ALABAMA COOPERATIVE Extension SYSTEM

ANR-1041

ALABAMA A&M AND AUBURN UNIVERSITIES

Guide to Commercial Pumpkin and Winter Squash Production

Historical Perspective

Pumpkins and winter squash are members of the Cucurbitaceae family (commonly referred to as the Cucumber or Gourd family). This family also contains summer squash, watermelons, muskmelons (cantaloupes), and ornamental gourds. Collectively, these crops are referred to as "cucurbits." All pumpkin and winter squash are in the genus *Cucurbita*:

- *C. pepo*—common field pumpkins, such as 'Howden' and other Jack-o-Lanterns; winter and ornamental gourds.
- *C. moschata*—winter squash and some types of pumpkins, such as 'Dickinson.'
- *C. maxima*—many of the large-fruited winter squash and pumpkins, such as 'Blue Hubbard' and 'Big Max,' respectively.
- *C. mixta*—Green-striped Cushaw.

Pumpkins and winter squash are monecious, producing separate male (Figure 1) and female (Figure 2) flowers on the same plant. As a result, they require insects for cross-pollination.

Figure 1. Male pumpkin flower.

Figure 2. Female pumpkin flower. Note swelling immediately below flower. Following pollination and fertilization, this will develop into the fruit.

Pumpkin and winter squash were cultivated in the United States by the native Americans long before any Europeans set foot here. The native Americans grew pumpkins and winter squashes for their food and feed value. The term *pumpkin* is derived from the French word *pampion* meaning "sun-baked squash." The English later modified *pampion* to *pompkin* that was finally changed to *pumpkin* by American colonists. Nutritionally, pumpkin and winter squash are good sources of fiber and vitamin A.

Growing pumpkins and winter squash is suited to small and part-time farming operations. Due to the great diversity in size, shape, and color, care must be taken to select varieties that are suited for the intended market. The best strategy is to establish a market before planting the first seed.

Planting Recommendations

Planting Dates

Pumpkin and winter squash are warm-season crops that are relatively easy to grow but that require a long season to produce a marketable crop. Most varieties require 85 to 120 days from sowing to reach market maturity. Pumpkin and winter squash should be direct seeded after all danger of frost is past. Soil temperatures should be between 70° and 90°F for optimal seed germination.

Pumpkins are grown primarily for Halloween. Most pumpkins are planted in June, depending on their relative maturity. Pumpkins planted too early, particularly in the southern half of Alabama, can rot or require harvesting and long-term storage before marketing. If you do produce a crop that matures too early, you can keep them in storage up to 3 months, provided the pumpkins are cured and then stored properly. To avoid problems,

try several planting dates and varieties to determine the best combination in your area.

Soil And Fertility

With proper care, pumpkins and winter squash can be grown on most soils in Alabama. Avoid low, poorly drained soils. Plant in well-drained, sandy loams with high levels of organic matter and a pH of 6.0 to 6.5. If irrigation is available, then use raised beds. To avoid potential soil-borne diseases and nematode problems, plant pumpkins and winter squash in soils that have not grown a crop of watermelons, muskmelons (cantaloupes), summer squash, or other member of the Cucumber family in the past 2 to 3 years.

Timely and appropriate applications of fertilizer can make a significant difference in the quality and quantity of fruit produced. In the winter or early spring, collect soil samples from each area you intend to crop and have a soil analysis performed on each sample. Soil testing eliminates much of the guesswork involved in a fertilizer program. Contact your county Extension agent for information on how to collect and submit samples. Be sure to apply lime several months before planting.

If you do not have the soil tested, apply enough fertilizer to supply 50 pounds per acre of nitrogen (1000 pounds per acre 5-10-10, or 10 pints of 5-10-10 per 100 feet of row). At 3 and 6 weeks after sowing, sidedress 6 to 8 inches to the side of the plants with 20 to 30 pounds per acre of nitrogen and 60 to 100 pounds per acre of potassium (1 pint of 13-0-44 per 100 feet of row). Optimal potassium levels will insure good dry-matter production.

