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Organic Pumpkin and Winter Squash Marketing and Production

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This publication is an overview of organic production and marketing of the cucurbits (*Cucurbitaceae* family) commonly known as "pumpkins" or classified as "winter squash." Production includes planting and soil management, weed control, and management of insect pests and diseases, as well as post-harvest protocols. Marketing looks at culinary varieties and varieties sold as ornamentals. A resource list provides related information.

Contents

C. maxima *on the vine. Photo courtesy of NRCS.*

Introduction

What is a pumpkin? What is a squash?

The terms "pumpkin" and "squash" do not correspond to any scientific taxonomy. (See Goldman, 2004.) Four species of cucurbits—distinguished by their stem structure and the fact that they do not normally cross-pollinate—include all the "pumpkins" and "squashes."

- *C. moschata*
- *C. mixta*
- *C. pepo*
- *C. maxima*

Each species has among its types one (or more) commonly called a "pumpkin."

Most pumpkins that fit the popular image of the round, orange, 15- to 25-pound, ribbed, stringy-fleshed, seedy fruit dotting farm fields after frost has killed the vines are *not* the type used today for human food—either fresh or canned. These pumpkins, typified by the Connecticut Field variety, are grown almost exclusively as ornamentals, although the Small Sugar (or New England Pie, 5 to 8 pounds) is commended by some for its flavor. Local tradition and common usage may dictate that a particular variety is called a squash in one area of the country and a pumpkin in another.(Reeves and

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Halloween crop art. NCAT photo by K. Adam.

Related ATTRA publications

Biorationals: Ecological Pest Management Database

Cucumber Beetles: Organic and Biorational Integrated Pest Management

Downy Mildew Control in Cucurbits

Organic Standards for Crop Production: Highlights of the USDA's National Organic Program Regulations

Principles of Sustainable Weed Management for Croplands

Squash Bug and Squash Vine Borer: Organic Controls

Glasener, 2004; Stephens, 2009; Wolford and Banks, 2010)

Pumpkins are now associated more with fall decorations than with winter food supplies. However, there is a market for the organic Halloween pumpkin.(Chait, 2009)

Certain types of "pumpkins" of superior culinary quality are commercially canned, technically fitting USDA standards and canning regulations for pumpkins and winter squash (USDA, 1957; USDA, 1983). Pumpkin varieties for commercial canning are all *C. moschata*, tan-colored (rather than orange), firm-fleshed, and elongated. Walter Reeves (a former Georgia Extension agent) of "Gardening in Georgia, WalterReeves.com" says that the processing varieties Dickinson Field, Kentucky Field, and Buckskin (a hybrid) are "for all practical purposes" identical. University of Illinois Extension (*http://urbanext.illinois.edu/pumpkins/varieties.cfm)* refers to processing pumpkins as "buckskin-colored" and includes the Chelsey hybrid variety.(Wolford and Banks, 2010) Kathleen Delate's Gerber trials at Iowa State found varieties of *C. moschata* ideal for the organic baby food market.(Delate, 2003; Adam, 2006)

Rohrbach Farm

After the 1993 flooding of the Mississippi–Missouri River system, Mark Rohrbach of the Rohrbach Farm, 60 miles north of St. Louis, planted several acres of various types of ornamental pumpkins on low-lying fields formerly planted in soybeans, and for a few years the Rohrbachs operated a popular agriculture-entertainment venture. The colorful pumpkin "crop art" attracted busloads of visitors to buy pumpkins and decorative squash—as well as souvenirs, food, and drink—at the on-farm store. All pumpkins left over after the fall holiday season became compost.

Additional *C. moschata* types called "pumpkins" include the Calabazza pumpkin (West Indies), Seminole pumpkin, and the Large Neck pumpkin (identified as the ancestor of butternut squash). Moschatas are typically necked and characterized by fine-grained flesh and excellent flavor.

C. mixta "pumpkins" include the Southwest's Green-striped Cushaw (so designated because its flavor fits the pumpkin ideal). The Orange-striped Cushaw, however, is called a squash.

