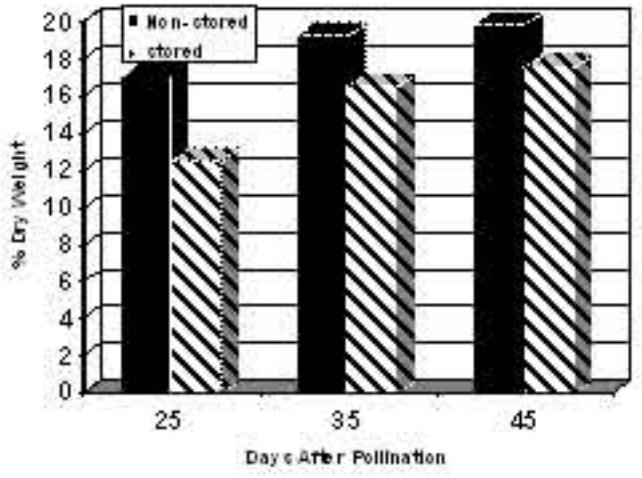
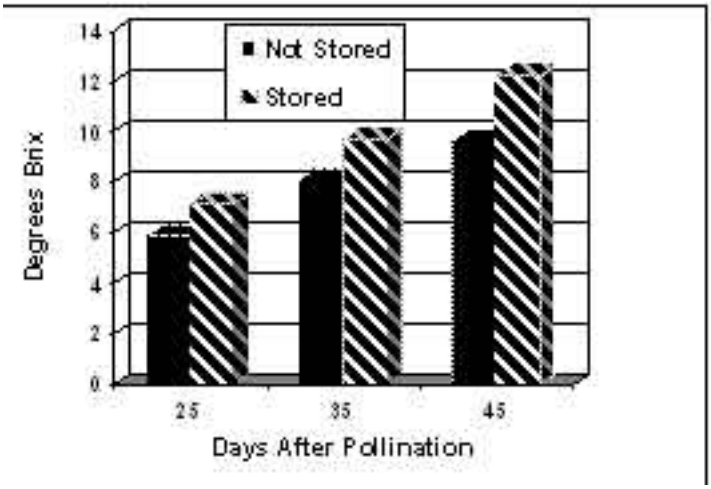


Fig. 2. Brix levels in the variety Tip Top at different harvest dates, with or without 10 days storage at 70 °F.



Post maturation changes occur in stored fruit. There is a steady 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 oF 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 considered 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 they are usually not harvested prematurely before seed fill is complete. With buttercup/kabocha varieties, it is actually desirable to harvest them before complete seed maturation, about 40 to 45 days after fruit set when the fruit is still bright green. The rind is harder so there is less damage to the fruit surface during harvest, and in turn, less chance for disease entry during subsequent storage. 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. In addition, 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 orange as it would be at maturity. If these immature squash are sampled, they are found to have very low sugar levels. If such immature squash are left in storage, then starch is depleted both by respiration and movement of nutrients from the flesh to the developing seed. 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 inherent 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.

Therefore, a grower can estimate the approximate time when fruit set occurred, and delay harvest until about 50 days 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, and these will shortly be available to growers and home gardeners. High Mowing Organic Seeds will offer a sweet dumpling type hybrid, Sugar Dumpling, in their 2007 catalog. Johnny's Selected Seeds will hopefully be selling seeds of one of my new mini-acorns in 2008. All of these new UNH hybrids will have powdery mildew tolerance, and this is a big plus in reducing variability in quality because the vines will stay healthy until complete fruit maturity with minimal use of fungicides.

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

EXOTIC PEST DETECTION: THE COOPERATIVE AGRICULTURAL PEST SURVEY

Massachusetts Department of Agricultural Resources works together with the USDA, APHIS, PPQ and UMass to detect exotic pests that are new to the United States or Massachusetts. I scout fields and forests and check pheromone traps looking for anything new. If we can detect new insects, diseases, and weeds early, eradicating or limiting the spread of new pests is possible. Here are the highlights on some of the insects we are searching for this year.

Swede Midge

The swede midge (*Contarinia nasturtii*) is an introduced pest of brassicas that has been found in 6 counties in western New York, in 23 counties in Ontario, Cananda and 22 counties in Quebec, Canada. This is the second year of the swede midge survey in Massachusetts. Two traps baited with a pheromone to attract the male swede midge were placed at 8 farms and 4 community gardens. Community gardens were targeted because a single male swede midge was found in the Northampton Community Garden last year. The gardeners have been asked not to move soil or brassica transplants out of the garden to prevent spread of swede midge. The swede midge could hitch a ride as an egg or larvae on a crucifer transplant or in the soil of a plant as a pupa. So far this year no swede midge has been found in Massachusetts but we still have a few more traps in the field to screen.

While swede midge will attack any member of the brassica family including cruciferous weeds, the highest levels of damage have been seen on broccoli and Asian greens. Larval feeding can cause the following symptoms: brown corky scarring especially along petioles, distorted and twisted leaf stalks, death of the growing point resulting in a blind head, crinkled and crumpled heart leaves, deformed and asymmetrical heads, and multi-headed or multi-stemmed plants resulting from destruction of growing tip.

Swede midge larvae and feeding damage on cauliflower. (Mao Chen, cornell university, www.forestryimages.org)

This damage can be mistaken for common physiological or nutritional problems so swede midge needs to be found to confirm the diagnosis.