Seeding Rate And Spacing

Prepare the land to insure establishment of a uniform stand. Turn the soil several months before planting so that crop residues can fully decompose. Early land preparation also allows time for weed seeds to germinate, allowing for early cultivation to destroy young weeds.

Plant seeds to a depth of ¾ to 1½ inches. To achieve the maximum stand, plant two to three seeds per hill and thin to a single plant, leaving only the healthiest seedling. For large commercial plantings, sow four seeds per foot and thin to desired spacing. Direct seeding will require 2 to 3 pounds of seed per acre for large vine types or 3 to 4 pounds per acre for bush and smaller vine types. Use Table 1 to determine the optimal spacing for the pumpkin or winter squash you intend to produce.

Table 1. Suggested Row Spacings Based On Vine And Fruit Types.

	Between Row Spacing (ft)	Within Row Spacing (ft)
Bush or short vine types	3-5	2-3
Small fruited with large vine	6-8	3-5
Large fruited with large vine	6-8	3-5

Varieties

Contact your county Extension agent for a copy of the latest edition of the “Fall Vegetable Variety Trials” from the Alabama Agricultural Experiment Station at Auburn University. In the report, you will find information on the performance of selected pumpkins and winter squashes evaluated in several locations throughout Alabama. Although a large number of commercial varieties are available, you should grow only those adapted to Alabama. Try growing a small trial plot of several varieties each year to determine which varieties are best suited to your growing conditions.

Successful Pollination Of Pumpkins And Winter Squash

The following information is adapted from *Cucurbit Production and Pest Management* (Circular E-853) by the Oklahoma Cooperative Extension Service, Oklahoma State University.

Cucurbit crops are highly dependent on active pollination by bees. Not only does adequate pollination increase yield, but good pollination may improve the earliness and quality of the crop. Because pollen is borne on male flowers (Figure 1), bees are essential to transfer pollen to female flowers (Figure 2). Cucurbit pollen is not effectively moved by wind.

Several factors play a significant role in managing bees for effective pollination. Among these, weather is one of the most important. Bees are less likely to forage for nectar and pollen during poor weather. If poor pollinating conditions exist during the flowering period, additional beehives may have to be supplied.

A second factor in managing bees for pollination is the presence of "competing blooms" during the flowering period. Most cucurbit flowers are poor sources of nectar and pollen. They may be less attractive to bees than adjacent flowering weeds or other crops. In such cases, crops that may attract bees away from the pumpkins or winter squash during the blooming period should not be planted nearby (at least a ½ mile buffer is desirable). Similarly, weeds adjacent to the crop that may serve as competing blooms before the pumpkins or winter squashes begin to bloom should be destroyed. Although such wild flowers can be detrimental if they are blooming in mass at the same time as the target crop, their availability during other times helps insure that bee colonies are well nourished and remain healthy.

The use of domesticated honeybees is the most effective means to pollinate cucurbit crops. However, wild bees or feral honeybees can be extremely important as pollinators. Wild bees include several species of native, ground-nesting bees that prefer pollen and nectar from specific cucurbits. The abundance of wild bees varies greatly by location and from year to year, making them less dependable than domesticated bees. For this reason, it is strongly recommended that managed honeybee colonies supplement any wild bee activity.

Fruit size and seed set of cucurbits are strongly related to bee activity. Cucurbit flowers are open for only 1 day, and squash flowers are usually open only in the morning. Because of the large size of the flowers and pollen, the small honey bees do not pollinate squash as efficiently as larger native bees. The pollination requirement of pumpkin and squash is similar to that of muskmelon (cantaloupe); one bee per ten "female" flowers is considered the minimum level of activity to maximize production. A minimum of one honey bee hive per acre is normally necessary to achieve this level of activity. Yield increases have been achieved with up to three hives per acre.