C. pepo pumpkins such as Connecticut Field vary greatly in size and color. Miniature pumpkins used as table decorations, often in arrangements with miniature ears of colored corn, are *C. pepo*. Since some other members of this species have light-colored rinds (e.g., spaghetti squash), it is not surprising that most "white pumpkins" are *C. pepo.* Cultivars include albino pumpkin, ghost pumpkin, Snowball, Lumina, Baby Boo, and Cotton Candy.

The Long Island seed project (LISP, *www.liseed.org/whitepepo.html*) provides an interesting history of white pumpkins, beginning with the introduction of Cotton Candy by the Rupp Seed Company. The cultivar Casper is one of a few *C. maxima* white pumpkins.

The *C. maxima* group is best known for giant varieties of pumpkins and squashes. Atlantic Giant began with 18th-century farmers on the Atlantic seaboard crossing Kabocha squash with a number of *C. maxima* hubbard varieties. Those crosses are the source of the giant pumpkins raised to compete in "biggest pumpkin" contests today.

Cucurbitaceae—the cucurbit family, consisting of gourds, melons, cucumbers, and squashes (including pumpkins)—originated more than 9,000 years ago in Central and South America, the first of the "Three Sisters" (corn, beans, squash) to be domesticated. Squash was grown primarily for its edible seeds, since the flesh of early types

was bitter, like that of their present-day wild relative, the Buffalo Gourd, *C. foetissima,* of the southwestern U.S.

Long before Europeans set foot in the New World, native South Americans cultivated improved varieties, seeds of which migrated north, along with specialized native pollinator bees.(Cane, 2009) Squash and pumpkins became a mainstay for the early colonists, who found many culinary and medicinal uses for them. The first pumpkin "pie" was actually a pumpkin with its top cut off, seeds removed, and the cavity filled with a mixture of apples, sweetener, spices, and milk. The top was replaced and the entire thing was baked.

How is a winter squash distinguished from a summer squash?

The stage of maturity when the fruit is ordinarily eaten is what commonly distinguishes a winter squash from a summer squash. Summer squashes such as zucchini, yellow crookneck (and the improved straightneck variety), patty pan, and cocozelle are practically inedible when mature.

Although winter squashes show peak flavor and texture when mature (and keep for a long time), they can also be consumed as immature fruits. In the 18th and 19th centuries, Americans on the frontier made a substitute for apple pie from immature pumpkins. With the proper spicing, such pies are indistinguishable from those made with the tree fruit. A search through older cookbooks reveals recipes for stuffed mature zucchini and its use in relishes, breads, desserts, and even pickles.

Various types of white pumpkins. NCAT photo by K. Adam.

Marketing Considerations

Table 1 below shows that production was steady until 2004 when it increased by almost 20% and has held steady since then. In 2008 alone, 43,400 acres of pumpkins were harvested for the fresh market and processing. Current statistics lump together culinary and ornamental uses. Total production was 10.66 million pounds, valued at $13.20 per cwt—a marked price increase from the previous year.(USDA, 2009)

Rain and drought in parts of the U.S. affected pumpkin and winter squash production from 2005–2008. Ranked by value of production, most pumpkins are raised in New York, Ohio, Illinois, California, and Pennsylvania.

Table 1: Annual U.S. pumpkin production, 2001 through 2008 (USDA/NASS)

Pumpkins (all types and uses)

	Acreage				
Year	Planted (All Purposes)	Harvested (All Purposes)	Production (in cwt.)	Price per Unit	Value of production (in $1,000)
2008	45,600	43,400	10,663	13.20	140,765
2007	49,300	45,900	11,458	10.80	123,519
2006	47,800	43,700	10,494	9.98	104,623
2005	47,800	43,800	10,756	9.64	103,651
2004	49,200	45,000	10,135	9.04	91,609
2003	43,500	39,300	8,151	9.92	80,203

Source: U.S. Department of Agriculture (USDA), www.nass.usda.gov/index.asp *("Crops and Plants"->"Fruits"->"Pumpkins"->Search)*

USDA/NASS does not collect separate statistics on summer squash and winter squash. Total squash production in 2008, from 42,400 harvested acres, was 6.69 million pounds, valued at $30.50 per cwt., for total return of $204.3 million—suggesting that culinary squashes provide gross returns more than 30% greater than returns for predominantly ornamental cucurbits.

