Cucurbit Crops — Squash and Pumpkin

Types and Varieties

Summer Squash: Common summer squash types include zucchni, yellow straightneck and yellow crookneck. Many specialty types also perform well, including golden zucchini, Middle-Eastern types, patty pan, and cocozelle.

Winter Squash: Common winter squash types include acorn, buttercup, butternut, hubbard, and spaghetti. Japanese types kuri and kabocha are also grown.

Pumpkin: Pumpkins grown for ornamental display or carving range from less than a pound to 30 pounds or more. For giant pumpkins, squash varieties such as Atlantic Giant or Prize Winner are used. Varieties with hull-less or "naked" seed are favored as a source of seeds for eating. Many specialty pumpkins are also edible winter squash, such as fairytale and Cinderella pumpkins. Most of the "pie" pumpkins sold to consumers are used for decorating, but some varieties are still used for home baking. Pumpkins that are processed into pie filling and other products are largely grown under contract to processors, and the varieties are more like winter squash than jack-o-lantern pumpkins.

Spacing and Seeding

Bush Types: Rows 4-6 feet apart. Plant 18-24 inches apart in row. Seed: 4-6 pounds per acre.

Vining Types: Rows 6-8 feet apart. Plant 2-5 feet apart in row. Seed: 2-3 pounds per acre.

Fertilizing

Lime: To maintain a soil pH of 6.0-6.8.

Preplant: N: 50 pounds per acre; P_2O_5: 0-150 pounds per acre; K_2O: 0-200 pounds per acre. Adjust according to soil type, previous management, and soil test results for your state. For summer squash transplants, a starter solution at a rate of 1 cup (8 ounces) per plant is recommended. If the transplant flat receives a heavy fertilizer feeding just prior to setting, the starter solution can be eliminated.

Sidedress N: For soils with more than 3 percent organic matter and following soybeans, alfalfa, or a grass-legume hay crop, no N is needed. For soils with less than 3 percent organic matter with the same rotation or a rotation of corn, rye, oats, wheat, or a vegetable crop, apply 30-40 pounds N per acre when the vines begin to run. For sandy soils, the preplant N application can be replaced by an early sidedressing of 40 pounds N per acre when the plants show the first set of true leaves. Apply the second sidedressing of 45 pounds N per acre at onset of rapid vining.

For crops grown from transplants on plastic mulch, N losses from leaching are greatly reduced. For this culture system, apply 50 pounds N per acre broadcast preplant over the row just before laying the plastic. If sidedress N is recommended (see above), apply up to 30 pounds N per acre on either side of the plastic at vining when the plant roots have reached the edge of the plastic. If you are using trickle irrigation, apply the 50 pounds N per acre preplant, and apply 0.5-1 pound N per acre daily, or 3-6 pounds N weekly through the trickle system if additional N is needed.

Pesticide Use in Greenhouses

Before using any pesticide, always read the product label for mention of greenhouse restrictions. See Selected Information About Recommended Fungicides (page 79), Selected Information About Recommended Herbicides (page 69), and Selected Information About Recommended Insecticides (page 54).

Disease Control for Squash and Pumpkin

Angular Leaf Spot

Angular leaf spot may be transmitted via seed. Lesions on leaves and fruit of pumpkin and squash are similar in appearance to those of bacterial leaf and fruit spot.

Recommended Products

Several **copper-based** bactericides are effective against angular leaf spot.
Dithane® and **Manzate®** may help manage angular leaf spot when used with fixed copper products.

Bacterial Fruit Blotch

Bacterial fruit blotch is much more likely to occur on watermelon than on squash or pumpkin. See the bacterial fruit blotch section in Disease Control for Cantaloupe, Cucumber, and Watermelon, page 123.

Bacterial Leaf and Fruit Spot

Bacterial leaf and fruit spot occurs primarily on pumpkin and winter squash. Symptoms on leaves may occur throughout the season. However, only lesions on fruit are of economic importance. Bacterial leaf and fruit spot lesions may be colonized by other organisms (such as *Fusarium* and soft-rot bacteria), which results in fruit rot.

The bacterial leaf and fruit spot pathogen may survive on crop residue and be transmitted on seed. All squash and pumpkin varieties appear to be susceptible. Symptoms may be similar to angular leaf spot.

Winter/Off-season: Rotate crops at least 3 years with cucurbit crops, and practice fall tillage. May be seedborne.

Planting: Treat with fixed copper compounds mixed with mancozeb products if symptoms are present.

Vine Touch: Apply fixed copper sprays when fruit is softball-sized. Tank-mix copper and mancozeb products. Continue applications until fruit set is complete.

Harvest: Do not save seed from affected fields. Identify fruit problems.

Recommended Products

Copper applications at 7-day intervals beginning when fruit are 4-5 inches in diameter. Applying copper mixed with mancozeb products (e.g., Dithane®, Manzate®, Penncozeb®) is more effective than copper alone.

Bacterial Wilt

This disease affects pumpkins and squash only when striped and spotted beetles feed on the plants before the 5 true leaf stage. Disease control depends on control of striped and spotted cucumber beetles. Regularly scout fields for beetles.

Winter/Off-season: The disease is unaffected by crop rotation.

Planting: Apply systemic insecticides such as Admire® or Platinum® (see insect section) at transplant. Apply contact insecticides after systemic insecticides lose effectiveness (2-3 weeks). Apply foliar insecticides only when beetles are present. When large numbers are present, treatments may be required twice weekly. Scout fields regularly for cucumber beetles.

Damping-off

Practice good greenhouse sanitation. The best way to prevent damping-off of seedlings in the greenhouse is to keep the greenhouse area clean. See section on Transplant Production, page 23.

Plant in warm field soils. The fungi responsible for damping-off in field soils cause more loss when the seedling is slow to emerge.

Using treated seed may help reduce the severity of damping-off if used with the cultural methods discussed above. Seed treated with contact fungicides with the active ingredients thiram or captan may help reduce the decay of the seed prior to emergence. Systemic products are designed to move into the seedling and help manage damping-off in the first two to three weeks. Examples of systemic products include Apron XL®, Dynasty®, and Maxim 4FS®. Seed that is treated with all three of these systemic products is available with the trade name Farmore 300®. Vegetable seed that is usually transplanted (such as muskmelon and watermelon) are less likely to benefit from fungicide seed treatments than crops that are direct seeded (such as pumpkin).

Recommended Products

Apron XL LS® (mefenoxam) seed treatment will help prevent damping-off caused by Phytophthora and Pythium.

Dynasty® (azoystrobin) seed treatment will help to prevent damping-off caused by *Rhizoctonia* spp.

Maxim 4FS® (fludioxonil) seed treatment will help prevent damping-off caused by *Rhizoctonia* spp.

Previcur Flex® See label for greenhouse uses and details about managing damping-off caused by Pythium species.

Ridomil Gold SL ®at 1-2 pts. per acre. For use on damping-off caused by Pythium species.

Downy Mildew

The fungus-like organism that causes downy mildew, *Pseudoperonospora cubensis,* does not survive Midwest winters because it requires green, living plant tissues. That means the fungus-like organism can only overwinter in south Florida or in greenhouses in the northern U.S and Canada. The wind carries downy mildew spores to new, living hosts, but, depending on conditions, it can be quite late in the growing season before the spores reach the Midwest. Downy mildew of cucurbits may occur as early as mid-July or may not show up in at all in a particular growing season. Since pumpkins are grown until relatively late in the growing season, this crop is often affected more than other cucurbits.

Strains of the downy mildew pathogen are known to exist that are resistant to some fungicides. Strobilurin fungicides (such as Cabrio®, Flint®, Merivon®, Pristine®, Quadris®, Reason®, Satori®) and fungicides with the

active ingredient mefenoxam (such as Ridomil®) are particularly prone to resistance. In addition, Revus and Previcur Flex have occasionally been ineffective for management of downy mildew. See Selected Information About Recommended Fungicides (page 79) for more information.

Winter/Off-season: The disease is unaffected by crop rotation.

Planting: Begin scouting in July. You can follow disease progress in the Purdue Extension *Vegetable Crops Hotline* bulletin or at cdm.ipmpipe.org. Apply specialized systemic downy mildew fungicides plus chlorothalonil (Bravo®, Echo, Equus, Initiate) if disease is observed in the area. Applying chlorothalonil before infection may suppress downy mildew severity.

Recommended Products

Bravo®, Echo®, Equus®, Initiate® are labeled for use at various rates. 0-day PHI.

Catamaran® at 6 pts. per acre. 1-day PHI.

Elumin® at 8 fl. oz. per acre. Tank-mixing this product with a contact fungicide such as chlorothalonil or mancozeb will help reduce resistance concerns. 2-day PHI.

Forum 4.18SC® at 6 fl. oz. per acre. 0-day PHI.

Gavel 75DF® 1.5-2.0 lbs. per acre. 5-day PHI.

Mancozeb products (including Dithane® or Manzate®) are labeled at various rates. *Some mancozeb formulations may not be labeled for pumpkin.* 5-day PHI.

Several **phosphite or phosphorous acid** products are labeled at various rates (including Agri-Fos®, Phostrol®, Prophyt®, Rampart®). Label includes several different crops, PHIs, resistance instructions, and other important information. Some manufacturers recommend tank-mixing. These products may be used in a preventative program until downy mildew is observed. 0-day PHI.

Omega 500F® at 0.75-1.5 pts. per acre. 30-day PHI.

Orondis Opti® may be available as a co-pack. Apply according to rates on each container. 0-day PHI.