Irrigation

After marketing, irrigation is the second most important element of a successful vegetable production operation. Keep in mind that irrigation is essential to the production of quality produce. Most vegetables are 90 percent water, so any loss in water weight is equal to a loss in salable weight. Whether you are using overhead or drip irrigation, provide sufficient water to the crop to insure the production of high yields of quality fruit.

In pumpkin and winter squash production, the most critical period for irrigation is while fruits are sizing. In pumpkin, any stress related to lack of water during fruit sizing can lead to the development of blossom-end rot. In pumpkin and winter squash, fruit size and yield are severely reduced by moisture stress.

Mulching And Drip Irrigation

Using polyethylene (plastic) mulch offers growers several advantages. Plastic mulch increases the soil temperature, accelerating plant growth and development. It also conserves soil moisture and reduces several common problems, such as soil compaction and crusting, ground rot of fruit, fertilizer leaching, drowning of crops, evaporation, and competition from weeds.

Although using mulch will increase production costs, those costs are offset by increased profits from earlier and larger yields of high-quality produce. Drip irrigation systems must be used with plastic mulch. In addition, grow-

ers can plant multiple crops (double-cropping) into the plastic mulch if the mulch is not excessively damaged (torn or ripped). Double-cropping will spread production costs over two crops, decreasing the risk associated with the higher initial set-up costs. Pumpkin and winter squash can be planted on mulch that was used to produce a spring crop, such as cabbage, collards, broccoli, or strawberries. The drip tape should be offset 3 to 4 inches from the center of the bed and buried 2 to 3 inches deep. Contact your county Extension agent for more information regarding the use of plastic mulch and drip irrigation.

Weed Control

Chemical weed control options in pumpkin and winter squash are very limited. Most herbicides registered for use provide annual grass and small-seeded broadleaf weed control (pigweed), but do not control large-seeded broadleaf weeds, such as sicklepod, annual morningglory, or common cocklebur. Refer to Circular ANR-500A, *Alabama Pest Management Handbook—Volume 1,* for a listing of herbicides currently registered for pumpkin and winter squash. Be sure to apply pre-emergence herbicides *immediately* after seeding. Some varieties of winter squash are more sensitive to certain herbicides and may be injured if you apply the herbicide as seeds germinate.

For better weed control, select locations with low weed populations or no perennial weed problems, such as nutsedge. Use mechanical cultivation between rows, and employ production practices which encourage rapid development of pumpkin and winter squash. When using mechanical cultivation, cultivate the soil only 1 to 2 inches deep because pumpkin and winter squash are shallow rooted and sensitive to root pruning. Some hand weeding may be needed. Consider using polyethylene mulch as part of your weed control strategy.

Insect Management

Many insects can have an impact on cucurbit production in Alabama. Some pest insects cause problems, but the benefits from other insects, such as bees, are essential for successful production. When developing a pest management program, take care to preserve beneficial insects. Refer to Circular ANR-500A, *Alabama Pest Management Handbook—Volume 1,* for a listing of insecticides currently labeled for use on pumpkin and winter squash.

Insect Scouting Methods

Depending on your location in the state and the planting date, insect problems in winter squash and pumpkins can vary from nonexistent to severe. It is important to be able to recognize pests and to understand their potential for damage when selecting appropriate control methods. Each pest does not respond the same way to a given control method.

Monitor fields at least once a week by walking a V or W pattern through the field and selecting plants from 10 random locations along the V or W pattern. When plants are small (up to 10 leaves), examine five adjacent plants per location for insect and disease pests. As plants get larger, sample two leaves per plant on five adjacent plants per location (total of 100 leaves). Use a hand lens to detect small pests, such as aphids and spider mites.

