Commercial Vegetable Recommendations – Pumpkins, Squashes, and Gourds
Michigan State University Extension Service
Bernard H. Zandstra, Horticulture; Edward J. Grafius, Entomology; Christine T. Stephens, Botany and Plant Pathology
Issued May 1986
8 pages

Extension Bulletin E-1953 (New) May 1986

Commercial Vegetable Recommendations

Pumpkins, Squashes, and Gourds

Bernard H. Zandstra, Department of Horticulture
Edward J. Grafius, Department of Entomology
Christine T. Stephens, Department of Botany and Plant Pathology

Production

Yields of marketable pumpkins and squashes vary considerably according to weather, season, type, and cultivar. The figures in Table 1 represent average yields under many conditions. Individual experience of a grower will be the best criteria for potential yields.

Uses

Approximately 75% of the summer squashes grown in Michigan is packed for fresh market; 25% is processed. Most winter squashes are packed for fresh market within two months of harvest, during the late summer and fall. A small amount is placed in storage for packing during the winter. A few acres of winter squashes are grown for processing into pie filling and other edible products. Yellow "Halloween" or "jack-o-lantern" type pumpkins and gourds are used for carving and decoration.

Types and Cultivars

The taxonomy and classification of pumpkins and squashes is somewhat confusing because the terms pumpkin and squash are used for the same species. The terms vine crops and cucurbits refer to all plants in the Cucurbitaceae family, including melons and cucumbers.

Table 1. Yields of pumpkins, squashes and gourds in tons per acre.

	Average State Yield	Good Yield	Excellent Yield
Halloween pumpkins; Hubbard, marrow, and other large squashes	7	15	20
Pie pumpkins, acorn, butternut, buttercup squashes	7	10	15
Summer squashes	10	15	20
Gourds	3	4	5

The pumpkins, squashes, and gourds most commonly grown in Michigan belong to four species of the family Cucurbitaceae and the genus *Cucurbita: C. pepo, C. maxima, C. moschata,* and *C. mixta.* Large, yellow or orange fruit used for carving or decoration are usually called pumpkins. Small, yellow pumpkins are often called pie or sugar pumpkins.

Squashes that were developed to be eaten very immature, such as zucchini, are called summer squashes. Most other squashes are called winter squashes because they can be stored and used during the winter. Some types of squash, such as acorn, do not store well and might be referred to more accurately as fall squashes.

Some unusual decorative gourds and squashes are grown on very limited acreage in Michigan, including white flowered, bottle, and club gourds *(Lagenaria siceraria),* and sponge gourd *(Luffa cylindrica).*

The following is a brief description of the characteristics of each species and the pumpkins and squashes that belong to them. Remember that cultivars within a species can cross-pollinate easily, so if you intend to save seed, separate cultivars of the same species by at least ¼ mile.

Cucurbita pepo: hard shell when mature; hard, solid, angular grooved stem; moderate storage: Halloween pumpkins, pie pumpkins, acorn squash, vegetable spaghetti, summer squash, most gourds.

Cucurbita maxima: medium-hard shell when mature; soft, hol-

low, round stem; long storage: Hubbard, buttercup, banana, turban, delicious, marrow, very large pumpkins.

Cucurbita moschata: hard shell; small, hard, grooved stem that expands at the fruit union: butternut.

Cucurbita mixta: medium-hard shell; enlarged, hard, grooved stem that does not expand at the fruit union: Cushaw.

Recommended Cultivars

The following cultivars will usually do well in Michigan. There are also many other good cultivars available.

Pumpkins

small	Small sugar
	Spookie
medium	Jack O'Lantern
	Spirit
	Youngs Beauty
large	Connecticut Field
	Howden
	Jackpot
	Pankow's Field (large stems)
very large	Atlantic Giant
	Big Max
	Big Moon

Summer squash

zucchini	Elite
	Select
	Senator
yellow straightneck	Lemondrop
	Gold Rush
	Seneca Butterbar
yellow crookneck	Sundance

Winter squash

acorn	Table Ace (bush type)
	Table Queen (vine type)
buttercup	Burgess strain
butternut	Hercules
	Ponca
	Waltham
marrow	NK 580

Climatic Requirements and Irrigation

All of the cucurbits are warm-season crops. They grow best during hot weather and cannot tolerate frost. Seeds will germinate at 60°F, but germinate best at 85° to 90°F. Pumpkins and squashes grow best at temperatures of 75° to 85°F day and 60° to 70°F night. Growth virtually stops at temperatures below 50°F, and the plants may be severely injured and maturity delayed by temperatures below 40°F for several days.

