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Organic Pumpkin and Winter Squash Production

Current Topic

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Background

Winter squash, pumpkins, and gourds all belong to the genus *Cucurbita*. Four species—discernible by their stem structure—are commonly grown in the United States (1). Production practices are essentially the same for all.

Cucurbita maxima has a short, corky, round stem and tends to be more yellow than orange. The species includes several large pumpkins and most winter squash (Hubbard, Buttercup, Banana, Mammoth, and Turban).

Cucurbita pepo is usually recognized as the true pumpkin and includes many pie, jack-o-lantern, and field pumpkins as well as summer squash, acorn squash, and spaghetti squash. Varieties within this group have hard, woody, distinctly furrowed stems. The pumpkins have bright, deep orange skin.

The stems of *Cucurbita moshata* are deeply ridged, pentagonal, and smooth. They enlarge but do not flare next to the fruit. A member of this group is used for most of the canned pumpkin sold in this country. Most varieties are tan and oblong. Cushaw, Winter Crookneck, and Butternut squash are in this species.

Cucurbita mixta was once included with *C. moschata*, but differs in flesh texture and has an enlarged corky stem. It is primarily a processing squash.

Cucurbita species originated over 9,000 years ago in Central and South America, the first of the triad of corn, beans, and squash to be domesticated. Squash was grown primarily for its edible seeds, because the flesh of these early types was bitter-tasting.

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

Pumpkins have slowly faded from the culinary forefront, with the sweet full-flavored squash becoming increasingly popular. Pumpkins are now associated more with Halloween than with winter food supplies.

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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, weed, insect, and disease management practices are not so readily available.

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. The ATTRA publication *Overview of Organic Crop Production* is recommended to those seeking a better understanding of the history, philosophy, and practices of organic farming.

Soil and Fertilization

Squashes prefer a well-drained sandy loam with high organic matter and a pH of 6 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 N, 100 pounds P_2O_5, and 100 pounds K_2O per acre before planting, with two additional applications of 25 pounds N and 80 pounds K per acre at 3 and 6 weeks (2). Should you wish to convert these standard recommendations to organic fertilizer rates, you might consult the University of Georgia Circular 853 *How to Convert an Inorganic Fertilizer Recommendation to an Organic One* at <http://www.ces.uga.edu/pubcd/C853.htm>. To obtain hard copies of Circular 853, contact:

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Roberta Bunker, an organic gardener in Maine (1), places a bushel of well-rotted manure and four shovelfuls of compost under each hill. An old USDA Farmers' Bulletin recommends well-decomposed stable manure applied at the rate of 10 tons or more per acre broadcast and plowed under in the fall (3). ATTRA has a number of publications on soil and fertility that can help you choose and locate organic nutrient sources and establish a sustainable fertility management system suitable for cucurbits and other crops.

Many organic growers use a winter annual legume cover crop to supply some of the nitrogen requirements. The enclosed articles on no-till pumpkin production describe a system for managing winter annual cover crops for increased soil health and weed suppression. The system has many benefits, as well as several constraints. Pennsylvania farmer Steve Groff, who practices and advocates no-till vegetable production, offers a video showing how the system works for him (4). Though Groff is not an organic producer, his information is highly relevant and can be readily adapted. For more information on no-till options, request the ATTRA publications *Conservation Tillage* and *Pursuing Conservation Tillage for Organic Crop Production*.

Planting

Cucurbits are warm-season annuals, preferring 75° to 86°F daytime and 64°F nighttime temperatures. 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. See the ATTRA publication *Season Extension Techniques for Market Gardeners* for details on plastic mulches.

Pumpkins and squashes, like other cucurbits, are not easy to transplant. If you decide to start seeds in a greenhouse for later transplanting, use 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. Use one container for each seedling, so that it can be set out with a minimum of root disturbance. Or start your plants in peat pots that can be planted pot and all. In certified organic production, organic potting mix must be used. See the ATTRA publications *Organic Potting Mixes for Certified Production* and *Organic Plug and Transplant Production*.

Information about depth of seed placement and spacing is available from seed dealers. In general, seeds are placed about 1-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 x 5 feet or as much as 8 x 12 feet apart. If you plant in rows, perhaps with a mechanical seeder, 2 to 3 pounds of seed per acre should be sufficient for achieving 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 shallow roots. The video *Vegetable Farmers and Their Weed Control Machines* (5) introduces innovations that make mechanical cultivation easier.

Mulches, either plastic or from plant residue, are used by many growers to prevent weed growth. Enclosed is an article describing plastic mulch and drip irrigation used for pumpkins. The no-till system mentioned earlier is one way to grow a weed-suppressing mulch of plant residues in place.

