



Squash

COMMERCIAL VEGETABLE PRODUCTION

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CLASSIFICATION

Squash (*Cucurbita spp.*) is a member of the cucurbit family, which consists of a number of warm-season vegetables including watermelon, cantaloupe, cucumber, and pumpkins. Squash are classified into several types based on fruit shape and color.

The most common forms of summer squash are yellow and zucchini squash. Yellow summer squash also comes in two forms: straightneck and crookneck. Zucchini squash is green and straight. Other forms of summer squash include patty pan or scallop, which is flat, round and usually white in color, as well as cocozelle or vegetable marrow, which looks much like zucchini squash. Most are bush types.

There is also another broad group of squash called winter squash. Unlike summer squash, which are harvested immature, winter squash are harvested at full maturity and thus have a much longer shelf life (several months up to a year compared with two to three weeks for summer squash). The use of the terms "winter" and "summer" squash are a bit misleading. Both are warm-season crops, but winter squash has traditionally been grown for winter storage. There are several types of winter squash based primarily on fruit shape and texture.

Acorn — Acorn squash are deeply ridged and tapered at one end. They have a dark green rind and a firm yellow flesh. They weigh between 1 and 3 pounds. Both bush and vining types are available.

Butternut and Waltham Butternut — These have cylindrical fruit that often bulge around the seed cavity. They have light tan rinds with orange flesh and are vining in growth habit.

Buttercup and Turk's Turban — These turban-shaped squash have rinds that can be multicolored with green, orange, or gray stripes. The flesh is medium orange.

Spaghetti Squash — This squash is also called vegetable spaghetti. These cylindrical (8 to 9 inches long) fruit have yellow flesh that is stringy.

Hubbard — These are round in general shape but taper to a point at the bloom end. The rind is rough

bluish-gray to green with occasional gray stripes. The flesh is orange-yellow in color.

FERTILIZATION

Squash will grow on a wide variety of soil types with proper management. In all cases, however, the soil should be well drained. Previous crop history should also be considered when selecting a site. Avoid land that has been in cucurbits the previous year. Also check for previous use of long-residual herbicides as well as heavy nematode infestation (your county Extension agent can help in collecting a soil sample for nematode evaluation).

It is recommended that a soil test be performed to determine optimum fertilization for squash production. This will include a test for soil pH, which should be between 6.0 and 6.5. Changing soil pH is a relatively slow process, taking a minimum of two months to occur and usually taking four to six months based on soil texture.

Fertilizer can be broadcast prior to planting or banded (apply 2 inches below and 2 inches to the side of seed or transplants) at time of planting. Because nitrogen is readily leached from soil, it is always recommended. On Coastal Plain soils, nitrogen should be applied at 100 to 120 pounds per acre. On Piedmont, Mountain, and Limestone Valley soils, nitrogen should be applied at 80 to 100 pounds per acre. Table 1 lists typical recommendations for phosphorous and potassium based on soil test reports. Nitrogen is more efficiently utilized if applied in multiple applications. One such method is to apply half of the nitrogen and all of the phosphorus and potassium preplant.

The remaining nitrogen should be applied in two equal applications. The first of these applications should occur when the plants are 8 to 10 inches tall and the second after the first harvest (to maintain production). Squash will also respond well to split applications of potassium.

VARIETY SELECTION

Squash varieties can be either open-pollinated or hybrids; however, open-pollinated varieties generally

are not used in squash production. The former are usually less expensive and widely available; the latter are more uniform and often higher yielding. Before selecting varieties, check with your customers about their needs and preferences. Yellow crookneck types include 'Dixie,' 'Medallion,' 'Supersett'¹, 'Prelude II'², and 'Destiny III'². Yellow straightneck types include 'Early Prolific,' 'Lemondrop L,' 'Goldbar,' and 'Mulpik'¹. Zucchini squash types include 'Senator,' 'Elite,' 'Seneca,' and 'Tigress.' Acorn squash include 'Seneca Autumn Queen (bush),' 'Early Acorn (bush),' and 'Royal Acorn (vine).'

New varieties are constantly being developed. Check with your buyers, seed salespeople, and local county Extension agent for the latest information on new varieties.

PLANTING

Summer squash production in Georgia begins as soon as soil temperatures are warm enough for seed to germinate (minimum 68°F, optimum 70° to 80°F). Summer squash will begin producing in 45 to 55 days from seeding. Summer squash are usually planted every 10 to 14 days to maintain production during the growing season. Although, theoretically, summer squash can be planted throughout the spring and summer up to 60 days before last frost, disease and insect problems generally curtail production during late summer and fall. About 4 pounds of seed are required per acre to plant squash (Table 2). This is based on a spacing of 3 to 4 feet between rows and 12 to 18 inches within rows.

Winter squash, particularly vining types, require 80 to 120 days to mature. About 2 pounds of seed are required to produce vining squash types that are planted with 5 to 8 feet between rows and 2.5 to 5 feet within rows.

Squash also can be seeded or transplanted into plastic mulch with trickle irrigation. These practices can advance harvest by several days and increase yields. Research has shown that reflective mulches also may delay the onset of viral disease symptoms.

WEED CONTROL

Both herbicides and cultivation practices can be used to control weeds. Weed control is important to insure maximum yields. Consult the current *Georgia Pest Control Handbook* or your local county Extension agent for the latest information on available herbicides for weed control in squash.

IRRIGATION

Squash require adequate moisture to produce high yields of quality fruit. About 1 inch of water is required each week during production. On sandy soils, higher

amounts of water may be required with more frequent watering (i.e., $\frac{3}{4}$ inch twice a week).