Plants are usually killed by one hour or more of frost (temperature below 32°F). Therefore, plant cucurbits in the field when soil temperatures are high enough for good germination and all chance of frost has passed. For early summer squash production, plastic mulch and plant covers will raise soil temperatures and provide some protection from frost.

Low temperatures also have an adverse effect on flowering and fruit set. Cucurbits are called monoecious plants—that is, each plant produces both male and female flowers. Normally, several male flowers form before female flowers develop. During periods of cool temperatures (below 70°F) most pumpkin and squash cultivars respond by producing primarily male flowers. Male flowers do not form fruit. Some cultivars of summer squash appear to form mostly female flowers in response to cool temperatures. Without male flowers to provide pollen, however, the female flowers do not form fruit.

Hot temperatures (over 85°F) combined with dry conditions will cause the plants to drop blossoms and small fruit.

Pumpkins and squashes are relatively deeply rooted (4 to 6 feet) and can tolerate dry conditions fairly well. However, extended dry periods will result in poor fruit set and/or poor fruit development and size. The plants can tolerate wet conditions fairly well, but foliar diseases and fruit rots will increase.

Summer squashes are especially susceptible to drought because the fruit develop and are harvested within a few days after pollination. Lack of sufficient moisture often results in poor or irregular fruit development.

Pumpkins and squashes are usually grown without irrigation. If irrigation is available, apply 1 to 1½ in. of water per week during flowering and fruit development. Summer squashes will usually benefit from regular irrigation throughout the production season.

Soil Requirements and Field Preparation

Pumpkins and squashes grow well on most well-drained soils. Sandy loams are ideal. They also grow well on clay soils, but harvest is difficult when the soils are wet and the fruit often become dirty and difficult to clean. Avoid production on low-lying or muck fields where plants are subject to late spring or early fall frosts.

Cucurbits are good rotational crops with other vegetables. Because they are usually grown for fall harvest, they can be planted after most other crops, and thus fit well into a planting schedule.

Prepare fields by plowing, broadcasting fertilizer, and discing before planting. Leave the soil surface rough to reduce sand blasting of young plants.

Fertilizer Requirements

Pumpkins and squashes require moderate amounts of fertilizer. For good fertilizer management, maintain a pH of 6.5 to 6.8 on mineral soils used for vine crop production. Maintain soil test levels of phosphate (P_2O_5) at 100 to 120 lb/acre and of potash (K_2O) at 250 to 300 lb/acre for optimum production.

Each year, add a total of 100 lb nitrogen (N), 100 lb P_2O_5, and 100 to 150 lb K_2O per acre. Half of the N

and all of the P_2O_5 and K_2O can be broadcast and plowed down or disced in before planting. Alternatively, broadcast half of the N, P_2O_5, and K_2O, and apply the rest of the P_2O_5 and K_2O in a band 2 in. to the side and 2 in. below the seed at planting.

Sidedress with 50 lb N per acre just before vines begin to spread out—about 4 weeks after planting—so that it is still possible to get through the field with a cultivator without damaging the vines. For pumpkins and large squashes, use a fertilizer that contains both N and K. For instance, apply 400 lb 12-12-12 per acre (48 lb N, 48 lb P_2O_5, 48 lb K_2O). On very light soils, sidedress again 3 to 4 weeks later with 100 lb ammonium nitrate (34-0-0) per acre with a whirling spreader.

A typical fertilizer program is to broadcast 500 lb 10-20-20 (50 lb N, 100 lb P_2O_5, 100 lb K_2O) before planting and sidedress 100 lb urea (45-0-0, 45 lb N) or 150 lb ammonium nitrate (34-0-0, 50 lb N). Urea must be incorporated or watered into the soil soon after application to avoid volatilization; ammonium nitrate does not volatilize if applied on the soil surface, but must be watered in to be available to the plants.

Transplant Production

Early summer squashes are often grown from transplants. Some growers also start large pumpkins from transplants to obtain competition-size fruit.