Orondis Ultra® may be available as a co-pack. Apply according to rates on each container. 0-day PHI.

Presidio® at 4 fl. oz. per acre. 2-day PHI.

Ranman® at 2.1-2.75 fl. oz. per acre. 0-day PHI.

Revus® at 8.0 fl. oz. per acre. 0-day PHI.

Tanos 50DF® at 8 oz. per acre. 3-day PHI.

Zampro® at 14 fl. oz. per acre 0-day PHI.

Zing 4.9SC® at 36 fl. oz. per acre. 0-day PHI.

Fusarium Fruit Rot

Pumpkin fruit are more likely than other cucurbits to be affected by Fusarium fruit rot. There are no symptoms on foliage. No resistant varieties are available. Fruit with Fusarium fruit rot are often observed from fields where other disease or cultural problems are present.

Winter/Off-season: Rotate with noncucurbit crops at least 4 years. Growing pumpkins in cover crops may help to lessen the disease. Avoid fields with a history of disease. May be seedborne.

Planting: Manage foliar diseases for better fruit health. Avoid other fruit diseases, such as bacterial fruit spot and Phytophthora blight.

Harvest: Identify fruit problems.

Gummy Stem Blight/Black Rot

Gummy stem blight may occur on cucurbits from transplant through harvest. The leaves and stems may be affected. Occasionally, fruit are affected, which is known as black rot. The black rot phase of the disease is more common in pumpkins than the gummy stem blight phase.

Strains of the gummy stem blight fungus are known to exist in the Midwest that are resistant to some fungicides. Strobilurin fungicides in Group 11 (such as Cabrio®, Flint®, Merivon®, Pristine®, Quadris®, Satori®) and fungicides with the active ingredient boscalid Group 7 (such as Fontelis® and Pristine®) are particularly susceptible to resistance; for this reason, these products are not listed here. See Selected Information About Recommended Fungicides, page 79. Tank-mix these products with products that have a different mode of action in situations where resistance may be a factor.

Winter/Off-season: Rotate crops at least 3 years and practice fall tillage. May be seedborne.

Greenhouse: Scout for disease. Apply fungicide labeled for greenhouse if necessary.

Planting: Avoid planting diseased seedlings in the field.

Vine Touch: Apply contact or systemic fungicides at 7-14 day intervals or according to MELCAST — see Purdue Extension publication BP-67-W, *Foliar Disease Fungicide Control Using MELCAST,* available from the Purdue Extension Education Store, www.edustore.purdue.edu.

Harvest: Identify fruit problems.

Recommended Products

Bravo®, **Echo®**, **Equus®**, and **Initiate®** are labeled for use at various rates. 0-day PHI.

Dithane® and **Penncozeb®** are labeled for use at various rates. 5-day PHI.

Inspire Super® at 16-20 fl. oz. per acre. 7-day PHI.

Luna Experience® at 10-17 fl. oz. per acre 7-day PHI.

Monsoon® at 8 fl. oz. per acre. 7-day PHI.

Switch® at 11-14 oz. per acre. 1-day PHI.

Toledo® at 8 fl. oz. per acre. 7-day PHI.

Vibe® at 8 fl. oz. per acre. 7-day PHI.

Phytophthora Crown Rot, Fruit and Foliar Blight

Phytophthora is often associated with heavy rains and fields with poor drainage. Raised beds may help lessen disease severity. The first symptoms are usually observed in low areas. No resistant varieties are available.

Winter/Off-season: Use crop rotations of 4 years or more that do not include solanaceous crops. Avoid fields with a history of a disease.

Planting: Direct-seeded crops benefit from fungicide-treated seed (see discussion of fungicide seed treatment under Damping-off). Treat seed with Apron XL LS® to help prevent *Phytophthora* infection for 5 weeks from time of seeding. Ponds with run-off water from infested soil may be contaminated with Phytophthora. Use crop rotations of at least three years with non-cucurbits and effective weed management. Avoid rotating with peppers.

Vine Touch: Apply contact or systemic fungicides at first sign of the disease. Systemic fungicides are available.

Harvest: Identify fruit problems. Sanitation is very important to prevent the spread of the disease.

Recommended Products

Apron XL LS® seed treatment. *Only for direct-seeded plants.*

Elumin® at 8 fl. oz. per acre. Tank-mixing this product with a contact fungicide such as chlorothalonil or mancozeb will help reduce resistance concerns. See label for drip irrigation instructions. 2-day PHI.

Forum 4.18SC® at 6 fl. oz. per acre. 0-day PHI.

Gavel 75DF® at 1.5-2.0 lbs. per acre. 5-day PHI.

Orondis Ridomil Gold SL® may be available as a co-pack. Apply according to rates on each container. 0-day PHI.

Orondis Opti® may be available as a co-pack. Apply according to rates on each container. 0-day PHI.

Orondis Ultra® may be available as a co-pack. Apply according to rates on each container. 0-day PHI.

Presidio 4SC® at 4 fl. oz. per acre. 2-day PHI.

Several **phosphite** or **phosphorus acid** products (Agri-Fos®, Phostrol®, Prophyt®, Rampart®) are labeled at various rates. Label includes different crops, PHIs, resistance instructions, and other important information. Some manufacturers recommend tank-mixing. These products may be used in a preventative program until Phytophthora blight is observed. 0-day PHI.

Ranman 400SC® at 2.75 fl. oz. per acre. 0-day PHI.

Revus 2.09SC® at 8 fl. oz. per acre. *Suppression only.* 0-day PHI.

Tanos 50WDG® at 8-10 oz. per acre. *Suppresion only.* 3-day PHI.

Zampro® at 14 fl. oz. per acre. 0-day PHI.

Powdery Mildew

Powdery mildew is primarily a disease of cantaloupe, pumpkin, and squash. This disease does not require leaf wetness for disease initiation or spread.

Some pumpkin varieties have partial resistance to powdery mildew. Fungicide resistance has been detected in the Midwest. Fungicides in Groups 1 and 11 may not be effective. Fungicides that are affected include Cabrio®, Flint®, Quadris®, Satori®, Sovran®, and Topsin®. Alternate fungicides between MOA groups. See Selected Information About Recommended Fungicides (page 79).

Winter/Off-season: Crop rotation and fall tillage are moderately important. Resistant or partially resistant pumpkin cultivars are available.

Vine Touch: Begin systemic fungicide applications at "bush" stage of pumpkin growth. Protect pumpkin vines until approximately 21 days from first harvest.

Recommended Products

Aprovia Top ® at 10.5-13.5 fl. oz. per acre. 0-day PHI.

Fontelis 1.67SC ® at 12-16 fl. oz. per acre. 1-day PHI.

Inspire Super® at 16-20 fl. oz. per acre. 7-day PHI.

Luna Experience® at 6-17 fl. oz. per acre. 7-day PHI.

Luna Sensation® at 4-7.6 fl. oz. per acre. 0-day PHI.

Merivon® at 4-5.5 fl. oz per acre. 0-day PHI.

Microthiol 80DF® at 5-10 lbs. per acre. 0-day PHI.

Monsoon® at 6-8 fl. oz per acre. 7-day PHI.

Procure 50WS® at 4-8 oz. per acre. 0-day PHI.

Quintec® at 4-6 fl. oz. per acre. May cause minor leaf yellowing. 3-day PHI.

Rally 40W® at 2.5-5.0 oz. per acre. 0-day PHI.

Torino® at 3.4 oz. per acre. 0-day PHI.

Toledo® at 8 fl. oz. per acre. 7-day PHI.

Velum Prime® at 6.5-6.84 fl. oz. per acre. May cause a mild yellowing of leaf margin. May be applied through drip. 0-day PHI.

Vibe® at 8 fl. oz. per acre. 7-day PHI.

Vivando® at 15.4 fl. oz. per acre. 0-day PHI.

Plectosporium Blight

Plectosporium blight primarily affects pumpkin. Leaves, stems, and occasionally fruit can be affected.

Winter/Off-season: Rotate cucurbit crops 3-4 years and practice fall tillage. Choose fields with well-drained soil.

Vine Touch: Start applying contact/systemic fungicide applications and continue at 7-14 day intervals.

Harvest: Identify fruit problems.

Recommended Products

Aprovia Top at 10.5-13.5 fl. oz. per acre. 0-day PHI.

Cabrio® at 12-16 oz. per acre. 0-days PHI.

Flint® at 1.5-2.0 oz. per acre. 0-day PHI.

Inspire Super® at 16-20 fl. oz. per acre. 7-day PHI.

Quadris 2.08SC® at 11.0-15.4 fl. oz. per acre. 1-day PHI.

Root-knot Nematodes

Winter/off-season: Root-knot nematodes have a host range of more than 2,000 plants, so crop rotation is often ineffective unless a grain crop is used. Certain cover crops may lessen symptom severity.

Planting: Vydate® at planting may manage moderate nematode populations. Fumigants may be used for higher nematode populations.

Harvest: Examine stunted and wilting plants for the presence of root-knot nematodes.

Recommended Products

InLine®. See label for rates. *RUP.*

Nimitz ® at 3.5-7 pts. per treated acre. Do not use on direct-seeded plants. May be broadcast, banded, or drip-applied. 7-day plant back interval.

Telone II® or **Telone C-35**®. See labels for rates. *RUP.*

Velum Prime® at 6.5 to 6.84 fl. oz. per acre by chemigation. 0-day PHI.

Vydate L® at 1-2 gals. per acre in 20 gals. of water broadcast. Incorporate 2-4 inches. *RUP.*

Vapam®. See label for rates.