Soil Insects

Feeding damage by soil insects usually occurs when plants are young, and can result in poor stands. Soil insects can also destroy seeds as they begin to germinate. Feeding on young roots by soil insects, such as whitefringed beetle grubs, white grubs (larvae of May and June beetles), wireworms, and the larvae of cucumber beetles, reduces nutrient and water uptake, causing plants to wilt and die. Cutworms also feed on roots, or they may cut young stems above the soil line. White grubs and wireworms are most abundant in fields that were previously in pasture, planted to a grass crop, or left fallow with large weed populations.

Base the decision to treat for soil insects on the cropping history and the potential of the field to have pest problems. Apply a pre-plant soil insecticide if you are planting squash or pumpkin into an area that was previously in pas-

ture or was infested with weeds. If you suspect cutworm damage, check the soil around the plants for dark caterpillars that roll into a C shape when disturbed. Control cutworms after planting by applying a recommended insecticide spray directed towards the base of the plants.

Cucumber Beetles

Spotted and striped cucumber beetles attack young seedlings when they emerge. The beetles are yellow to greenish yellow, with black spots or stripes (Figure 3). If beetles are numerous, feeding damage will weaken or kill seedlings. Beetles can also transmit bacterial wilt, a disease that occasionally affects squash. It is thought that beetles pick up the bacteria from adjacent weeds and carry it into production fields. Infected plants wilt, then rapidly die. Younger plants are most susceptible to infection before bloom.

The critical period for cucumber beetle control is within the first 2 to 3 weeks after plant emergence. Apply a recommended insecticide if beetles are detected during this period, particularly if the field has a history of bacterial wilt disease. Alternately, use row covers to protect plants from beetles before flowering. Control weeds to reduce the amount of bacterial wilt inoculum that is available to the beetles.

Figure 3. Striped cucumber beetle.

Squash Bugs

Adult squash bugs emerge in the spring from overwintering sites in field debris, along field borders, or in nearby woods. Adults are about ½ to ¾ inch long and dark to gray brown in color. The tops of their bodies are flattened, with wings not completely covering the orange and brown edges of the abdomen. Eggs are laid in a mass, usually on the leaf underside, and turn metallic bronze in color within a few hours. Newly hatched squash bugs (nymphs) are wingless and pale green to white, with reddish brown heads and legs (Figure 4). Older nymphs are gray, with black legs.

Adults and nymphs suck sap from the plant. If feeding is severe, the leaves turn brown and die. Vines that are fed upon wilt from the point of attack to the end of the vine. Large populations of squash bugs cause plants to wilt under hot, dry conditions; however the plant will recover if squash bugs are controlled in time. Feeding may also occur on fruit, causing misshapen fruit to develop.

There are two critical periods for management of squash bugs: the seedling stage and the early flowering stage. Monitor newly planted fields for squash bug adults and/or wilting of plants. If you observe wilting, check the underside of leaves for squash bug adults or evidence of their feeding. Apply a pyrethroid insecticide to control adults.

Figure 4. Squash bug with nymphs.

Once plants are established, monitor them weekly for adults and eggs. Apply a foliar insecticide if the average number of egg masses per plant before or after flowering exceeds one per plant. Time sprays to kill small nymphs, which are more susceptible to insecticides. Good spray coverage (that is, at least 30 GPA by ground application) is important for effective control. Remove and destroy crop debris after harvest to reduce overwintering squash bug populations.

Squash Vine Borer

Squash vine borers are usually more of a problem in home gardens than in commercial fields. Vine borer infestation is usually not noticed until after the damage is done. The adult vine borer is a "clear-wing" moth that resembles a wasp. The body is reddish white, with black bands on the abdomen. Females lay eggs at the base of the plant. The emerging larvae enter the stems just above the soil line. Larvae feed inside the stems, causing wilting and the eventual death of the occupied parts of the plant (Figure 5). Infested stems can be identified by entry holes with piles of "frass" or excrement. Squash vine borers prefer cucurbits with large-diameter stems, such as 'Hubbard' squash.