Organic pumpkin farm statistics

Based on a sample of 1460 pumpkin farms listed on *localharvest.org*, there may be 75 or more farms in the U.S. that market certified organic ornamental pumpkins. Of the remaining 1,385 pumpkin farms, most advertise use of a substantially organic production method—or claim some alternative type of certification.

Prospective growers of pumpkins or winter squash should try to locate a nearby farm and make arrangements to visit it. For an in-depth look at no-till pumpkin production, see "Farm Profile: No-till Pumpkins at Cedar Meadow Farm," below, and the farm's website.

Marketing for the table

If you are planning to raise organic pumpkins or squash, it is best to have a clear idea of your potential marketing channels from the outset. Some cultivars are most suited to marketing as ornamentals; others are best marketed for culinary purposes. Some of the best for organic growers are those closely related to the fine-textured and -flavored butternut squash (*C. moschata*)—as suggested by University of Illinois pest resistance rankings.(Grupp, 2005) Many butternut types have only a moderately longer growing season than *C. pepo* and are more suitable for commercial organic production.(Reiners and Petsoldt, 2009; Delate, 2002, 2003; Van Tine and Verlinden, 2003)

Sales display, historic farm, Missouri. NCAT photo by K. Adam.

Risk of crop loss is significantly increased for long-season varieties (*C. mixta, C. maxima*), due to increased exposure to drought, pests, and diseases; however, Kabocha and Red Kuri genetics have provided some insect and disease resistance for contest pumpkins. These Japanese types have excellent taste and texture, as well, and Red Kuri matures in 90 days, unusual for *C. maxima.*

Besides having ornamental and culinary uses, pumpkins have long been used as stock feed. Recently, their rough fiber has suggested their inclusion in diets of household pets (dogs and cats) with digestive problems (upon recommendation of a veterinarian, of course).

If you are growing on contract, the processing company generally specifies the variety to plant—sometimes providing seed and growing guidelines. On-farm, value-added processing is rarely attempted, since additional organic handler certification would be necessary to produce a processed organic product on the farm.

Marketing as decorations

The one obvious bright spot in on-farm, value-added marketing is decorative cucurbits sold in connection with a farm entertainment business. Besides conventional "pumpkins" in various sizes, ornamental cucurbits can include any with an interesting shape, color, or pattern. Some necked squashes, can (like gourds) be displayed as animals, birds, etc. Gooseneck squash is a type of cushaw (*C. mixta*) closely related to the calabash. Turban squash are popular items for farm stands. (See the illustrated "Squash Glossary" of the on-line food magazine *The Nibble, www.thenibble.com/reviews/main/vegetables/squash-glossary.asp.*) Carnival (*C. pepo*) is basically a striped form of acorn squash. Giant Hubbard types are used mainly for ornamental purposes in the U.S., although they are sold in cut sections in Caribbean and Central American food markets.

General Production Information

Information on conventional production methods is available from the Cooperative Extension

Service in most states. Much of this information is useful to organic growers, as well. However, information on organic soil fertility and organic weed, insect, and disease management is not so readily available. The ATTRA publication *Organic Crop Production Overview* is recommended to those seeking a better understanding of the history, philosophy, and practices of organic farming.