Scab

Scab lesions may be observed on the fruit of most cucurbit crops. Fungicides used for gummy stem blight control may help. Fungicides may be ineffective when temperatures of less than 57°F persist for longer than 9 hours.

Winter/Off-season: Rotate crops 3-4 years and practice fall tillage. Use disease-free seed.

Planting: Fungicides may help to reduce the severity of scab if applied before fruit development.

Harvest: Inspect fruit for symptoms of scab.

Virus Diseases: Cucumber Mosaic (CMV), Papaya Ring Spot (PRSV), Squash Mosaic (SqMV), Watermelon Mosaic (WMV), Zucchini Yellow Mosaic (ZYMV)

Aphids transmit virus diseases, including cucumber mosaic virus, papaya ring spot virus, watermelon mosaic virus, and zucchini yellow mosaic virus. Since these diseases usually appear later in the season, they most often affect pumpkin and squash. All varieties are susceptible to these viruses.

It may help to kill perennial weeds (virus source plants) within 150 feet of planting. Controlling aphids (virus carriers) by insecticides can reduce secondary spread of viruses but does not reduce initial infection and rarely results in any decrease in the incidence of virus symptomatic fruit. Early planting and development of pumpkins and squash fruit before virus diseases become prevalent may reduce symptoms on fruit.

Planting: Earlier planted or earlier maturing pumpkin cultivars will help to avoid severe disease problems.

Vine Touch: Control weeds in and around production area.

Common Cucurbit Viruses and Transmission Sources

Virus	Host Range	Transmission Source
Cucumber Mosaic Virus	wide	aphids[1]
Papaya Ring Spot Virus	Cucurbitaceae	aphids[1]
Squash Mosaic Virus	Cucurbitaceae, Chenopodiaceae	seeds, cucumber beetles
Watermelon Mosaic Virus	Cucurbitaceae, weeds	aphids[1]
Zucchini Yellow Mosaic Virus	Cucurbitaceae	aphids[1]

[1]Aphidborne viruses are non-persistent, thus aphids can begin transmitting the virus after seconds of feeding, and may transmit the virus for only a few hours.

Weed Control for Squash and Pumpkin

For combined weed control options in cucurbits, see page 129.

Insect Control for Squash and Pumpkin

For combined insect control options in cucurbits, see page 133.

Cucurbit Crops — Cantaloupe, Cucumber, and Watermelon

Cucumber

Several types of cucumbers are grown in the Midwest.

Fresh market slicing cucumbers have thick, dark skin and a few large spines. They are commonly grown in the field with no support.

European greenhouse cucumbers are long with thin skin, no spines, no seeds, and are grown on trellises in greenhouses.

Beit alpha cucumber types are shorter but also have thin skin with no spines, and may be grown in the field or in protected structures.

Pickling cucumbers are short with thin skins and large spines. They are adapted for field production. Pickling cucumbers can also be marketed for fresh use.

Gynoecious cucumber varieties produce mainly female flowers and, unless they are also parthenocarpic, require a pollinizer variety for good fruit set. Pollenizers are usually included when you buy gyneocious seed. Parthenocarpic varieties will set fruit without pollination and no seeds will develop. Parthenocarpic varieties will produce seeds if they get pollinated.

Melon

Melons are warm-season crops that achieve prime quality when grown under warm, sunny conditions. Cool, cloudy weather results in melons with inferior quality. Melons prefer sandy and sandy loam soils. Production on plastic mulch and light soils produces an early crop that commands a premium price.

The most commonly cultivated melon is cantaloupe. Cantaloupes grown in the Midwest are primarily eastern types. Typical varieties include Athena and Aphrodite.

Melon types with distinctive fruit attributes are generally referred to as specialty melons. Common specialty melons include honeydew, charentais, galia, ananas, Persian, crenshaw, canary, and Asian melon. These melons with unique fruit characteristics attract consumers at local food markets. Some specialty melons (such as galia and ananas) are bred in dry conditions. Their skins tend to crack with excessive water. Greenhouse or high tunnel environments are more suitable for growing these melons in the Midwest.

Cantaloupe or Muskmelon?

Both cantaloupe and muskmelon are acceptable names for fruit from the vines known to scientists as *Cucumis melo* subsp. *melo* var. *cantalupensis*. In this guide, we use cantaloupe to agree with USDA standards, which use this term.

Watermelon

Watermelons are either seedless or seeded. Seedless watermelons are triploid. They produce fruit that has few if any true seeds. For seedless watermelons to set fruit, growers must plant diploid watermelons (non-edible pollenizer plants or seeded watermelons) next to the triploid plants. The general rule is to plant a pollinizer plant for every two to four triploid plants.

Watermelons produce a wide range of fruit sizes. Seeded watermelons generally have larger fruit (more than 20 pounds) than seedless types. Royal Sweet is a widely grown seeded watermelon variety, that produces oblong melons that weigh 20 to 24 pounds.

Typically, seedless watermelons are more than 12 pounds. They are sold in cardboard bins with 60, 45, 36 and 30-count categories. Excursion is a variety that produces relatively large fruit that are primarily 36-count. Wayfarer is a variety that produces relatively smaller fruit that are

mainly 60-count. Mini or personal-size watermelons are less than 10 pounds and include varieties such as Extazy and Ocelott.

Watermelons differ in rind patterns and fruit shapes. Most watermelons have striped patterns on a dark or light green background. However, some varieties (Sweet Gem and Wayfarer) do not have stripes, but rather a pure dark green rind. There also is a unique rind pattern called moon and star. It has golden yellow spots on a deep green background. Seed companies have successfully bred both seedless and seeded watermelons with the moon and star patterns. The shapes of most large watermelons are blocky or oblong, while mini watermelons tend to be round.

Although watermelons with red flesh are most familiar, there are yellow, orange and white-fleshed varieites available. Varieties include Orange Crisp (orange, seedless), Amarillo (yellow, seedless), and Cream of Saskatchewan (white, seeded).

Watermelon Variety Resistance to Fusarium Wilt[1]

Variety	Company	Type	Resistance[2]
Afternoon Delight	Dwayne Palmer	triploid	+1/2
Crunchy Red	Harris Moran	Triploid	++
Distinction	Syngenta seeds	Triploid	++++
Fascination	Syngenta Seeds	triploid	++++
Fiesta	Syngenta Seeds	diploid	++1/2
Indiana	Seedway	triploid	++
Liberty		triploid	++
Palomar	Syngenta Seeds	triploid	+
Matrix		triploid	+++1/2
Melody		triploid	+++
Regency	Seminis	diploid	++++
Revolution		triploid	+
Royal Sweet	Seminis	diploid	++
Summer Sweet 5244	Abbott & Cobb	triploid	++
Summer Sweet 7167	Abbott & Cobb	triploid	+
SW 4502	Seedway	triploid	+1/2
Trillion	Abbott & Cobb	triploid	+1/2
Triple Threat		triploid	+++
Tri-X-313	Syngenta Seeds	triploid	+1/2
Troubadour	Harris Moran	Triploid	++
Vagabond		triploid	+++1/2

[1] Inclusion of these varieties does not imply endorsement or criticism of any variety or company. Refer to company literature for information on host resistance claims.

[2] The resistance ratings provided here are averages based on several years of greenhouse research. In that research, each watermelon variety was observed after receiving an artificial inoculation with a race 1 strain of the disease. ++++ = good resistance; +++ = moderate resistance; ++ = some resistance; + = little or no resistance.

[3] OP=open pollinated variety included for comparison.

Pollenizer Watermelon Resistance to Fusarium Wilt

Variety	Type	Resistance[1]
Ace	pollenizer	+
Companion	pollenizer	+++1/2
Jenny	pollenizer/edible	++1/2
Mickey Lee	pollenizer/edible	++1/2
Pinnacle	pollenizer	+1/2
Polimax 6017	pollenizer	++
Sidekick	pollenizer	+++1/2
SP-5	pollenizer	++++
Regency	pollenizer/edible	++++

[1] The resistance ratings provided here are averages based on several years of greenhouse and field research. In the greenhouse research, each watermelon variety was observed after receiving an artificial inoculation with a race 1 strain of the disease. ++++ = good resistance; +++ = moderate resistance; ++ = some resistance; + = little or no resistance.

Spacing

Cantaloupes: Rows 5 to 7 feet apart. Plants 3 to 5 feet apart in row. 1 to 2 plants per hill. Plastic mulch is recommended. Clear mulch is suggested only for earliest plantings in northern areas.

Watermelons: Rows 6 to 12 feet apart. Plants 3 to 6 feet apart in row. One plant per hill. Plastic mulch is recommended for all transplanted watermelons.

Mini- or "personal" watermelons: Rows 6 to 10 feet apart. Plants 1.5 to 2 feet apart in row to allow 12 to 15 square feet per plant.

Cucumbers for fresh market: Rows 4 to 6 feet apart. Plants 15 to 18 inches apart in row.

Pickles (machine harvest): Rows 18 to 20 inches apart. Plants 5 to 7 inches apart in row.

All cucumbers should be planted after the danger of frost is past since they are not frost-tolerant. For proper germination, soil temperature must be above 60°F. Planting too early (when the soil is too cold and wet) will result in poor seedling emergence.

Fertilizing

Lime: To maintain a soil pH of 6.0 to 6.5. Cantaloupe is particularly sensitive to low soil pH and should be limed to 6.3 to 6.8. If your soil test indicates less than 70 ppm magnesium, use dolomitic limestone, or apply 50 pounds per acre Mg broadcast preplant incorporated.