Figure 5. Squash vine borer and characteristic damage.

In areas with a history of vine borer problems, monitor plants regularly for the presence of borer frass and entry holes. If you find frass, split stems to check for presence of young borers. If young larvae are present, reduce further infestation by hatching larvae by making two insecticide applications spaced 5 to 7 days apart. Plantings in late summer or fall usually escape vine borer infestations.

Aphids

Aphids are small, soft-bodied insects, usually green or sometimes red, with piercing-sucking mouth parts. Developing aphid colonies are usually found on new growth or on the underside of leaves. Infested leaves appear distorted or cupped. If numerous, aphids may cause direct damage to plants by their feeding or their production of "honeydew" (syrupy excrement) and accompanying "sooty-mold" that may cover fruit. The primary damage caused by aphids, however, results from the many plant viruses they can transmit.

Aphids have many natural parasite and predator enemies that help to keep populations in check. Application of insecticides that eliminate natural enemies, therefore, may increase the numbers of aphids. Insecticides are not effective in preventing aphid transmission of many viruses. Insecticides are only recommended to control aphids if they are present in sufficient numbers to cause direct damage to plants. An insecticide application is warranted if aphids are present on 10 to 20 percent or more of leaves, and their feeding is causing obvious stress to the plants. Late summer or fall plantings of squash and pumpkin are likely to experience more severe virus problems than are earlier plantings.

Spider Mites

Mites are not insects but are more closely related to spiders. They are tiny, about 1/25 to 1/50 inch long, and are either red or whitish yellow with black spots on either side. They feed by sucking sap from plants and are usually located on the underside of leaves. They are easily seen with a hand lens, along with their round, yellow eggs and webbing that they produce.

The first sign of feeding is the appearance of light-colored specks on the upper leaf surface. Leaves turn yellow, then bronze, and eventually

turn brown and dry up. Once mite populations become large with a lot of webbing and plant damage, they are nearly impossible to control. Hot, dry conditions favor mite development. Mites "float" onto plants using their silk as a parachute lifted by wind currents.

Mite infestations usually begin on field borders. Check field borders regularly, particularly during hot, dry weather. Plants that become covered with dust raised by vehicular traffic are more prone to severe mite infestations. If you find mites along a field border, examine the interior of the field to see how far the infestation has spread. If only the border is effected and conditions favor mite development, spot-treat the border and about 100 feet beyond the infestation with a recommended miticide.

Some insecticides, particularly carbamate and pyrethroid insecticides, can worsen mite problems by destroying natural enemies. Insecticidal soap is effective for control of soft-bodied pests like aphids and mites without destroying natural enemies.

Control Of Pumpkin And Winter Squash Diseases And Nematodes

Downy Mildew

All cucurbits are susceptible to downy mildew, caused by the fungus *Pseudoperonospora cubensis*. Symptoms first appear on older leaves near the center of the plant. Infected leaves first appear mottled; then yellow spots develop on the upper leaf surface (Figure 6). These spots are angular and limited by major veins. Under moist conditions a white to gray to purple, fuzzy fungal growth develops on the underside of leaf spots on the lower leaf surface. Leaf spots merge and turn tan to brown. Infected leaves eventually die, but remain erect while the edge of the leaf blade curls inward. Spread is rapid from the crown leaves outward towards new growth. When severe, downy mildew can cause defoliation, stunting, and reduced yields.

Figure 6. A melon leaf with symptoms of downy mildew.

Downy mildew is spread by wind currents, in water droplets in heavy rains or during irrigation, and mechanically by field workers or on equipment. Moist conditions, high humidity, and moderately warm temperatures favor disease development.

To control downy mildew, avoid fields with poor drainage, and use drip irrigation. Start a fungicide spray program when the disease appears. Bury or destroy plant debris after harvest.