Summer Fruit Tortrix Moth

The Summer Fruit Tortrix Moth (*Adoxophyes orana*) feeds on a wide variety plants with a preference for Rosaceous plants especially apple and pear. This tortricid moth is a native of Europe that is not known to occur in North America. This moth is reported to feed and develop on more than 50 plant species in multiple families includ-

Summer fruit tortrix moth
(Hania Arentsen, Garden Safari, www.forestryimages.org)

ing fruits, forest trees, and ornamentals. This moth feeds on both the leaves and fruits of tree. The first generation caterpillars cause the greatest economic loss to fruit production. Larvae are 18-22mm long and yellowish-green in color and may leave point-like holes in the fruit tissue from sting-feeding or extensive areas of damage from grazing on the fruit surface. A pheromone is available to lure adult male moths into a sticky trap. These traps were placed in 12 abandoned and active orchards in western MA. No summer fruit tortrix moths were recovered this year.

The Wood Borers

Wood boring insects have arrived to the United States though solid wood packing materials in shipments of foreign goods. Asian longhorned beetle (*Anoplophora glabripennis*) and the Sirex woodwasp (*Sirex noctilio*) are two of the woodboring insects included in our surveys.

The Asian longhorned beetle (ALB) was introduced to North America in solid wood packing material from China. ALB was first reported by a resident of Brooklyn, NY in 1996. Since that time it has been found in Chicago (1998), New Jersey (2002), and Ontario, Canada (2003). Eradication projects are being conducted at these locations. Eradicating ALB may cost more than 300 million dollars and take beyond 2009 to complete.

The Asian longhorned beetle is a large (1-1 ½ inches long), shiny, black beetle with white splotches on its back. Its antennae have alternate black and white bands and are 1 to 2 ½ times the insect's body length. Look for damage caused by the Asian longhorned beetle on hardwoods including maples, horse chestnut, willow, poplar, and elm. Exit holes created by the beetle are approximately ½ inch in diameter and have well-defined edges, resembling precisely drilled holes. There are no pheromone traps for ALB so we have 2 methods to look for them. 1) Go to areas where solid wood packing materials have entered Massachusetts and look for signs of ALB. 2) Investigate ALB sightings reported by the public.

Asian longhorned beetle with exit hole and dime for size comparison (USDA APHIS PPQ Archives, www.forestryimages.org)

Male Sirex woodwasp
David R. Lance, USDA APHIS PPQ, www.forestryimages.

The Sirex woodwasp is a native of Europe that attacks pine trees. The adult wasp has a steel-blue, cylindrical body and is ½ to 1 ½ inches in length. Males have a patch of orange on their abdomen. The female wasp injects a toxic mucus and fungus into the trees when she oviposits eggs. The mucus and fungus work together to kill the tree and provide a suitable environment for the developing wasp.

The first detection of the Sirex woodwasp in the United State was in 2004 in Oswego County, New York. As a result of surveys in 2005 and 2006 conducted by state and federal officials, the Sirex woodwasp has been detected in an additional 19 counties in New York and 2 counties in Pennsylvania. The Sirex woodwasp has also been reported from Ontario, Canada. In Massachusetts, the MA Dept. of Agricultural Resources and MA Dept. of Conservation and Recreation are cooperating with the USDA, APHIS and U.S. Forest Service in conducting Sirex surveys. An alpha/beta-pinene mixture is used to lure the insects into a trap. To date we have found no S. noctilio specimens in traps in Massachusetts.

For more information and photos of all these pests and more visit our website: http://massnrc.org/pests/. If you have any questions or have found one of these insects, feel free to contact me via phone [413-577-0809] or email [Julie.callahan@state.ma.us].

-Julie Callahan, Massachusetts Department of Agricultural Resources

NORTHEAST SARE PARTNERSHIP AND FARMER GRANTS

Northeast Sare offers grants to agricultural professionals who work directly with farmers. Partnership Grants explore sustainable production and marketing techniques using on-farm research and demonstrations. Grants are capped at $10,000 and the postmark deadline is December 5, 2006. You can get application materials electronically by going to www.uvm.edu/~nesare, or call (802) 656-0471 to request a printed copy. If you have questions about the Partnership Grant program, visit the website, call, or send an email to *nesare@uvm.edu.*

The Northeast SARE Farmer Grant application is now available online at www.uvm.edu/~nesare. Also available is a guide, "How to Write a SARE Farmer Grant Application." This booklet explores what makes a proposal competitive. You can download the guide and the application from the web site or request printed versions by calling (802) 656-0471. If you have questions about the Farmer Grant program, visit the website, call (518) 733-0602, or send an email to *farmergrants@taconic.net*. The postmark deadine for Farmer Grant applications is December 22, 2006.

REMINDER:Next Conference - November 1, 2, 3, 2006 at the Centrum Centre, Worcester, MA

A 28-year tradition has developed into an event attracting over 2,000 growers and garden retailers. The University of Massachusetts Extension Floriculture Program along with other New England State Universities and Growers' Associations join New England Floriculture Inc. as sponsors to feature 70 educational programs and 200 trade show booths. This conference is held every other year.

For conference highlights and more information see http://*www.negreenhouse.org*

Vegetable Notes, Ruth Hazzard, editor and Kate Reidel, 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.