Preplant: N: 40 to 60 pounds per acre. P_2O_5: 0 to 150 pounds per acre. K_2O: 0 to 200 pounds per acre. Adjust according to soil type, previous management, and soil test results for your state. For transplants, a starter solution at the rate of 1 cup (8 ounces) per plant is recommended. If the transplant flat receives a heavy fertilizer feeding just prior to setting, the starter solution can be eliminated.

Sidedress N: Apply 45 pounds N per acre in a band to either side of the row when plants are rapidly vining. For direct seeded watermelon, the preplant N application can be replaced by an early sidedressing of 40 pounds N per acre when plants show the first set of true leaves followed by the 45 pounds N rate at the rapid vining stage of growth. If heavy rains occur in June, 30 pounds N per acre should be applied through the irrigation system at fruit set (late June to early July).

For cantaloupes and cucumbers grown on plastic mulch, the N rate can be reduced because N losses from leaching are greatly reduced. For this culture system, apply 50 pounds N per acre broadcast preplant over the row just prior to laying the plastic. Sidedress 30 pounds N per acre on either side of the plastic at vining when plant roots have reached the edge of the plastic (mid-June). If you are using trickle irrigation, apply the 50 pounds N per acre preplant and apply 0.5 to 1 pound N per acre daily, or 3 to 6 pounds N weekly through the trickle system until fruit are about 2 inches in diameter.

Irrigation

Cucumbers: Maximum yields and fruit quality will result only if plants receive adequate and timely moisture. Depending on your soil type, obtaining high quality cucumbers requires approximately 1 to 2 inches of water per week. An irregular water supply, particularly during blossoming and fruit development, can affect fruit quality detrimentally and result in increased nubbins or hooked fruit.

Cantaloupes: Cantaloupes are moderately deep rooted and require adequate soil moisture with good drainage. Natural rainfall may not be adequate, so supplemental irrigation may be required, particularly in the early stages of growth. When irrigating, irrigate the soil in the effective root zone to field capacity. A good, steady moisture supply is critical for good melon production. After melons have attained a good size, it is best to reduce irrigation. Reduced irrigation at this time can, in some cases, increase the mature fruit's sugar content. Excessive moisture during fruit ripening can result in poor quality.

Watermelons: Watermelons are deep-rooted plants, so natural rainfall often is adequate, and irrigation may not be cost effective on heavier soils. Adequate soil moisture in the early growth stages will help ensure vigorous growth. Soil moisture also is critical during blossoming and fruit development.

Harvesting

Cucumbers: Unless a once-over mechanical harvester is being used, cucumbers should be harvested at 2 to 4 day intervals to prevent losses from oversized and over mature fruit. Desired harvest sizes range from 5 to 8 inches long and 1.5 to 2 inches in diameter for fresh market slicing types. If growing for processors, be sure to understand the specific terms of their contracts at the beginning of the growing season. Prices received are related to the quantity of fruit within specific size ranges as established by either USDA guidelines or by the processor.

Melons: During ripening, eastern type cantaloupes develop an identifiable abscission zone and form tan-colored netting. Harvest index is at three-quarter or full-slip stage. The fruit do not keep well in the field when ripe. Harvest every one to three days.

Cantaloupe varieties with long shelf life (such as Infinite Gold and Durawest) were tested in the Midwest. Long shelf life varieties have delayed abscission compared to normal eastern type cantaloupes. They either stay in green or have a continuous color change. Color and abscission are not used as harvest indices for long shelf life varieties. Indicators of the optimal ripeness are when there are a few vertical cracks on the peduncle but the fruit has not slipped yet. Long shelf life varieties can hold longer in the field, allowing growers to harvest two or three times.

Honeydew, crenshaw and canary melons do not develop netting on the skin and do not form abscission zones during ripening. Color is the primary harvest index.

Watermelons: Harvesting watermelons at the correct stage of maturity is critical and difficult. While each cultivar is different, maturity can be determined in several ways, including ground spots changing from white to yellow, browning of tendrils nearest the fruit, and a hollow or dull sound when "thumped." Watermelons should be cut from the plant to avoid vine damage and prevent stem-end rot. Leave 1 to 2 inches of stem attached.

Pesticide Use in Greenhouses

Before using any pesticide, always read the product label for mention of greenhouse restrictions. See Selected Information About Recommended Fungicides (page 79), Selected Information About Recommended Herbicides (page 69), and Selected Information About Recommended Insecticides (page 54).

Disease Management with the MELCAST System

MELCAST is a disease warning system that can help Indiana farmers schedule their fungicide applications for control of certain diseases of watermelons and cantaloupes. See Disease Forecasting Systems (page 84) for details.

Disease Control for Cantaloupe, Cucumber, and Watermelon

Alternaria Leaf Blight

Alternaria leaf blight (ALB) primarily affects cantaloupe. ALB symptoms may occur on leaves from May through harvest.

Winter/Off-season: Rotate crops at least 2 years and practice fall tillage.

Vine Touch: Apply contact or systemic fungicides at 7-14 day intervals or according to MELCAST — see Purdue Extension publication BP-67-W, *Foliar Disease Fungicide Control Using MELCAST,* available from the Purdue Extension Education Store, www.edustore.purdue.edu.

Harvest: Fungicide applications are unnecessary within 2-3 weeks of final harvest.

Recommended Products

Aprovia Top® at 10.5-13.5 fl. oz. per acre 0-day PHI.

Bravo®**, Echo**®**, Equus**®**,** and **Initiate**® are labeled for use at various rates. 0-day PHI.

Cabrio EG® at 12-16 oz. per acre. See label to avoid practices that could result in crop injury. See label for tank-mix caution. 0-day PHI.

Dithane®**, Manzate**®**,** and **Penncozeb**® are available for use at various rates. 5-day PHI.

Fontelis® at 12-16 fl. oz. per acre. See label for greenhouse uses. 1-day PHI.

Gavel 75DF® at 1.5-2 lbs. per acre. 5-day PHI.

Inspire Super® at 16-20 fl. oz. per acre. 7-day PHI.

Luna Experience® at 6-17 fl. oz. per acre. 7-day PHI.

Luna Sensation® at 7.6 fl. oz. per acre. 0-day PHI.

Merivon® at 4-5.5 fl. oz. per acre. 0-day PHI.

Pristine 38WG® at 12.5-18.5 oz. per acre. 0-day PHI.

Quadris 2.08SC® at 11.0-15.5 fl. oz. per acre. 1-day PHI.

Quadris Opti® at 3.2 pts. per acre. 1-day PHI.

Quadris Top® at 12-14 fl. oz. per acre. 1-day PHI.

Satori® at 11-15.5 fl. oz. per acre. 1-day PHI.

Switch 62.5WG® at 11-14 oz. per acre. 1-day PHI.

Tanos 50WG® at 8 oz. per acre. 3-day PHI.

Zing 4.9SC® at 36 fl. oz. per acre. 0-day PHI.

Angular Leaf Spot

Angular leaf spot is normally restricted to the spring or early summer. Angular leaf spot may be transmitted via seed.

Dithane® and Manzate® may help manage angular leaf spot when used with fixed copper products.

Anthracnose

Race 1 of the fungal pathogen that causes anthracnose affects mainly cucumber — many watermelon varieties are resistant to Race 1. Race 2 affects mainly watermelon. Lesions of this disease may be observed from transplant stage through harvest on leaves, stems, and fruit.

Winter/Off-season: Rotate crops at least 3 years and practice fall tillage. Rotation with non-cucurbit crops will decrease the threat of anthracnose in future years. May be seedborne.

Greenhouse: Scout for disease. Apply fungicide labeled for greenhouse if disease threatens.

Planting: Inspect seedlings. Avoid planting diseased seedlings.

Vine Touch: Apply contact or systemic fungicides at 7-14 day intervals or according to MELCAST — see Purdue Extension publication BP-67-W, *Foliar Disease Fungicide Control Using MELCAST,* available from the Purdue Extension Education Store, www.edustore.purdue.edu.

Harvest: Inspect fruit. Avoid saving seed.

Recommended Products

Aprovia Top® at 10.5-13.5 fl. oz. per acre 0-day PHI.

Bravo®**, Echo**®**, Equus**®**,** and **Initiate**® are labeled for use at various rates. 0-day PHI.

Cabrio EG® at 12-16 oz. per acre. See warnings under Alternaria leaf blight. 0-Day PHI.

Dithane®**, Manzate**®**,** and **Penncozeb**® are available for use at various rates. 5-day PHI.

Inspire Super® at 16-20 fl. oz. per acre. 7-day PHI.

Luna Sensation® at 7.6 fl. oz. per acre. 0-day PHI.

Merivon® at 5.5 fl. oz. per acre. 0-day PHI.

Pristine 38WG® at 18.5 oz. per acre. 0-day PHI.

Quadris 2.08SC® at 11-15.4 fl. oz. per acre. 1-day PHI.

Quadris Opti® at 3.2 pts. per acre. 1-day PHI.

Quadris Top® at 12-14 fl. oz. per acre. 1-day PHI.

Tanos 50WG® at 8 oz. per acre. 3-day PHI.

Topsin 4.5L® at 10 fl. oz. per acre. 1-day PHI.

Topsin WSB® at 0.5 lb. per acre. 1-day PHI.

Zing 4.9SC® at 36 fl. oz. per acre. 0-day PHI.