To grow transplants, plant seeds in 2½ to 3 in. square peat pots that contain a lightly fertilized peat-vermiculite mix. The plants grow rapidly and should be ready for transplanting in 3 to 4 weeks. To avoid damping-off of seedlings, do not over-water. Control cucumber beetles in the greenhouse because they often emerge early causing physical damage and spreading bacterial wilt.

Start plants for large pumpkins in 6 in. pots 6 weeks before transplanting. Plants older than 6 weeks at transplanting will suffer considerable shock when transferred to the field.

Plants are ready for transplanting when they have 2 to 3 true leaves. Begin to harden plants 4 to 5 days before transplanting by reducing water by 25% and exposing the plants to outside air and sunlight. Just before planting, water heavily to thoroughly soak peat pots and soil before setting in the field. Bury peat pots completely when transplanting so that no portion of the pot is above the soil surface. Squash plants are very fragile so handle them very carefully. They will usually not survive if they are transplanted bare-rooted.

Spacing, Planting, and Culture

Early summer squashes can be planted with plastic mulch and under plant covers after May 10 in southern Michigan. Transplanting without covers should begin after most chance of frost has passed, usually after May 20 in southern Michigan.

Begin seeding summer squashes when the soil temperature at a 4 in. depth exceeds 65°F. Sow winter squash seed for summer or early fall production in May. Sow pumpkins for Halloween and winter squashes for storage from early to mid-June.

Pumpkins and squashes are usually seeded with corn planters with plates designed specifically for these crops, or with vacuum seeders. Plant seed 1 to 1½ in. deep in moist soil.

Summer squashes, bush-type winter squashes, and small-vined gourds can be planted in rows 4 to 5 feet apart, with plants spaced 1½ to 2 feet apart in rows. Plant medium-vined squashes and pumpkins in rows 6 to 8 feet apart, with plants spaced 1½ to 2 feet apart in rows. Leave spray and harvest aisles in summer squashes and in other crops if you anticipate late applications of pesticides.

The amount of seed needed per acre varies with type, cultivar, and spacing. Large seeded cultivars (most pumpkins and winter squashes) require 2 to 4 lb of seed per acre. Small seeded cultivars (butternut, some summer squashes, and gourds) require 1½ to 3 lb seed per acre.

Pumpkins, squashes, and gourds are usually cultivated once or twice during the growing season for weed control and sidedressing. Cultivate shallowly to avoid causing injury to roots.

Bees and Pollination

Bees are an essential part of the production and culture of all vine crops. Wild bees will normally pollinate small fields sufficiently. However, where fields exceed 1 to 2 acres in size, bring in beehives for pollination. One hive is needed for every 2 to 3 acres of pumpkins and squashes.

Place hives in protected areas at edges of fields. Bees normally forage as close to the hive as possible, usually within ½ mile. Therefore, to obtain more complete pollination of large fields, place hives at several locations around them.

Blossom density for squashes and pumpkins is low, and therefore these crops are not very attractive to bees. In addition, each cucurbit flower has to be visited about 15 times for complete pollination. Incomplete pollination results in small and misshapen fruit. To improve the success of pollination, place bees in fields 3 to 5 days after the first blossoms appear—at that time about 10 to 15% of the plants should have open female flowers. Because they are unaccustomed to the area, the bees will forage close to the hive and will not stray into more attractive crops further away.

Remove bees after 2 weeks; this will avoid pollination of late flowers, which produce mostly small fruit. The early fruit will then tend to be larger. Avoid planting cucurbits near forage crops such as alfalfa, clover, buckwheat, or trefoil, because they are more attractive to bees and will draw them away from the cucurbits.

Bees may be killed by insecticide applications. *Sevin* (carbaryl) and *Penncap-M* (encapsulated methyl parathion) are especially injurious to bees because they are carried back to the hive and kill the brood. Do not use these chemicals in or around fields of vine crops during flowering. Some synthetic pyrethroids (e.g., *Ambush*, *Pounce*, and *Pydrin*) are also toxic to bees, so avoid using them in vine crops when possible.

If it is necessary to use insecticides, apply them before 8:00 am or after 7:00 pm when bees are not in the fields. Make sure that hives are not within the spray pattern of ground or air sprayers. Be especially careful when using airblast sprayers. If at all possible, avoid insecticide applications during flowering.