Organic farmers rely heavily on crop rotations, crop residues, animal manures, legumes, green manures, composts, and mineral-bearing rock powders to feed the soil and supply plant nutrients. They manage insects, weeds, and other pests with mechanical cultivation and cultural, biological, and biorational controls. They do not use conventional commercial fertilizers, synthetic pesticides, or synthetic growth regulators. Insect pollination of cucurbits is the norm, but hand pollination is possible.(Cane, 2009)

Farm Profile: No-till pumpkins at Cedar Meadow Farm

Cheri and Steve Groff's farm, Holtwood (Lancaster County), Pennsylvania, is a main source of ornamental pumpkins for fall sales.

Nearly one-half of pumpkin acreage there is in no-till cultivation. Groff considers soil quality the foundation of success. He recommends several ways for farmers to improve their soil. While Cedar Meadow Farm is not certified organic and uses some pesticides, the following practices can be applied in organic farming.

- Minimize erosion.
- Use cover crops.
- Practice crop rotation.
- Use fertilizers that enhance soil building.
- Minimize the number and weight of field operations.
- Minimize tillage.
- Minimize the use of pesticides. (In organic production, use only approved pestcides, and then only as a last resort, when cultural and biological strategies have failed.)

Groff has been raising no-till pumpkins since 1994, as part of his overall no-till vegetable strategy. He frequently points out the cleaner fruit that results from pumpkins maturing on crop residues or a cover crop.

The foundation of Groff's system is fall-seeded establishment of the cover crop on pumpkin fields. His favorite mixture is 25 pounds of hairy vetch and 30 pounds of rye—providing 40 to 50 pounds of nitrogen (N) per acre. Straight vetch residue decomposes too quickly to protect the pumpkins as they mature. Rye alone will not provide enough N. Although no-tilling into residues of other previous crops has been successful, Groff feels that it loses the advantages of a seeded cover crop.

The cover crop is mechanically controlled with a modified 10-foot Buffalo Rolling Stalk Chopper. Groff also uses Roundup (not allowed in organic production). The stalk chopper has two rows of rollers, four in front and four in back, with eight 23-inch blades per roller. The turning rollers (with their parallel linkage so that each roller floats independently) crimp the cover and push it down. They can be run at 8 to 10 miles per hour. The machine is fast and economical, in Groff's view.

While in a bad year Groff uses more pesticides, he has been successful in eliminating all herbicides when he has a good thick mulch cover. A heavy cover is also ideal for organic growers.

Direct seeding

Groff direct seeds pumpkins 1 to 1.5 inches deep, with a customized Kinze no-till planter with Monosem row units, Rawson coulters, Yetter parallel linkage, Martin spading closing wheels, and foam markers. Seeds are planted in 50-foot rows. The leading 13 wave 1-inch coulter is set on the row to cut 4 inches deep, to give a nice clean cut through the residue. Row cleaners are set so that they don't leave much soil showing on the row.

Alternatively, Groff can plant seedlings into killed cover crops with a customized RJ Equipment carousel no-till transplanter. This transplanter has a spring-loaded, 20-inch turbo coulter, followed by a double-disk opener and a short shoe (to hold the transplant). Angled press wheels tuck the soil firmly around the plant and leave virtually no soil showing afterwards, preserving full mulch coverage for the whole season.

Fertilizer management

Groff side-dresses, broadcasting 40 to 80 pounds of dry N (depending on the contribution of the cover crop) approximately 3 weeks after planting, and does some foliar feeding as well. He sometimes uses supplemental fertilizer (mainly ammonium sulfate, prohibited in organic production).

Avoiding soil compaction is a major aim of no-till. After a few years, Groff reports, soil becomes much less susceptible to compaction as cover crops build up the soil structure.

Lime and manure trucks are scheduled on the field at the least susceptible times, causing as little surface disturbance as possible.

Groff controls perennial weeds with intensive crop rotations and occasional spot spraying (not allowed in organic production). A roller-crimper machine can be used if the rye cover crop is allowed to lodge before rolling and planting. A cover crop will not reliably eliminate stubborn perennial weeds such as thistles, bindweed, hemp, and dogbane. They must be eliminated before going to seed. No-till helps keep the seeds of stubborn perennials buried deep enough not to sprout.