Bacterial Fruit Blotch

The occurrence of bacterial fruit blotch (BFB) is highly correlated with seed contaminated with the causal bacterium. BFB symptoms may occur on leaves in the transplant greenhouse or in the field where they may be easily overlooked. However, only lesions on mature fruit are of economic importance. The pathogen is primarily seedborne (introduced with contaminated seed), but may overwinter on crop debris in greenhouses and in the field.

Many cucurbit crops may be affected, but bacterial fruit blotch is most often observed on watermelon and cantaloupe.

Winter/Off-season: Fall-plow contaminated fields and plant to crops other than cucurbits for at least 2 years. Subsequent grain crops are suggested for the rotation so that broadleaf herbicides will kill volunteer seedlings in the spring. Purchase seed tested for BFB.

Greenhouse: Scout and apply fixed copper if disease threatens. Sanitize greenhouse thoroughly after each generation of transplants.

Planting: Avoid planting diseased seedlings.

Vine Touch: Fixed copper compounds may lessen the impact of the disease.

Harvest: Inspect fruit. Avoid saving seed.

Recommended Products

Actigard® at 0.5-1 oz. per acre. Apply with two of the fixed copper product applications described below. 0-day PHI.

In situations where fruit blotch threatens, apply copper products as outlined below to help reduce the rate of disease spread.

Several **fixed copper** products are labeled at various rates. Apply fixed copper 2 weeks prior to the opening of the first female bloom, at first bloom, and 2 weeks after the first female bloom. No more than 6 applications per season.

Bacterial Wilt

Bacterial wilt primarily affects cantaloupe and cucumber. Striped or spotted cucumber beetle feeding from the seedling stage until shortly after vine touch spreads the causal bacterium from plant to plant. Symptom expression may not occur until cantaloupe fruit nears maturity, at which point it is too late to stop the spread of the disease.

Winter/Off-season: The disease is unaffected by crop rotation.

Planting: Apply systemic insecticides such as Admire® or Platinum® (see insect section). Apply contact insecticides after systemic insecticides lose effectiveness (2-3 weeks). Apply insecticides only when beetles are present. When large numbers are present, treatments may be required twice weekly. Scout fields regularly for cucumber beetles.

Damping-off

Practice good greenhouse sanitation. The best way to prevent damping-off of seedlings in the greenhouse is to keep the greenhouse area clean. See Transplant Production, page 23 and the discussion of seed treatments on page 26.

Plant in warm field soils. The fungi responsible for damping-off in field soils cause more loss when the seedling is slow to emerge.

Recommended Products

Previcur Flex®. See label for details about for managing damping-off caused by Pythium species.

Ridomil Gold SL® at 1-2 pts. per acre. For damping-off caused by Pythium.

Downy Mildew

The fungus-like organism that causes downy mildew, *Pseudoperonospora cubensis,* does not survive Midwest winters because it requires green, living plant tissues. That means the fungus-like organism can only overwinter in south Florida or in greenhouses in the northern U.S and Canada. The wind carries downy mildew spores to new, living hosts, but, depending on conditions, it can be quite late in the growing season before the spores reach the Midwest. Downy mildew of cucurbits may occur as early as mid-July or may not show up in at all in a particular growing season. Since pumpkins are grown until relatively late in the growing season, this crop is often affected more than other cucurbits.

Strains of the downy mildew fungus are known to exist that are resistant to some fungicides. Strobilurin fungicides (such as Cabrio®, Flint®, Merivon®, Pristine®, Quadris®, Reason®, Satori®) and fungicides with the active ingredient mefenoxam (such as Ridomil®) are particularly susceptible to resistance. See Selected Information About Recommended Fungicides (page 79).

Winter/Off-season: The disease is unaffected by crop rotation.

Planting: Begin scouting in July. Follow disease progress in the Purdue Extension *Vegetable Crops Hotline* bulletin or at cdm.ipmpipe.org. Apply systemic downy mildew fungicides only if disease is observed in the area.

Recommended Products

Bravo®, Echo®, Equus®, and **Initiate®** are labeled for use at various rates. 0-day PHI.

Catamaran® at 4 pts. per acre. 1-day PHI.

Elumin® at 8 fl. oz. per acre. Tank-mixing this product with a contact fungicide such as chlorothalonil or mancozeb will help reduce resistance concerns. 2-day PHI.

Mancozeb products (including Dithane®, Manzate®) are labeled at various rates. Some mancozeb formulations may not be labeled for pumpkin. 5-day PHI.

Several **phosphite** or **phosphorous acid** products are labeled at various rates (including Agri-Fos®, Phostrol®, Prophyt®, Rampart®) Label includes several different crops, PHIs, resistance instructions, and other important information. Some manufacturers recommend tank-mixing. These products may be used in a preventative program until Phytophthora blight is observed. 0-day PHI.

Omega 500F® at 0.75-1.5 pts. per acre. 30-day PHI.

Orondis Opti®. Follow rates given on each multi-pack container. Apply as tank-mix of both products in multi-pack. 0-day PHI.

Orondis Ultra®. Follow rates given on each multi-pack container. Apply as tank-mix of both products in multi-pack. 0-day PHI.

Presidio® at 3-4 fl. oz. per acre. 2-day PHI.

Ranman® at 2.1-2.75 lbs. per acre. 0-day PHI.

Tanos 50DF® at 8 oz. per acre. 3-day PHI.

Zampro® at 14 fl. oz. per acre. 0-day PHI.

Zing 4.9SC® at 36 fl. oz. per acre. 0-day PHI.

Fusarium Fruit Rot

No resistant varieties are available. Fruit with Fusarium fruit rot are often observed from fields where other disease or cultural problems are present.

Winter/Off-season: Rotate with noncucurbit crops at least 4 years. Avoid fields with a history of disease. May be seedborne.

Planting: Manage foliar diseases for better fruit health. Avoid other fruit diseases, such as bacterial fruit spot or Phytophthora blight.

Harvest: Identify fruit problems.

Fusarium Wilt in Cantaloupe

Plant resistant cantaloupe cultivars. Several cultivars have good resistance to strains of Fusarium.

Fusarium Wilt in Watermelon

Plant watermelon cultivars with partial resistance. See table on page 120. Rotate with noncucurbit crops to decrease incidence of wilt.

Recommended Products

Proline® at 5.7 fl. oz. per acre. May be applied by ground or chemigation application equipment. Do not use in water used for hand transplanting. 7-day PHI.

Gummy Stem Blight/Black Rot

Gummy stem blight may occur on transplants in the greenhouse through harvest. The leaves and stems of cantaloupe and watermelon may be affected. Occasionally, fruit are affected, which is known as black rot.

Strains of the gummy stem blight fungus are known to exist in the Midwest that are resistant to some fungicides. Strobilurin fungicides in Group 11 (such as Cabrio®, Flint®, Merivon®, Pristine®, Quadris®) and fungicides with the active ingredient boscalid Group 7 (such as Fontelis®, Merivon®, Pristine®) are particularly susceptible to resistance. See Selected Information About Recommended Fungicides (page 79). Tank-mix these products with products that have a different mode of action in situations where resistance may be a factor.

Winter/Off-season: Rotate crops at least 3 years and practice fall tillage. May be seedborne.

Greenhouse: Scout for disease. Apply fungicide labeled for greenhouse if necessary.

Planting: Avoid planting diseased seedlings in the field.

Vine Touch: Apply contact or systemic fungicides at 7-14 day intervals or according to MELCAST — see Purdue Extension publication BP-67-W, Foliar Disease Fungicide Control Using MELCAST, available from the Purdue Extension Education Store, www.edustore.purdue.edu.

*Harvest***:** Identify fruit problems.

Recommended Products

Aprovia Top® at 10.5-13.5 fl. oz. per acre 0-day PHI.

Bravo®**, Echo**®**, Equus**®**,** and **Initiate**® are labeled for use at various rates. 0-day PHI.

Dithane® and **Penncozeb**® are labeled for use at various rates. 5-day PHI.

Fontelis® at 12-16 fl. oz. per acre. 1-day PHI.

Inspire Super® at 16-20 fl. oz. per acre. 7-day PHI.

Luna Experience® at 10-17 fl. oz. per acre. 7-day PHI.

Monsoon® at 8 fl. oz. per acre. 7-day PHI.

Quadris Top® at 12-14 fl. oz. per acre. 1-day PHI.

Switch® at 11-14 oz. per acre. 1-day PHI.

Toledo® at 8 fl. oz. per acre. 7-day PHI.

Vibe® at 8 fl. oz. per acre. 7-day PHI.

Phytophthora Root Rot and Foliar Blight

Phytophthora is often associated with heavy rains and fields with poor drainage. Raised beds may help lessen disease severity. The first symptoms are usually observed in low areas. No resistant varieties are available.

Winter/Off-season: Use crop rotations of 4 years or more that do not include solanaceous crops. Avoid fields with a history of a disease.

Planting: Direct-seeded crops may benefit from fungicide-treated seed.

Vine Touch: Apply contact or systemic fungicides at first sign of disease. Some systemic fungicides are available.

Harvest: Identify fruit problems.

Recommended Products

Apron XL LS® at 6.4 fl. oz. per 100 lbs. seed. *Direct-seeded plants only.*

Elumin® at 8 fl. oz. per acre. Tank-mixing this product with a contact fungicide such as chlorothalonil or mancozeb will help reduce resistance concerns. See label for drip irrigation instructions. 2-day PHI.

Forum 4.18SC® at 6 fl. oz. per acre. 0-day PHI.