Powdery Mildew

All cucurbits are susceptible to powdery mildew which is caused by a number of fungal genera. Symptoms first appear as pale yellow spots on stems, petioles, and leaves. These spots enlarge, and a white talcum-powder-like fungal growth appears on both the upper and lower leaf surfaces (Figure 7). Symptoms first

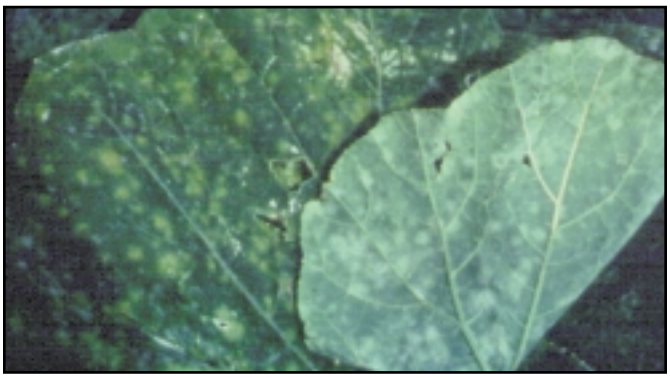


Figure 7. Symptoms of powdery mildew on the upper and lower leaf surface.

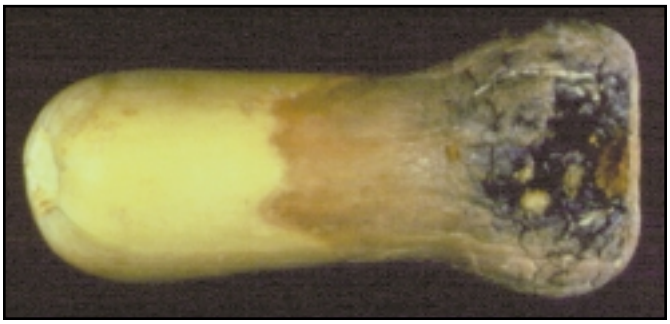
appear on older leaves or shaded lower leaves on mature plants. Infected leaves gradually turn yellow and become brown and papery as plants die prematurely. Fruit infections are rare.

The fungus overwinters on weeds and is spread long distances by wind currents. Disease development is favored by dense plant growth, moderate temperatures, low light intensity, and dews.

To control powdery mildew, plant resistant varieties when available. Where resistance is not an option, use fungicides. Weed control and good sanitation practices will help control powdery mildew. After harvest, destroy or bury all plant debris.

Black Rot

Black rot, caused by the fungus *Didymella bryoniae,* is a major problem on winter squash and pumpkin, and to a lesser extent on gourds. The disease is known as gummy stem blight on watermelon and cantaloupe. Black rot can appear in the field on fruit before harvest or during storage. Symptoms begin as irregular, faded green or yellow, circular spots on the fruit. Spots later turn gray to brown and finally black (Figures 8a and 8b). The fungus can penetrate the rind and cause a dry rot. Secondary fungal or bacterial rot organisms can enter through these wounds and cause a soft, watery rot of the entire fruit.



Figures 8a and 8b. Black rot on butternut squash in the field (above) and in storage (below).

The fungus survives from season to season on crop debris or on other cucurbit crops or weeds. Seed of rotted fruit can be contaminated with the fungus. Disease development is favored by warm temperatures and wet weather. Plants damaged by other pests or weakened by stress are more susceptible to black rot. The fungus enters the fruit through wounds in the rind.

Control black rot by rotating fields out of cucurbit crops for 2 or more years. Avoid fields with poor drainage. Do not save seed from a crop in which black rot was a problem. To reduce black rot incidence, begin a fungicide spray program that controls gummy stem blight. During the season and at harvest, avoid wounding rind tissue on winter squash and pumpkins. Cure harvested fruit properly to allow wounded areas to heal themselves in a few weeks.

Anthracnose

Anthracnose, caused by the fungus *Colletotrichum lagenarium*, is a destructive disease of cucurbits during warm, wet growing seasons. Gourds are considered susceptible to anthracnose, while squash and pumpkin are highly resistant.