For more information, especially about common mistakes, see the Groff website *(www.cedarmeadowfarm.com?PublishedArticles/Proceedings/Proceedings03.html)*, as well as *Real Life Experiences in the Uses of Cover Crops (www.cedarmeadowfarm.com/PublishedArticles/Proceedings/Proceedings05.html)* and *What Growers Can Do To Improve Soil Quality (www.cedarmeadowfarm.com/PublishedArticles/Proceedings/Proceedings06.html).*

Soil and Fertility Management

Squashes prefer a well-drained sandy loam rich in organic matter and with a pH of 6.0 to 6.5. The Cooperative Extension Service or a soil-testing laboratory can provide nutrient recommendations based on soil tests. Conventional production recommendations (when soil-test results are not available) are to apply 50 pounds of nitrogen (N), 100 pounds of phosphorus (P), and 100 pounds of potassium (K) per acre before planting, with additional applications of 25 pounds N and 80 pounds K per acre at 3 and 6 weeks.(Peet, 2001)

The following website from the University of Georgia, *http://www.caes.uga.edu/publications/pubDetail.cfm?pk_id=7170*, can assist in converting conventional recommendations to organic fertilizer rates.(McLaurin and Reeves, 2009) Or call the ATTRA information line (800-346-9140) for a print copy of University of Georgia Circular 853.

Cucurbits are warm-season annuals, preferring 75° to 86°F daytime temperatures and around 64°F at night.

Many organic growers use a winter annual legume cover crop to supply some of the nitrogen requirements, increase soil health, and suppress weeds. The system has many benefits, as well as several constraints. For more information on soil fertility, cover crops, and related topics—including no-till options—visit the ATTRA website at *www.attra.ncat.org*. Specifically, see *Sustainable Soil Management* and *An Overview of Cover Crops and Green Manures.*

Planting

Cucurbits are warm-season annuals, preferring 75° to 86°F daytime temperatures and around 64°F at night. The seeds germinate most rapidly when the soil temperature is 86°F. Winter squash and pumpkins can be direct-seeded as soon as the soil temperature reaches 60°F. They need 90 to 120 frost-free days to reach maturity. Plastic mulches of various colors can be used to increase the soil temperature and speed early-season plant growth. The ATTRA publication *Season Extension Techniques for Market Gardeners* discusses pros and cons of using plastic mulches—including disposal issues in organic production.

Greenhouse-raised transplants are commonly used in short-season parts of the U.S. Home gardeners sometimes decide to start seeds in a greenhouse for later transplanting, using paper or other fiber containers that can be easily peeled away from the roots, or tapered pots so that plants can be easily slipped out. Using one container for each seedling ensures a minimum of root disturbance. Increased labor and materials and waste disposal raise serious questions about using this method for any but the smallest scale of production. In certified organic production, organic potting mix must be used.

Information about depth of seed placement and spacing is available from seed dealers. In general, seeds are placed about one inch deep, either in hills of several seeds, or in rows. If you are using a hill system, plant three to five seeds per hill, then thin to one to three plants per hill. The hills can be spaced as closely as 4 to 5 feet apart or as much as 8 to 12 feet apart (to allow additional space for later mechanical cultivation). If you plant in rows, perhaps with a mechanical seeder, two to three pounds of seed per acre should be sufficient to achieve the recommended 3,000 to 4,000 plants per acre.

Weed Management

Mechanical cultivation and hand hoeing before the plants begin to vine are time-honored methods of weeding. Cultivation should be shallow to avoid injuring roots. Mulches, either plastic or from plant residue, are sometimes used to suppress weeds. When using a plant-based mulch, avoid using hay because it can harbor weed seed. Drip irrigation works well with winter squash production because it is in the ground for the entire growing season. The no-till cover-crop system mentioned earlier is one way to provide a weed-suppressing mulch of plant residues. The ATTRA publication *Principles of Sustainable Weed Management for Croplands* is cited, along with other sources, in the 2009 Cornell Cooperative Extension database *Integrated Crop and Pest Management Guidelines for Commercial Vegetable Production: Cornell Organic Guide for Cucumbers and Squash.* (Reiners and Petsoldt, 2009)

Many growers have successfully used tractor-mounted tine weeders on squash.