Production of Very Large Pumpkins

Production of very large pumpkins has become a competitive activity in recent years. These large pumpkins are members of the species *Cucurbita maxima.* Other than their decorative value, their only use is for animal feed. Pumpkins of 300 to 400 lb have become routine in competition, with the largest pumpkins exceeding 500 lb.

Manure and compost will increase the aeration and water holding capacity of the soil and make it ideal for large pumpkin production. If it is available, work 4 to 6 in. of manure into the soil each year.

Atlantic Giant, Big Max, and Big Moon are commercially available cultivars used to produce large pumpkins. Seed the plants in the greenhouse about May 1 in 4 to 6 in. pots, and transplant into the field by the end of May. Space the plants about 15 by 15 feet so that each plant has at least 225 square feet of growing area. Water and fertilize the plants to maintain maximum growth.

After 3 or 4 pumpkins have set, remove all new flowers as they open. Select one of the developing pumpkins and remove the others after about 2 weeks. Lay the pumpkins on a sheet of plastic mulch and turn them once a week to avoid soil rots and to reduce flat spots on the fruit.

Fertilize each plant every 2 weeks after vining begins with 7 oz of a complete fertilizer, such as 12-12-12 or an equivalent. Water the plants daily.

Harvest

Summer Squashes

Harvest of summer squashes usually begins about 50 to 60 days after sowing or transplanting. The first harvest should begin in early July.

Summer squash plants produce fruit until they are killed by frost, but production drops after about 4 weeks. Fruit develop rapidly and fields should be harvested every 2 or 3 days. Remove all fruit of usable size at each harvest. Fruit left on the plant will reduce the subsequent set of other fruit.

Summer squashes are harvested very young and tender for fresh market, usually when they are 6 to 10 in. long. Larger fruit may be harvested for processing. Very small fruit may be harvested for mini-vegetables.

Summer squashes are very immature and bruise easily, so use care in harvesting and handling. Cut fruit off the plants with knives and place them in plastic containers for transporting to packing sheds. Wash the fruit and pack in ¼ or ½ bushel lugs or cartons.

Winter Squashes

Most winter squashes mature 90 to 120 days after seeding, depending on type and cultivar. Early acorn and butternut cultivars mature in 80 to 90 days.

Harvest squashes after vines decline and fruit mature. Cut *C. maxima* cultivars from the vines with knives or pruning shears leaving ½ to 1 in. of stem attached to the fruit. Leave ¼ to ½ in. of stem attached to *C. pepo* and *C. moschata* fruit.

When harvesting, take only the obviously good fruit and leave diseased, misshapen, and undersized fruit in the field. Place the squashes in bulk boxes, and cure in a warm place for 2 to 3 weeks before packing and shipping.

Pumpkins

Pumpkins are usually shipped during the last 3 weeks of October for sale before Halloween (October 31). Because they are larger than most squashes and the marketing period is very short, they are handled somewhat differently.

Pumpkins normally mature 110 to 120 days after seeding. After vines have died down, harvest the pumpkins with stems attached to the fruit, and place them in rows in the field. Do not handle fruit by the stems. After 2 to 3 weeks of curing they can be loaded directly on to trucks in bulk or in bulk boxes for shipping. When loading, discard any diseased, soft, or immature fruit. Green fruit will not normally turn yellow after harvest and should be discarded.

Gourds

Harvest gourds after vines begin to decline and fruit become hard and brightly colored. Gourds require about 120 days to reach maturity, so they are harvested late in the season.

Postharvest

Pumpkins, squashes, and gourds should not be exposed to frost. Frost that penetrates the fruit causes rapid deterioration of the flesh and rot sets in. Minor frosts will discolor the skin. Fruit exposed to temperatures below 50°F for 10 days or more will not store well. Fruits left outside during curing should be covered with straw or tarpaulin to protect them from cold or frost injury.

Curing

Cure all pumpkins, winter squashes, and gourds before shipping or storage. Curing allows the fruit to continue to mature, which hardens the fruit shell. During curing, cuts and bruises heal, and some starch is converted to sugar.

Cure the fruit by placing them in a well-ventilated place at 75° to 85°F for 2 weeks. A less effective method is to harvest the fruit, place in piles in the field, and let cure there for 2 to 3 weeks before placing in storage.