All aboveground plant parts are susceptible to infection, and plants can become infected at any stage in their development. Older leaves first show small, water-soaked or yellowish areas that enlarge rapidly and turn tan to reddish brown. Spots are often circular to angular at first, eventually merging and blighting large sections of the leaf. These areas become dry and tear away, typically giving the foliage a ragged appearance. Often the leaves at the center of a plant are attacked first, leaving the stem and runners bare. Tan to black, elongated, slightly sunken streaks form on petioles and stems. These streaks can girdle the vine, killing the tissue beyond the lesion. Fruit, if infected early, may turn black, shrivel, and die. Round, water-soaked spots, ¼ to 2½ inches in diameter, develop on the older fruit. Spots turn a dark green to brown with age and may become sunken. Under wet conditions, pinkish colored spore masses begin oozing out of the sunken spots.

The fungus overwinters in plant debris, in seed, or on cucurbit weeds. Warm, wet conditions favor rapid development and spread of the disease. Anthracnose can appear anytime during the season, but most damage occurs late in the season after fruit set.

To control anthracnose, plant certified disease-free seed. Plant cucurbits in an area no more than once every 3 years. Plant in well-drained soil free from surface run-off water. Follow a weekly spray program with a recommended fungicide beginning at the first true leaf stage. Bury or destroy all plant debris after harvest.

Mosaic Viruses

Many viruses attack cucurbits in Alabama. Some of the most common viruses found in Alabama include cucumber mosaic virus (CMV), watermelon mosaic virus (WMV), zucchini yellow mosaic virus (ZYMV), and papaya ringspot virus (PRSV). Symptoms produced by these viruses are similar, making field identification impossible. Special laboratory testing is required for positive identification.

Cucurbits are susceptible at any stage of growth. When plants become infected in the six- to eight-leaf stage, symptoms first appear on the youngest, still expanding leaves. A mosaic pattern often develops (healthy dark green leaf tissue intermingled with light green and yellow tissues) (Figures 9a and 9b). Leaves are often distorted, crinkled, curled, and stunted. Vines may appear bunchy due to the shortening of the internodes. In severe cases, older leaves may die. Typical mosaic symptoms develop only on actively growing leaves. When a plant becomes infected at midseason, previous growth usually remains normal and produces healthy fruit. Few fruits set on plants infected early in the growing season. Fruits that do set are often of poor quality and may be mottled green (Figures 9a and 9b) or have warts (Figure 10).

Figures 9a and 9b. Mosaic virus symptoms on pumpkin (above) and winter squash (below) foliage and fruit.

Figure 10. Mosaic virus symptoms on pumpkin (fruit).

Mosaic viruses typically overwinter in surroundings weeds, which are a reservoir for the viruses. In spring, these viruses are spread from weeds into cultivated crops by insects, usually aphids.

Control mosaic viruses in cucurbits by eradicating biennial and perennial weeds and wild reservoir hosts in and around gardens and fields. Apply insecticides to prevent the buildup of large aphid populations, as well as other insects, and to reduce virus incidence and spread. When possible, plant certified virus-free seed. Isolate later plantings far from earlier settings, especially if virus incidence was high. Removing infected plants when symptoms first appear may reduce or delay spread of the disease. Use reflective mulches and row covers to reduce damage from insect-transmitted viral diseases.

Root-Knot Nematode

All cucurbits are susceptible to root-knot nematode, caused by *Meloidogyne* spp. Affected plants may be stunted and show signs of a nutrient deficiency (yellowing foliage). Symptoms are more severe on light, sandy soils. Heavily infected plants may wilt during the warmest part of the day. Roots on infected plants will have galls, knots, or swellings that vary in size from the head of a pin to ½ inch in diameter on larger roots (Figure 11). Galls on severely infected roots may fuse causing the root system to appear malformed. The disruption in normal root growth and activity affects the plant's ability to take up water and essential nutrients.