The University of Vermont has produced a 75-minute video, *Vegetable Farmers and Their Weed Control Machines,* showing farmers demonstrating the use of machines listed below for weed control.(Grubinger and Else, 1997)

- Rolling cultivators
- Finger weeders
- Basket weeders
- Rotary hoes
- Batwing shovels
- Field cultivators
- Bezzerides tools
- Flex-tine weeders
- Sweeps
- Custom flame weeders
- Stale seedbed rollers
- Backpack flame weeders
- Tractor-mounted flame weeders

Pest Problems

Insects

Pumpkins and winter squash are among the most resistant of the cucurbits to certain diseases and insect damage.

Squash bugs (*Anasa tristis* DeGeer) are not often considered a severe pest of large-scale cucurbit production, probably due to the absence of suitable overwintering sites in well-managed crop fields and because the bug's effects are diluted by the vast acreage. Small fields and home gardens are commonly damaged, however.(Capinera, 2003) Squash vine borer, if precautions are not taken, can kill the vines before the fruits mature. Cucumber beetles are also a problem because they spread bacterial wilt (see below). Positive identification of such pests should be sought locally (usually from your county Extension). For an extensive discussion of strategies for dealing with these insect pests in certified organic production systems, see the ATTRA publications *Squash Bug* and *Squash Vine Borer: Organic Control* and *Cucumber Beetle: Organic Control.*

To avert aphid infestations in sustainable and organic agriculture, growers find that prevention strategies are most effective. These include cultural techniques such as use of physical barriers, mulching, crop rotation, border crops, and cover crops. Both synthetic and living mulches have been shown to reduce populations of alate (winged stage) aphids on plants, thereby reducing the incidence of aphid-transmitted viruses. Crops receiving high concentrations of nitrogen are more susceptible (attractive) to aphids; therefore, slow release fertilizers may help to avoid high aphid infestations.

Other pest management strategies (Liburd and Nyoike, 2009) include monitoring and trapping, using parasitods, predators, or pathogens, and applying horticultural oils.

See ATTRA's "Biorationals: Ecological Pest Management Database," *www.ncat.org/attra-pub/biorationals,* for information on environmentally friendly pest management.

Diseases

Downy mildew, one of the most serious foliar diseases of cucurbits, is caused by the fungus *Pseudoperonspora cubensis.* It thrives in damp weather when temperatures range between 45° and 55°F for more than a month. It is more of a problem in cooler areas than in warm areas. Symptoms first appear as yellow patches on the leaves that then become tan or brown with white or gray downy fuzz underneath. As the disease worsens, the patches turn sooty black. As the leaves die, the plants may also shrivel and die. Fruit quantity and quality are reduced.

To avoid downy mildew, plant tolerant cultivars, grow vines with plenty of space between them, spray vines with compost tea when conditions are right for the disease to occur, and practice a three-year rotation. For more details, see the ATTRA publications *Downy Mildew Control in Cucurbits* and *Notes on Compost Teas.*

Powdery mildew is another major foliar disease of cucurbits. Several different fungi cause it. Symptoms are a whitish, talcum-like growth on both the leaf surfaces and stems. Warm weather—coupled with high humidity, rainfall, or dew—activates dormant spores that infect the leaves. The disease is most severe when days are hot and nights are cool. Older, fruit-bearing plants are affected first. Infected leaves usually

wither and die. In extreme cases, the entire vine will die.

To avoid powdery mildew, plant resistant cultivars, control insects, avoid overhead watering, spray vines with compost tea or a baking soda solution, remove and destroy vines at the end of each season, and rotate crops. See the ATTRA publication *Use of Baking Soda as a Fungicide* for more information.