Storage

After curing, maintain squashes and pumpkins at 50° to 55°F and 50% to 75% relative humidity. Under these conditions most cultivars of *C. maxima* and *C. moschata* will store for 3 to 5 months. Acorn squash will store for 6 to 8 weeks; Halloween pumpkins will store for 2 to 3 months. The fruit continue to respire under these conditions and lose 3 to 5% of their weight per month.

Packing, Handling, Shipping

Small and medium size winter squashes are usually washed, dried, waxed with a vegetable washer, and packed in 1-1/9 bushel boxes. Keep squashes at 50° to 55°F during handling, shipping, and storage.

Large squashes and pumpkins are usually shipped in bulk or in large bins. To prevent decay, avoid damaging or breaking the skin during handling.

Insects

Consult Extension Bulletin E-969, *Cucumber, Melon, Squash, and Pumpkin Insect Pests*, for pictures of pests and damage and detailed life history information. See Extension Bulletin E-312, *Control of Insects, Diseases and Nematodes on Commercial Vegetables*, for current pest control recommendations.

Seed Corn Maggot

Seed corn maggot *(Delia platura)* adults, similar in appearance to small house flies, emerge in early spring. They are attracted to soils that contain large amounts of organic matter or germinating seeds. Eggs are laid in the soil and the larvae feed on the organic matter or attack germinating seeds. Several generations of seed corn maggots occur and they may attack seeds planted at any time. Slow germination as a result of cool weather favors damage by seed corn maggots.

To reduce seed corn maggot attack plow down cover crops and weeds early enough to allow their decomposition before planting. Treat seed with insecticides labeled for seed corn maggot control.

Striped Cucumber Beetle

Striped cucumber beetle *(Acalymma vittatum)* adults are about 1/5 in. long with yellow and black stripes that run the length of their backs. They overwinter as adults and emerge during the first warm days of spring. The adults feed on young plants in the greenhouse and field soon after they emerge. Adult feeding damage appears as holes in the leaves. The adults lay eggs at the base of the plants and the larvae attack the roots of the plants.

Heavy infestations can stunt or kill many plants. Adult beetles carry the bacterial wilt organism over the winter and infect plants in the spring.

Spotted Cucumber Beetle

Spotted cucumber beetle *(Diabrotica undecimpunctata howardii)* adults are small (¼ in.), yellow, with 12 black spots on their backs. They feed on over 200 host plants. The larvae attack corn roots and are called southern corn rootworm. The adults also carry the bacterial wilt organism.

Effective control of beetles for 1 to 2 months is possible by incorporating a systemic insecticide at seeding or transplanting. When beetles are seen, begin foliar insecticide sprays and repeat as recommended on insecticide labels.

Cutworms

Cutworms live in the soil, emerge at night, and chew off young plants at the soil surface. Plants literally disappear overnight.

Check fields every day for 2 to 3 weeks after emergence or transplanting for missing plants or plants that appear to be broken off near the soil surface. Apply insecticides in late afternoon or early evening. Direct the spray toward the base of the plants. Repeat according to label recommendations until damage ceases.

Squash Bugs

Squash bugs *(Anasa tristis)* are about ⅝ in. long, brownish-black, with a back shaped like a shield. The adults and larvae puncture leaves and suck sap, causing leaves and vines to wilt. Apply a recommended insecticide as needed to kill the squash bugs.

Thrips

Thrips *(Thrips tabaci)* attack many crop plants, including vine crops. They are small (1/16 in. long), tan colored insects that chew and rasp on the leaves, causing sap loss. They are usually only a problem during hot, dry weather.

Thrips also attack blossoms, and in heavy infestations, destroy flowers and thus reduce yields. To control thrips, apply a foliar insecticide and repeat as recommended.

Aphids

Green peach aphids *(Myzus persicae)* are small (1/16 in.), green insects that suck sap from the leaves. They injure pumpkin and squash plants primarily by transmitting mosaic viruses.

As soon as aphids are seen, begin a regular spray program for control. Systemic insecticides are especially effective against aphids.

Mites

Mites *(Tetranychus urticae)* sometimes attack vine crops during hot, dry weather in mid- to late summer. They are very small, 8-legged creatures that can be seen only with a magnifying lens. Affected leaves have a speckled appearance and may shrivel and dry. When symptoms appear, check for mites, and if they are present, apply a recommended insecticide or miticide for control.