Orondis Opti®. Follow rates given on each multi-pack container. Apply as tank-mix of both products in multi-pack. 0-day PHI.

Orondis Ridomil Gold SL®. Follow rates given on each multi-pack container. Apply as tank-mix of both products in multi-pack to soil only. 5-day PHI.

Orondis Ultra®. Follow rates given on each multi-pack container. Apply as tank-mix of both products in multi-pack. 0-day PHI.

Presidio 4SC® at 4 fl. oz. per acre. 2-day PHI.

Several **phosphite** or **phosphorus acid** products (Agri-Fos®, Phostrol®, Prophyt®, Rampart®) are labeled at various rates. Label includes different crops, PHIs, resistance instructions, and other important information. Some manufacturers recommend tank-mixing. These products may be used in a preventative program until Phytophthora blight is observed. 0-day PHI.

Ranman® at 2.75 lbs. per acre. 0-day PHI.

Revus 2.09SC® at 8 fl. oz. per acre. *Suppression only.* 0-day PHI.

Tanos® at 8-10 oz. per acre. 3-day PHI.

Zampro® at 14 fl. oz. per acre. 0-day PHI.

Powdery Mildew

Many cucumber and cantaloupe varieties have good resistance to powdery mildew. Watermelon usually are not affected by powdery mildew in the Midwest. This disease does not require leaf wetness for disease initiation or spread.

Fungicide resistance has been detected in the Midwest. Fungicides in Groups 1 and 11 may not be effective. Fungicides that are affected include Cabrio®, Flint®, Merivon®, Quadris®, Satori®, and Topsin®. Alternate fungicides between MOA groups. See Selected Information About Recommended Fungicides (page 79).

Winter/Off-season: Crop rotation and fall tillage are moderately important. Resistant or partially resistant cantaloupe cultivars are available.

Vine Touch: Begin systemic fungicide applications 7-14 days before harvest (cantaloupe).

Recommended Products

Aprovia Top ® at 13.5-15.5 fl. oz. per acre. 0-day PHI.

Fontelis 1.67SC® at 12-16 fl. oz. See label for greenhouse uses. 1-day PHI.

Luna Experience® at 6-17 fl. oz. per acre. 7-day PHI.

Luna Sensation® at 4-7.6 fl. oz. per acre. 0-day PHI.

Inspire Super® at 16-20 fl. oz. per acre. 7-day PHI.

Merivon® at 4-5.5 fl. oz. per acre. 0-day PHI.

Microthiol 80DF® at 5-10 lbs. per acre, or other **sulfur** formulations. 0-day-PHI.

Monsoon® at 8 fl. oz. per acre. 7-day PHI.

Pristine® at 12.5-18.5 oz. per acre. 0-day PHI.

Procure 50WS® at 4-8 oz. per acre. 0-day PHI.

Quintec® at 4-6 fl. oz. per acre. *Not for cucumber.* 3-day PHI.

Rally 40W® at 2.5-5.0 oz. per acre. 0-day PHI.

Torino® at 3.4 oz. per acre. 0-day PHI.

Velum Prime® at 6.5-6.84 fl. oz. per acre. May cause a mild yellowing of leaf margin. May be applied through drip. 0-day PHI.

Vivando® at 15.4 fl. oz. per acre. 0-day PHI.

Root-knot Nematodes

Winter/off-season: Root-knot nematodes have a host range of more than 2,000 plants, so crops rotation is often ineffective unless a grain crop is used. Certain cover crops may lessen symptom severity.

Planting: Vydate® at planting may manage moderate nematode populations. Fumigants may be used for higher nematode populations.

Harvest: Examine stunted and wilting plants for the presence of root-knot nematodes.

Recommended Products

InLine® See label for rates.

Nimitz® at 3.5-5 pts. per acre. *Do not use on direct-seeded plants.* May be broadcast, banded, or drip pplied. 7-day plant back interval.

Telone II® or **Telone C-35®** See labels for rates. *RUP.*

Vapam® See label for rates.

Velum Prime® at 6.5-6.84 fl. oz. per acre. Apply through low-pressure drip, trickle, or micro-sprinkler. May cause a mild yellowing of leaf margin. 0-day PHI.

Vydate L® at 1-2 gals. per acre in 20 gals. of water broadcast. Incorporate 2-4 inches. *RUP.*

Scab

Scab lesions may be observed on the fruit of most cucurbit crops. Fungicides used for gummy stem blight control may help. Fungicides may be ineffective when temperatures of less than 57°F persist for longer than 9 hours.

Winter/Off-season: Rotate crops 3-4 years and practice fall tillage. Many cucumber varieties have resistance. Use disease-free seed.

Planting: Fungicides may help to reduce the severity of scab if applied before fruit development.

Harvest: Inspect fruit for symptoms of scab.

Virus Diseases: Cucumber Mosaic Virus (CMV), Zucchini Yellow Mosaic Virus (ZYMV), Watermelon Mosaic Virus (WMV)

Aphids transmit virus diseases, including cucumber mosaic virus, papaya ring spot virus, watermelon mosaic virus, and zucchini yellow mosaic virus. All varieties are susceptible to these viruses.

It may help to (1) kill perennial weeds (virus source plants) within 150 feet of planting and (2) control aphids (virus carriers). Resistant varieties are not yet available. Early planting and development of pumpkins and squash before virus diseases become prevalent may reduce disease severity.

Planting: Earlier planted or earlier maturing pumpkin cultivars will help to avoid severe disease problems.

Vine Touch: Control weeds in and around production area.

Common Cucurbit Viruses and Transmission Sources

Virus	Host Range	Transmission Source
Cucumber Mosaic Virus	wide	aphids[1]
Papaya Ring Spot Virus	Cucurbitaceae	aphids[1]
Squash Mosaic Virus	Cucurbitaceae, Chenopodiaceae	seeds, cucumber beetles
Watermelon Mosaic Virus	Cucurbitaceae,weeds	aphids[1]
Zucchini Yellow Mosaic Virus	Cucurbitaceae	aphids[1]

[1]Aphidborne viruses are non-persistent, thus aphids can begin transmitting the virus after seconds of feeding, and may transmit the virus for only a few hours.

Product/Disease Ratings for All Cucurbits[1]

Product (REI/PHI)[2]	**Common name** MOA or FRAC code: fungicides with a number as the MOA code should be tank-mixed or alternated with a different MOA code according to the label.	Alternaria leaf blight	Anthracnose	Bacterial leaf & fruit blotch	Bacterial leaf and fruit spot	Downy mildew	Gummy stem blight/black rot	Plectosporium blight	Phytophthora blight	Powdery mildew	Scab	**Comments**
Actigard® (12/0)	acibenzolar-S-methyl (21)			F	P	P				P	P	Use with copper applications for bacterial fruit blotch (see page 123).
Agri-Fos®, Phostrol®, Prophyt®, Rampart® (4/0)	phosphorus acid/phosphite (33)					F	F		F			Use early and in tank mixes.
Aprovia Top (12/0)	difenconazole (3), benzovindiflupyr (7)	ID	ID				ID	ID		G	ID	
Bravo®, Echo®, Equus®, Initiate® (12/0)	chlorothalonil (M)	G	G			F	G	G	P	F	G	
Cabrio® (12/0)	pyraclostrobin (11)	G	G			P	P	G		F		There may be resistance issues with downy mildew and gummy stem blight.
copper (active ingredient) (24/0)	copper (M)	P	P	F	F	P	P					
Dithane®, Manzate®, Penncozeb® (24/5)	mancozeb (M)	G	G			F	G	G			G	
Elumin® (12/2)	ethaboxam (22)					G			G			Do not alternate with Gavel® or Zing!®. See tank-mix recommendation on page 123.
Flint® (12/0)	trifloxystrobin (11)					P		F		P		There may be resistance issues with powdery mildew.
Fontelis® (12/1)	penthiopyrad (7)	G					P			G		There may be resistance issues with gummy stem blight.
Forum 4.18SC® (12/0)	dimethomorph (40)					G			F			Do not alternate with Revus®. Use early and in tank mixes.
Gavel® (48/5)	mancozeb (M), zoxamide (22)	G				G			F			
Inspire Super® (12/7)	difenoconazole (3), cyprodinil (9)	G	G				G	G		F		
Luna Experience® (12/7)	fluopyram (7), tebuconazole (3)	G	F				G			G		
Luna Sensation® (12/0)	trifloxystrobin (11), fluopyram (7)	G	G							F		All cucurbits.
Merivon® (12/0)	fluxapyroxad (7), pyraclostrobin (11)	G	G			P	P			G		
Monsoon®, Onset®, Toledo®, Vibe® (12/7)	tebuconazole (3)						G			F		
Orondis Opti® (4/0)	oxathiapipropilin (U15), chlorothalonil (M)					G			G			Apply as tank-mix of both products in multi-pack.
Orondis Ridomil Gold SL® (48/5)	oxathiapipropilin (U15), mefenoxam (4)								G			Apply as tank-mix of both products in multi-pack to soil.
Orondis Ultra® (4/0)	oxathiapipropilin (U15), mandipropamid (40)					G			G			Apply as tank-mix of both products in multi-pack.
Presidio 4SC® (12/2)	fluopicolide (43)					G			G			Primary use will be for Phytophthora blight in rotation with Revus®.
Previcur Flex® (12/2)	propamocarb (28)					P						Has greenhouse label for damping-off
Pristine® (12/0)	boscalid (7), pyraclostrobin (11)	G	G			P	P			P		There may be resistance issues with downy mildew and gummy stem blight.
Procure® (12/0)	triflumizole (3)									G		
Quadris®, Satori® (4/1)	azoxystrobin (11)	G	G			P	P	G		F		There may be resistance issues with downy mildew and gummy stem blight.
Quadris Opti® (12/1)	azoxystrobin (11), chlorothalonil (M)	G	G			P	P			F		
Quadris Top® (12/1)	azoxystrobin (11), difenconazolel (3)	G	G				G			P		
Quintec® (12/3)	quinoxyfen (13)									G		Contact fungicide with single mode of action
Rally® (24/0)	mycolobutanil (3)									G		
Ranman® (12/0)	cyazofamid (21)					G			G			
Revus® (4/0)	mandipropamid (40)					P			G			Primary use will be for Phytophthora blight in rotation with Presidio®.
Switch 62.5WB® (12/1)	cyprodinil (9), fludioxanil (12)	G					G			F		
Tanos® (12/3)	cymoxanil (27), famoxadone (11)	G	G	S		F			S			
Topsin M® (12/0)	thiophanate-methyl (1)		G				F			P		
Torino® (4/0)	cyflufenamid (U6)									G		
Vivando® (12/0)	metrafenone (U8)									G		Must be in possession of supplemental label.
Zampro® (12/0)	ametoctradin (45), dimethomorph (40)					G			G			See label for directions for at planting drench.
Zing® (12/0)	zoxamide (22), chlorothalonil (M)	G	G			G						