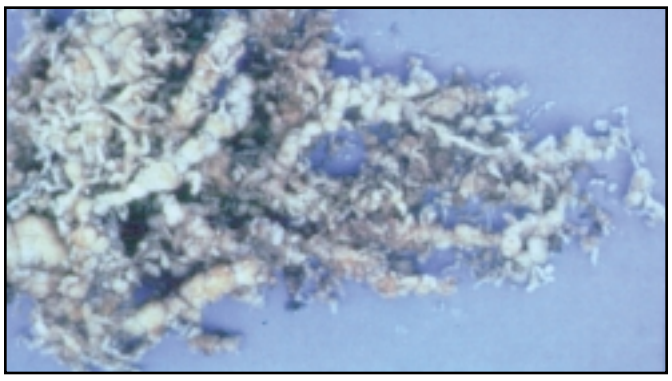


Figure 11. Root-knot galls on pumpkin.

Root-knot nematodes can survive in an area for many years without a host. The nematode also has a wide host range that includes most cultivated crops.

Controlling root-knot nematodes is difficult because no resistant varieties are available. Rotating cucurbits with a grass crop or a nematode-suppressive crop, such as sesame or velvetbean, will reduce the nematode population but will not eliminate root-knot from the soil. Clean fallowing is another option. Soil fumigation may be economical.

Harvesting And Curing

Pumpkin and winter squash are still alive even after they have matured and are removed from the vine. The objective of curing and storage is to prolong the post-harvest life of the fruit.

Mature pumpkins and winter squash store better than immature fruit. When mature, winter squashes, such as 'Butternut,' 'Acorn,' and 'Hubbard' types, have hard skins that resist puncture with your thumbnail. Skins of winter squash appear dull and dry compared to the fresh, bright sheen of the skin of immature fruit. Leave a long stem (handle) on pumpkins. On winter squashes, such as the 'Hubbard' types, remove the stems completely.

Keep in mind that dead vines do not indicate maturity in pumpkin and winter squash. When vines die prematurely from disease or drought, for example, the fruits are likely immature and will not store successfully.

Curing involves elevating storage temperatures to 80° to 85°F with 75 to 80 percent relative humidity for approximately 10 days. Curing heals wounds, helps ripen immature fruit, enhances color, and insures a longer post-harvest life. After curing, reduce temperature and relative humidity as indicated in Table 2. Curing is beneficial in pumpkins and some winter squash, but 'Butternut,' 'Hubbard,' and 'Quality' squashes have not shown any added benefits from curing. Curing is detrimental in Acorn types, such as 'Table Queen.'

Table 2. Storage Recommendations For Pumpkins And Winter Squash.

Type	Approximate Length of Storage	Temperature Conditions	Relative Humidity	Remarks
Pumpkins	2-3 months	50-55°F	50-75%	Should be well-matured
Winter Squash				
Hubbard	5-6 months	50-55°F	70-75%	Holds well in storage
Acorn	5-8 weeks	50°F	50-75%	Develops poor color at higher temperatures
Butternut. Turban, Buttercup	2-3 months	50°F	50-75%	

Storage

All pumpkins and winter squash should be well matured and free from injury and decay when stored. They should be kept dry and provided with good air circulation. Control humidity because high humidities will promote decay and lower humidities will cause excessive weight loss. When winter squashes are taken out of storage, they should be marketed immediately (see Table 2).

J. M. Kemble, *Extension Horticulturist,* Associate Professor, Horticulture; **E. J. Sikora,** *Extension Plant Pathologist,* Associate Professor, Entomology and Plant Pathology; **G. W. Zehnder,** *Extension Entomologist,* Associate Professor, Entomology and Plant Pathology; and **E. Bauske,** former *Extension Associate,* Horticulture; all at Auburn University

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