Squash Vine Borer

Squash vine borer *(Melittia cucurbitae)* is the larva of a day-flying moth. The adults (clear wings, red bodies) lay eggs near the base of plants and the larvae tunnel into the main stems. The plants then wilt and die. Damage usually occurs about the time that the plants begin to vine.

When adults are seen or damage to plants is observed, apply an insecticide to the base of the plants and repeat 3 or 4 times if needed. Butternut squash appears to have some natural resistance to attack by vine borer. Acorn and Hubbard appear to be particularly susceptible. Crop rotation will help reduce infestation because the insects overwinter in soil and crop debris.

Diseases

Damping Off

Damping off (*Pythium* sp., *Phytophthora* sp., *Rhizoctonia solani*) may be a problem with transplants. Seed rot or preemergence damping off result in reduced seedling emergence. Postemergence damping off causes young seedlings to become constricted just above the soil line. To avoid damping off, use pasteurized or soilless media, treat seed with a fungicide, and avoid overwatering.

Bacterial Wilt

Bacterial wilt *(Erwinia tracheiphila)* is a serious problem on cucumbers and melons, but also affects pumpkins and squashes. Individual lateral vines of plants wilt during the heat of the day, but appear to recover at night. After several days they wilt permanently and dry up. The bacteria mechanically plug the vascular system, which causes the laterals to wilt.

The disease can be identified by cutting the affected stem near the crown of the plant, squeezing each cut end slightly, then touching them together and pulling apart slowly. A white, sticky strand between the stem ends, which is the bacterial ooze, confirms the presence of bacterial wilt.

Bacterial wilt is carried by cucumber beetles, and is controlled by controlling the insects.

Powdery Mildew

Powdery mildew *(Erysiphe cichoracearum)* attacks all the vine crops. It usually appears on pumpkins and squashes in mid- to late summer during warm weather. It appears first as a white, powdery growth in spots on the upper sides of leaves, but soon spreads and covers both leaf surfaces. Affected leaves become yellow, then turn brown and die. Heavy infestations before fruit matures will cause reduced fruit size and yield. The fungus rarely attacks the fruit.

When the first symptoms of powdery mildew appear, treat with a recommended fungicide. Fungicide applications after fruit are mature are of little economic value.

Gummy Stem Blight and Blackrot

Gummy stem blight and blackrot *(Didymella bryoniae)* are the same disease with different symptoms on different hosts. Stem and foliar spotting (gummy stem blight) is more common on melons and cucumbers, and fruit rotting (blackrot) is more common on pumpkins, squashes, and gourds.

Gummy stem blight appears as pale brown or gray spots on leaves, petioles, and stems. The spots on stems usually begin near nodes and elongate into streaks. Tiny black pycnidia develop on the spots. A red, gummy exudate comes out of the stem spots. (A red exudate often appears after other injuries to the plants, so it is not diagnostic in itself.)

Blackrot of fruit is a serious storage disease. It begins as irregular green or yellow spots on fruit that turn brown and black. The spots become slightly sunken, hard, and dry. Other rotting organisms often enter later, causing watery, odoriferous collapse of the fruit. Fruit that appear sound when harvested may rot during curing or storage because of incipient blackrot.

The organism overwinters on crop debris and seed from diseased fruit. Crop rotation will help avoid the disease. Treating seed with a fungicide will also help. If the disease has been a problem in previous growing seasons, treat fields regularly with a foliar fungicide.

Check fruits carefully at harvest. Do not store fruits with disease spots. Avoid breaking the skin of fruits because the pathogen can enter easily through wounds.

Alternaria Leaf Spot

Alternaria leaf spot *(Alternaria cucumerina)* is primarily a problem in melons, but does appear occasionally in pumpkins and squashes, especially on weak, old, or senescing plants.

Leaf symptoms begin as small, water-soaked spots that expand and become dark brown with concentric rings. The spots join together covering large portions of leaves, and the centers of the spots often crack apart. The leaves may wither and die.

The causal organism overwinters in seed and crop debris. Cultural practices that produce vigorous, healthy plants are the best defense. If the disease appears, fungicide sprays will reduce its spread and severity.

Anthracnose

Anthracnose *(Colletotrichum lagenarium)* is a major problem on muskmelons, watermelons, and cucumbers. It also attacks gourds, but rarely attacks pumpkins and squashes.