[1]Fungicide rating code: G=good. F=fair. P=poor. S=suppression only. ID=labeled, but insufficient data to allow rating. Based on research and experience of the authors.

[2]REI (re-entry interval) in hours: do not enter or allow workers to enter areas treated during the REI period. PHI (pre-harvest interval) in days: the minimum time that must pass between the last pesticide application and crop harvest.

Weed Control for All Cucurbits

Weed control methods in cucurbits vary by production system. The challenges for those who rely on herbicides include the chance of injuring crops under adverse weather, the relatively short residual of preemergence herbicides, and the lack of a broad-spectrum postemergence broadleaf herbicide that can be applied over the top of the crop.

For cucurbits that are no-till direct-seeded into a killed crop (such as pumpkins after soybeans, rye cover crop, or wheat) growers often use a burndown herbicide with a preemergence herbicide. If residue and cucurbit vines are not sufficient to suppress later-emerging weeds, growers may use postemergence herbicides, or shielded applications of nonselective herbicides.

For cucurbits direct-seeded into tilled soil, growers often combine one or more preemergence herbicides at planting with one or more cultivations. Sometimes, growers also apply a preemergence herbicide at the last cultivation to improve control of late-emerging weeds. If needed, growers may use postemergence herbicides or shielded applications of nonselective herbicides.

When cucurbits are transplanted into plastic mulch, some growers apply a premergence herbicide under the mulch as well as between the rows. Other growers only apply between the rows. Growers may also use one or more cultivations, and if needed, postemergence herbicides or a shielded application of a nonselective herbicide.

In organic production, organic mulches, plastic mulch, cultivation, and hand-weeding are common. Planting on the square will allow cultivation in two directions.

Weed pressure may be substantially reduced when growers prepare seedbeds several weeks in advance of planting and kill the first one or two flushes of weeds before planting without stirring up new weed seeds. Cucurbits lend themselves to this stale seedbed practice because they are often planted after common weeds have emerged in tilled soil.

The more quickly cucurbit vines cover the soil surface, the better they will suppress late-emerging weeds. Closer row spacing promotes rapid vine cover, and growers can increase in-row spacing to maintain a constant plant population. Uniform plant spacing in the row will also promote uniform vine cover. Seeding equipment that allows large gaps in direct-seeded crops usually leads to weed patches where the crop population is lower.

For specific weeds controlled by each herbicide, check Relative Effectiveness of Herbicides for Vegetable Crops (page 68).

Rates provided in the recommendations below are given for overall coverage. For band treatment, reduce amounts according to the portion of acre treated.

Burndown or Directed/Shielded Application Broadleaves and Grasses

Recommended Products

Glyphosate products at 0.75-3.75 lbs. acid equivalent (ae) per acre. Use formulations containing 3 lbs. ae/gal. (4 lbs. isopropylamine salt/gal.) at 1-5 qts. per acre, or formulations containing 4.5 lbs. ae/gal. (5 lbs. potassium salt/gal.) at 0.66-3.3 qts. per acre. Broadcast at least 3 days before seeding or transplanting, or apply between crop rows with hooded or shielded sprayer. Use low rate for annuals and higher rates for perennials. See label for suggested application volume and adjuvants. Remove herbicide residue from plastic mulch prior to transplanting. 14-day PHI.

Gramoxone SL 2.0 ® at 2-4 pts. per acre. Include 1 qt. of COC or 4-8 fl. oz. of NIS per 25 gals. of spray solution. Apply before seeding or transplanting, or after seeding but before crop emergence. *RUP*.

Burndown or Directed/Shielded Application Broadleaves

Recommended Products

Aim EC® at 0.5-2 fl. oz. per acre. *Controls broadleaves only*. Do not apply before direct seeding. Apply prior to transplanting or apply between crop rows with hooded sprayer. Do not allow spray to contact crop. Use COC or NIS. Weeds must be actively growing and less than 4 inches tall. Do not exceed 6.1 fl. oz. per acre per season.

Sandea® at 0.5-1.0 oz. per acre. Apply between rows. Avoid contact with crop. 30-day PHI for cucumber, squash and pumpkin. 57-day PHI for cantaloupe and watermelon. 15-day PHI for cucumber.

Preemergence Broadleaves and Grassses

Recommended Products

Chateau SW® at 4 oz. per acre. *Cantaloupe, honeydew, and watermelon in Indiana only. Applicators must be in possession of 24-C and section 3 labels. Indemnified label may be required.* Use a shielded or hooded sprayer to apply before transplanting to row middles between plastic mulch-covered raised beds. Bed must be at least 4 inches higher than treated area and at least 24 inches wide. Spray must remain between raised beds and contact no more than the bottom 1 inch of plastic. Do not apply after crops are transplanted. Rainfall or irrigation over beds is required after application but before transplanting.

Command 3ME® at the following rates:

Cantaloupe and watermelon: 0.4-0.67 pt. per acre.

Cucumber: 0.4-1.0 pt. per acre. 45-day PHI.

Summer squash: 0.67-1.33 pts. per acre. 45-day PHI.

Winter squash and processing pumpkin: 0.67-2 pts. per acre. 45-day PHI.

Not for jack-o-lantern pumpkins. See label for sensitive varieties. Apply prior to seeding or transplanting, or after seeding before crop emergence. Does not control pigweed and related species. Rates below 1 pt. will only suppress weeds. May cause temporary bleaching of crop leaves.

Curbit 3EC® at 3-4 pts. per acre. Use lower rates on coarse soils. *Direct-seeded crops*: apply to soil surface within 2 days after seeding. Do not incorporate. *Transplants*: apply as a banded spray between rows. Does not control large-seeded broadleaves. Needs 0.5 inch of water within 5 days of application to be effective. If no rain occurs, cultivate shallowly. Do not apply over or under hot caps, row covers, or plastic mulch. Do not broadcast over top of plants. Under cool temperatures may cause crop injury or failure.

Dual Magnum® at the following rates:

Cantaloupe and watermelon in Indiana, Michigan, Missouri, and Ohio only: 0.5-1.27 pts. per acre in Missouri; 0.67-1.27 pts. per acre in Indiana, Michigan and Ohio. For crops on plastic mulch, apply between rows after laying mulch, but before crop emergence or transplanting. For crops on bare ground, apply before transplanting, or after seeding before crop emergence. On bare ground, the herbicide may be broadcast or applied just between rows. There is less risk of crop injury if applied between rows, and if melons are transplanted rather than seeded. Do not exceed 1.27 pts. per acre or 1 application per crop per season. 60-day PHI.

Cucumber in Indiana, Michigan, and Ohio only: 0.67-1 pt. per acre. Apply after seeding before weeds or crop emerge, or apply broadcast after cucumbers have 1-2 true leaves. Do not exceed 1 pt. per acre or 1 application per crop per season. 30-day PHI.

Pumpkin: 1-1.33 pts. per acre to row-middles only. Apply between rows or hills. Leave an untreated area at least 1 foot wide over the planted row, or at least 6 inches from planted seed or pumpkin leaves. Additional application methods are permitted in Michigan only. See Michigan indemnified label at FarmAssist.com. 30-day PHI.

Winter squash in Indiana, Michigan and Ohio only: 1-1.3 pts. per acre. Apply after seeding before weeds or crop emerge. Injury to winter squash may occur if applied directly over the planted row or hill. Consider leaving an untreated strip directly over seed. Do not exceed 1.3 pt. per acre per crop. 30-day PHI.

Summer squash in Michigan only: 0.67-1.33 pts. per acre. *Applicators must have a 24(c) label*. Indemnified label also may be required — check with your state regulator before purchasing or using. Use the lower rate on coarse, sandy soils. Broadcast to soil before seeding or transplanting, or after squash emergence when the plants have at least one true leaf. For summer squash grown on plastic, apply to soil before laying the plastic. May also be applied to row middles after laying plastic. 30-day PHI.

Prowl H2O® at 2.1 pts. per acre. *Cantaloupe and watermelon only.* Apply to row middles only. Use a shielded sprayer with 6 inches on either side of the row middles. Apply before transplanting or before emergence of direct-seeded crop. A second application may be made before vines run. Wait at least 21 days between applications. Do not exceed 2.1 pts. per acre per application or 4.2 pts. per acre per season. 35-day PHI.