Insect Pest Problems

Squash bugs (*Anasa tristis*) are *the* major pest for most squash and pumpkin growers. Market gardener and author Steve Salt writes:

> Year in and year out, . . . the Public Enemy Number One of pumpkins (on my farm at least)—causing losses greater than rots, frost, and drought combined—is the squash bug. These pungently odoriferous gray-brown insects lay masses of red-brown eggs on leaves and stems in early midsummer. The eggs hatch into hordes of tiny pale gray nymphs which fan out through the pumpkin patch, sucking sap and (some scientists speculate) possibly injecting a poison into the plants. Plants attacked by even a few squash-bug nymphs wither, and the leaves curl and turn a crispy texture with a characteristic bronze color. Immature fruits on affected plants cease development, and frequently rot or fall prey to cucumber beetle predation. Plants fail to recover even after the nymphs move on in search of fresh victims. Losses can be severe; badly infested fields look like someone has gone through the patch with a flame-thrower.

The ATTRA publication *Organic Control of Squash Bug* offers strategies for dealing with this pest.

Cucumber beetles are another insect pest to watch for. There are several kinds, and they vary in importance around the country. The striped cucumber beetle is about 3/16-inch long, greenish-yellow, with three longitudinal black stripes. The spotted cucumber beetle is the same color but with 12 black spots. These beetles feed on young plants as they emerge and can decimate a planting. They also spread bacterial wilt, a disease that can cause severe plant losses later in the season. Row covers can provide a barrier to cucumber beetles when the plants are young. (They must be removed when plants begin to bloom so that insect pollinators can reach the blossoms.) Natural enemies include soldier beetles, tachinid flies, brachonid wasps, and bats, but they may not be effective in substantially reducing beetle damage. A botanical insecticide, such as rotenone, may be helpful if damage is intolerable. Research done by Cornell University entomologist Michael Hoffmann has shown that fall cultivation, if done while the beetles are still active, can cause more than 40% mortality (6).

Squash vine borers (*Melittia cucurbitae*) appear when vines begin to run. The borer is a fat, 1-inch-long, brown-headed white caterpillar, the larva of a ¾-inch-long moth with dark front wings, clear hind wings, and a red abdomen. The moths lay single eggs in late spring or early summer along the stem near the base of a vine. The larvae emerge in about a week and bore holes to enter the stem. Evidence of borer activity are the small hole and a pile of greenish frass (excrement) beneath the hole. The vine wilts suddenly and dies. Since damage occurs inside the stem, it is difficult to spot and treat. For ways to deal with this pest, see the ATTRA publication *Organic Control of Squash Vine Borer*.

Diseases

Downy mildew, one of the most important foliar diseases of cucurbits, is caused by the fungus *Pseudoperonospora 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 patches on the leaves that start out yellow, 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 whitish, talcum-like growth on both 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 publications *Powdery Mildew Control in Cucurbits* and *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. To avoid black rot, irrigation should be managed to minimize free moisture on leaf surfaces, and a minimum two-year rotation cycle is a must.

Harvest, Curing, and Storage

The enclosed article *Harvest time crucial for winter squash* describes ways to judge ripeness of various types of winter squash. If long term storage is anticipated, winter squash and pumpkins should be cured for 7 to 10 day at 80° to 85°F. In general, longest term storage is achieved at 50°F and 60% relative humidity.

Marketing

Pumpkins and winter squash speak to us of Halloween and Thanksgiving. Major consumers include children and adults seeking the perfect pumpkin for a jack-o-lantern. You can be creative in meeting that market. A harvest festival can bring customers to the farm to pick-their-own pumpkin, participate in a face-cutting contest, or go through a hay-bale maze. See the ATTRA publication *Entertainment Farming and Agri-Tourism* for additional ideas. Both pumpkins and squash are in demand as seasonal decorations in homes and businesses. Thanksgiving pies, roasted seeds, and breads are mouthwatering culinary uses.

The enclosures provide additional details on growing, harvesting, storing, and marketing winter squash and pumpkins.

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2) Peet, Mary. No date. Squash, Gourd, and Pumpkin: Production Practices. 1 p. Accessed online 2/19/2002. <http://www.cals.ncsu.edu/sustainable/peet/>.

3) Anon. 1964. Growing Pumpkins and Squashes. U.S.D.A. Farmers' Bulletin No. 2086. 27 p.

4) Groff, Steve. No-Till Vegetables (video).
Available for $21.95 plus $3 shipping and handling from:
Cedar Meadow Farms
679 Hilldale Rd.
Holtwood, PA 17532
717-284-5154
sgroff@epix.net
http://www.cedarmeadowfarm.com

5) Vegetable Farmers and their Weed-Control Machines (video).
Filmed in New England on the farms of nine vegetable growers. The cost of the 75-minute video is $12 plus $3.75 shipping and handling. It can be ordered from:

NRAES
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http://www.nraes.org

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Includes a detailed description of the Native American corn/beans/ and squash planting system known as the three sisters.

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