Anthracnose develops most rapidly during warm, wet conditions. Affected gourd leaves have yellow, water-soaked spots, commonly starting on a vein, that enlarge rapidly, turn brown, and often cover the whole leaf. Young fruits may be killed. Mature fruits develop sunken, brown spots that often are invaded by bacterial soft rot.

The disease overwinters on crop residue and in seed from infected fruit, so crop rotation is advisable. Use fungicide-treated seed. If the disease appears in the field, apply foliar fungicides as recommended.

Angular Leaf Spot

Angular leaf spot *(Pseudomonas lachrymans)* is a bacterial disease that primarily affects cucumbers, but is occasionally seen on pumpkins, summer squashes, and gourds.

Leaf spots are water-soaked at first, then turn tan or brown, and the centers of the spots fall out. The spots occur between the leaf veins, thus giving the lesions an angular shape. Spots on fruit are small and watersoaked; infected fruit break down quickly after secondary infection by bacterial soft rot.

The bacteria overwinter in crop residues and in seed from infected plants, and spread in the field with splashing rain. Crop rotation will help avoid the problem. Use only disease-free seed. Copper sprays will help hold the disease in check. Dry weather is the best cure.

Choanephora Wet Rot

Choanephora wet rot *(Choanephora cucurbitarum)* is a fungal disease of summer squash fruit. The infection begins on wilted blossoms and spreads to the attached fruit. The fruit turn brown or black at the blossom end and the rot progresses toward the stem end. A gray-black mold covers the rotted area. Upon examination, the fungus looks like many black-headed pins stuck into the fruit. The disease is more frequently a problem under a heavy canopy and during damp weather.

Mosaic Viruses

Several mosaic viruses infect vine crops. The most important are cucumber mosaic virus (CMV), watermelon mosaic virus (WMV), and squash mosaic virus (SqMV).

Affected plants are stunted, grow slowly and produce few fruit. Leaves are mottled green and yellow, often rough, misshapen, and cupped. Young leaves are dwarfed and fail to expand, often forming a rosette at the ends of the vines. Fruit that develop after infection are mottled, poorly colored, rough, and small. Fruit that form before infection often develop normally.

These viruses affect other crops and weeds, and therefore are usually present in and near cucurbit fields. Some are spread exclusively by aphids, others by cucumber beetles, and others by mechanical means. When possible, use virus-resistant cultivars and virus-free seed. Maintain a regular spray program to control aphids and cucumber beetles. Destroy perennial weeds in and around fields to reduce host plants for overwintering of the viruses.

Weeds

Weeds present major problems in vine crops if they are not controlled. In addition to competition for nutrients, water, and light, they serve as hosts for several insect and disease pests and interfere with harvesting.

Herbicides currently registered for use on vine crops do not provide season-long control of most weeds. Therefore, cultivation is an important part of a weed control program. Space the rows so that plants can be cultivated until the vines spread out. A small disc or field cultivator may be used to control weeds between rows in widely spaced crops.

Pesticide Information

Pesticides must be registered with the U.S. Environmental Protection Agency (EPA) and the Michigan Department of Agriculture before they can be used legally in Michigan. Purchase only pesticides that are labeled for the crop to be treated and the pest to be controlled. Remember that the pesticide label is a legal document on pesticide use, and all instructions and limitations on it must be followed closely. The use of a pesticide in a manner not consistent with the label can lead to injury of crops, humans, animals, and the environment, and can lead to civil fines and/or condemnation of the crop.

Additional Information

More information on the vine crops is available in the following bulletins available from county Cooperative Extension Service offices, or from the MSU Bulletin Office, P.O. Box 6640, East Lansing, MI 48823-6640. Some bulletins are for sale only, so check for availability and prices.

E-312 *Control of Insects, Diseases, and Nematodes on Commercial Vegetables*

E-433 *Weed Control Guide for Vegetable Crops*

E-550 *Fertilizer Recommendations for Vegetable and Field Crops in Michigan*

E-675 *Vegetable Varieties for Commercial Growers*

E-969 *Cucumber, Melon, Squash, and Pumpkin Insect Pests*

E-1751 *Identifying Diseases of Vegetables*

Issued in furtherance of Cooperative Extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture. W.J. Moline, Director, Cooperative Extension Service, Michigan State University, E. Lansing, MI 48824.

5:86-5M-NEW-SDC/MPC, Price 45 cents.