DISEASES AND INSECTS

There are several methods for controlling diseases and insects. Crop rotation, particularly with pasture grasses and small grains, can help reduce problems (particularly with nematodes). Viral diseases are often eliminated or reduced by planting early before virus-transmitting insects become a problem. Judicious use of pesticides also will reduce or eliminate many insect and disease problems. Consult your local county Extension agent or the latest edition of the *Georgia Pest Control Handbook* for chemical recommendations.

Listed below are several common disease and insect problems you may encounter growing squash.

Powdery Mildew is a fungal disease that appears as a white powdery mildew on the upper leaf surface.

Downy Mildew appears as yellow or brown spots on the upper leaf surface. A gray fungus is apparent on the lower leaf surface, particularly in wet humid weather.

Viral Diseases are the most limiting factor to squash production, particularly during summer and fall months. There are several viruses that cause diseases in squash. Symptoms include a mosaic pattern on leaves that in severe cases causes a shoestring effect. Warty green areas can appear on the fruit of yellow summer squash.

Aphids are soft-bodied insects that often appear in clusters. They are $\frac{1}{16}$ to $\frac{1}{8}$ inch long and may be green, red, brown, or black. They suck plant juices and transmit viral diseases.

Cucumber Beetles are bright yellow beetles with either black stripes or spots on their wing covers. They are about $\frac{1}{4}$ inch long.

Pickleworms are the caterpillar stage of a moth. They are mostly green and up to $\frac{3}{4}$ inch long. Leaving signs of their entry by a small bit of fraise, these insects riddle the fruit with small ($\frac{1}{8}$ inch) holes.

Squash Bugs are $\frac{5}{8}$ inch long flat-backed bugs that damage the plant by sucking plant juices. Masses of orange-yellow eggs can be seen on the underside of leaves. They emit a disagreeable odor when crushed.

Squash Vine Borers are white grublike caterpillars of a moth. They bore into the plant's stem, which they damage by feeding on its interior. This will often result in collapse of the plant.

POLLINATION

Squash have both male and female flowers on the same plant; therefore, pollen must be transferred from the male flowers to the female flowers. With the decline of wild honeybees, growers must supplement wild bee populations with commercial hives. One hive for each acre is adequate. Hives can be placed

¹Precocious yellow gene helps mask virus symptoms in squash fruit.

²Transgenic variety virus resistance from genetic engineering.

throughout a field or along the edges in clusters. Care should be taken to insure shade and adequate water for the hives. Bees among clustered hives will forage further into a field because of competition among the hives.

Care should be taken when using pesticides with bees present. Avoid products that are particularly toxic to bees. Pesticide sprays should be applied only when bee activity is at a minimum in the field; this will occur on overcast days and in late evening.

HARVESTING AND HANDLING

Summer squash for fresh market are harvested every other day or three times a week during peak harvest. The fruit should be 1.5 to 2.5 inches in diameter with a glossy appearance. Squash are harvested with 1 to 1.5 inches of the stem attached. Zucchini squash should be about 8 inches long. Fruit should be harvested before it gets too large and seed becomes hard. Summer squash are not normally stored. They should be marketed as quickly as possible after harvest. If necessary, however, they can be stored for three to four days at 45° to 50°F and 85 percent to 90 percent humidity. However, they tend to deteriorate rapidly after storage.

The USDA has established two grades for summer squash: U.S. No. 1 and U.S. No. 2. U.S. No. 1 grade consists of squash of one variety or of similar varietal characteristics with stems attached. Overall, no more than 10 percent of any lot can exceed the standards (size, damage, shape, etc.) with no more than 5 percent from serious damage and no more than 1 percent of serious damage from decay or breakdown. U.S. No. 2 grade consists of squash of one variety or of similar varietal characteristics with no more than 10 percent of any lot exceeding the standards. In addition, only 1 percent can be from decay or breakdown.

Winter squash are harvested one or two times when fully mature. Be sure the desirable color and size are reached before harvest. The rind should be hard and resist denting. Winter squash can be stored for several months without any appreciable deterioration.

The USDA has defined two grades for fall and winter type squash and pumpkin: U.S. No. 1 and U.S. No. 2. U.S. No. 1 winter squash must meet basic requirements as to variety, maturity, and absence of breaks or cracks. In addition, they must be free of soft rot or wet breakdown as well as scars, dry rot, freeze damage, dirt, disease, insects, and mechanical damage. Grades for U.S. No. 2 differ in having less stringent requirements for maturity as well less stringent requirements for damage.

More detailed information on USDA grades can be obtained from the USDA Agricultural Marketing Service or from the Internet at www.ams.usda.gov/standards.

Table I. Fertilizer recommendations based on soil test results*

Phosphorus/ Potassium Ratings	Low	Medium	High	Very High
Recommended P	120	80	40	0
Recommended K	120	90	60	30

* Recommendations for nitrogen:
 Coastal Plain — 80 to 120 pounds per acre
 Piedmont, Mountain, and Limestone Valley — 80 to 100 pounds per acre
 P — pounds of P₂O₅ recommended per acre
 K — pounds of K₂O recommended per acre

Table 2. Seeding rate information for squash production

	Bush	Vining
Distance between rows (ft)	3-4	5-8
Distance between plants (ft)	1-2	2.5-5
Seed planting depth (in)	1-1.5	1.5-2
Seed required (lbs./A)	2-4	1-2
Time to harvest (days)	45-55	80-120

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