Black rot (on fruits) is also called gummy stem blight (on leaves and stems) and is most common in the southern U.S. It is also found in cooler regions, especially on winter squash and pumpkins. The fungus *Didymella bryoniae* causes black rot. It lives on dry plant material or in the soil, where it can survive for more than a year. Free water on leaves for at least one hour is necessary for infection, and further continuous leaf wetness is required for lesion expansion. Fruits are infected either through wounds or by the extension of leaf lesions. Black rot can cause loss of squashes and pumpkins in storage.

Diseased fruits and vines should be immediately bagged for off-site disposal and not composted.

To avoid black rot, manage irrigation to minimize moisture on leaf surfaces, and use a minimum two-year crop rotation. "A moisture film from dew, rain, or overhead irrigation is necessary for spore germination." (Miller et al., 1996)

Angular leaf spot is a bacterial disease caused by *Pseudomonas syringae* pv. *lachrymans*. This disease occurs on all continents on cucumbers, gherkins, muskmelons, pumpkins, squash, vegetable marrows, and watermelons. The bacterium causes spotting on the leaves, stems, blossoms and fruit. It favors warm, humid climates and can cause fruit to drop or become disfigured. Strategies for control:

- Use disease-free seed
- Use hot water treatment on seeds known to be affected by the bacteria
- Assume three-year old seed to be disease free
- Rotate away from all hosts for two years.
- Avoid excessive nitrogen
- Do not plant in fields that receive runoff water from other cucurbit fields
- Avoid overhead irrigation
- Avoid working in the fields or harvesting while the plants are wet
- Cut, rather than tear, fruit from stems to avoid post-harvest rots

The symptoms of mosaic viruses vary but include mosaic patterns, leaf mottling, ring spots, blisters and fruit deformation. Besides the use of certified virus-free seeds, control measures are aimed at minimizing the presence of cucumber beetles. Strategies for controlling mosaic viruses in pumpkins and squash:

- Control cucumber beetles and aphids
- Eradicate biennial and perennial weeds
- Plant resistant varieties
- Remove infected plants when symptoms first appear
- Since later plantings (mostly in the South) are at greater risk due to build-ups of insect populations and disease, plant them as far away as possible from early plantings

Bacterial wilt is caused by the bacterium *Erwinia tracheiphila*, which overwinters in the bodies of the striped and 12-spotted cucumber beetles. In the spring, the beetles emerge from the ground and feed on young plants, introducing bacteria into the leaves or stems. The bacteria reproduce in the water-conducting vessels, producing gums that interfere with water transport. The beetles and bacteria are so intimately related that controlling the beetles will control infection by the bacteria. Once infection has occurred, however, no control is possible, and wilting plants should be removed, if practical. The disease is not seed-borne.

Local county Extension offices or land-grant universities can help in positively identifying plant diseases.

Harvest, Culling, Curing and Storage

Winter squash is judged ready to harvest by the hardness of the shell—it should not be able to be penetrated with a fingernail or have tinges of green (if a light-colored squash). Another indicator is that vines are mostly dead.(Blanchard, 2000) Culinary types that are damaged by insects or machinery should be culled for canning or freezing. Ornamental types can be composted or possibly used for animal feed. Diseased fruits and vines (at whatever stage) should be immediately bagged for off-site disposal and not composted.

For long-term storage, undamaged winter squash and pumpkins are cured for 7 to 10 days at 80° to 85°F. In general, longest term storage

is achieved at 50°F and 60% relative humidity. (Sargent and Treadwell, 2009)

Conclusion

Winter squash and pumpkins, native to the Western Hemisphere, provide many marketing opportunities for growers. Specific varieties are grown for commercial canning, others for winter storage, ornamentals, or immediate use. At least 75 farms in the U.S. grew organic pumpkins in 2009. The largest U.S. market for most types of pumpkins and winter squash is as ornamentals and in entertainment farming. Pumpkins and winter squash are among the most resistant of the cucurbits to insect and disease damage. Specific control strategies are used in organic production.

NCAT photo by K. Adam.

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Notes

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