Sinbar® at 2-4 oz. per acre. *Watermelons only*. Do not use on sand or gravel soils. Not recommended on soils with less than 1% organic matter due to crop injury potential. Apply pre-transplant to bare ground, or pre-transplant under plastic mulch, or to row middles. For direct-seeded crops on bare ground, apply after planting before crop emerges. Do not allow spray to contact crop. 70-day PHI. Do not plant other crops within 2 years of application.

Strategy® at 2-6 pts. per acre. Strategy® is a premix containing the active ingredients of Command® and Curbit®. *Direct-seeded crops*: apply to soil surface within 2 days after seeding. Do not incorporate. *Transplants*: apply as a banded spray between rows. Does not control large-seeded broadleaves. Needs 0.5 inch of water within 5 days of application to be effective. If no rain occurs, cultivate shallowly. Do not apply over or under hot caps, row covers, or plastic mulch. Do not broadcast over top of plants. Under cool temperatures may cause crop injury or failure. 45-day PHI for cucumbers and squash.

Trifluralin products at 1-2 pts. per acre. Use 4EC formulations at 1-2 pts. per acre. Use lowest rate on coarse soils. Apply as a directed spray between rows after plants have 3-4 leaves and incorporate. 60-day PHI for watermelon. 30-day PHI for all others.

Preemergence Broadleaves

Recommended Products

League® at 4-6.4 oz. per acre. *Cantaloupe and watermelon only*; *not for cucumber, squash, or pumpkin*. Use the higher rate in fields with a known history of nutsedge. Apply between rows after plants are well-established and at least 5 inches wide. Avoid contact with crop and plastic mulch (if present). If emerged weeds are present include a Valent-recommended surfactant to control yellow nutsedge and labeled broadleaf weeds that are 1-3 inches tall. Do not exceed 1 application and 6.4 oz. per acre per year. 48-day PHI.

Reflex® at the following rates:

Pumpkin only in Michigan and Illinois: 0.5-1 pt. per acre. *Applicators must have a 24(c) label*. Indemnified label also may be required — check with your state regulator before purchasing or using. Apply after seeding pumpkin. Use in tank mix with other preemergent

herbicides. Apply up to 7 days before transplanting. Use only once in 2 years on same soil. See label for rotation restrictions. 32-day PHI.

Summer and winter squash only in Michigan: 0.5-1 pt. per acre. *Applicators must have a 24(c) label.* Indemnified label also may be required — check with your state regulator before purchasing or using. Apply after seeding squash. Use with another preemergent herbicide. Apply up to 7 days before transplanting. Use only once in 2 years on same soil. See label for rotation restrictions. 32-day PHI.

Watermelon only in Missouri. Growers in Missouri must have a 24(c) label at the time of application. Rates less than 16 fl. oz./A are not intended to be used as a standalone weed control program. All rates listed are on a broadcast basis unless otherwise specified. Apply these rates only to watermelon in Missouri:

Pre-transplant under mulch: 10-12 fl. oz./A under mulch. Ensure the mulch laying process does not disturb treated soil. Do not apply prior to laying drip or running a bed pan. 35-day PHI.

Pre-transplant over mulch: 10-12 fl. oz./A over top of mulch. Must be washed off of mulch with 0.5 inch rainfall/irrigation in a single event before hole punching and transplanting. It is essential to shape the top of the mulch bed so water does not accumulate in the transplant row (drill) and sheds uniformly to each side of the mulch. 35-day PHI.

Row middle application: 10-16 fl. oz./A. May be applied to row middles before emergence or transplanting. Rate must be reduced in proportion to the area treated. Severe crop injury or plant death will occur if foliage is contacted. See label for important precautions. 35-day PHI.

Sandea® at the following rates:

Direct-seeded pumpkins and winter squash on bare ground: 0.5-0.75 oz. per acre.

Direct-seeded cucumber, cantaloupe, and processing pumpkin on bare ground: 0.5-1 oz. per acre. Apply after seeding but prior to cracking.

Pretransplant cucumber, cantaloupe, pumpkin, and winter squash: 0.5-0.75 oz. per acre.

Pretransplant cucumber and cantaloupe: up to 1 oz. per acre. Apply to soil surface after final soil preparation or bed shaping and just before applying plastic mulch. Wait 7 days after application and mulch laying before transplanting.

Preemergence and pretransplant applications are allowed on watermelon in Indiana, Illinois, Kansas, and Missouri.

Preemergence Grasses

Recommended Products

Dacthal W-75® at 6-14 lbs. per acre, or **Dacthal Flowable®** at 6-14 pts. per acre. *Cantaloupe and watermelon only*. Apply when plants have 4-5 true leaves and growing conditions favor good plant growth. Crop injury may occur if applied under unfavorable growing conditions or earlier than recommended.

Prefar 4E® at 5-6 qts. per acre. Use low rate on soils with less than 1% organic matter. Apply before planting and incorporate 1-2 in. or apply after seeding before crop emerges and irrigate within 24 hours.

Postemergence Broadleaves

Recommended Products

Aim EC®. See details for Burndown or Directed/Shielded Application Broadleaves.

League®. See details above for Preemergence. Also controls nutsedge.

Sandea® at the following rates:

Pumpkin and winter squash on bare ground: 0.5-0.67 oz. per acre.

Cucumber, cantaloupe, and processing pumpkin on bare ground: 0.5-1 oz. per acre.

Not for summer squash or watermelon on bare ground. For crops on plastic mulch, see details under Burndown or Directed/Shielded Application Broadleaves. Apply after the crop has 3-5 true leaves and is actively growing but before female flowers open. Use lower rates on coarse soils with low organic matter. Add 0.5-1 pt. of NIS per 25 gals. of spray solution if emerged weeds are present. Not recommended for use under cool temperatures due to potential for crop injury. May delay crop maturity. Do not exceed 2 applications per crop cycle. 14-day PHI for cucumber (supplemental label). 30-day PHI for squash and pumpkin. 57-day PHI for cantaloupe.

Postemergence Grasses

Recommended Products

Poast 1.5E® at 1-1.5 pts. per acre. Use with 1 qt. of COC per acre. Spray on actively growing grass. Do not exceed 3 pts. per acre per season. 14-day PHI.

Select Max® at 9-16 fl. oz. per acre, or **2EC formulations of clethodim products** at 6-8 fl. oz. per acre. Use low rates for annual grasses. Use high rates for perennial grasses. Use Select Max® with 8 fl. oz. of NIS per 25 gals. of spray solution (0.25% v/v). Use 2EC formulations with 1 qt. of COC per 25 gals. of spray solution (1% v/v). Spray on actively growing grass. Wait at least 14 days between applications. Do not exceed 64 fl. oz. of Select Max® per acre per season. Do not exceed 32 fl. oz. of 2EC formulations per acre per season. 14-day PHI.

Herbicides for All Cucurbits[1]

Product (REI/PHI)	Common Name	Timing and Application Location Relative to Crop[2]					Incorporated	Timing Relative to Weeds		Weed Groups Controlled			Crops[3]					
		Before seeding	After seeding before emergence	Before transplanting	Postemergence - between rows only	Postemergence		Preemergence	Postemergence	Annual grasses	Small-seeded broadleaves	Broadleaves	Cucumber	Cantaloupe	Watermelon	Squash, summer	Suqash, winter	Pumpkin
Aim EC® (12h/-)	carfentrazone			X	X				X		X	X	X	X	X	X	X	X
Command 3ME® (12h/45d)	clomazone	X	X	X				X		X	X	X	X	X	X	X	X	*
Curbit 3EC® (24h/-)	ethalfluralin		X		X		no	X		X	X		X	X	X	X	X	X
Dacthal W-75®, Dacthal Flowable® (12h/-)	DCPA					X		X		X				X	X			
Dual Magnum® (24h/30d)	s-metolachlor	X between rows	X between rows	X between rows	X			X		X	X							X
Gramoxone® (12h to 24h/-)	paraquat	X	X	X	X				X	X	X	X	X	X	X	X	X	X
League® (12h/48d)	imazosulfuron				X			X	X		X	X		X	X			
Poast® (12h/14d)	sethoxydim					X			X	X			X	X	X	X	X	X
Prefar 4E® (12h/-)	bensulide	X	X	X			yes	X		X			X	X	X	X	X	X
Prowl H2O (24h/35d)	pendimethalin		X between rows	X between rows	X			X		X	X			X	X			
Roundup®, others (12h/14d)	glyphosate	X	X	X	X				X	X	X	X	X	X	X	X	X	X
Sandea® (12h/14d)	halosulfuron		X	X	X	X		X	X		X	X	X	X	X	X	X	X
Select Max®, others (12h/14d)	clethodim					X			X	X			X	X	X	X	X	X
Sinbar® (12h/70d)	terbacil		X	X	X			X			X				X			
Strategy® (24h/ 45d)	clomazone and ethalfluralin		X		X		no	X		X	X	X	X	X	X	X	X	X
Treflan®, others (12h/30d to 60d)	trifluralin				X		yes	X		X	X		X	X	X	X	X	X

[1]For effectiveness against specific weeds, see Relative Effectiveness of Herbicides for Vegetable Crops (page 68), and read label. This table does not include all label information. Be sure to read and follow all instructions and precautions on the herbicide label. Herbicides can cause serious crop injury and yield loss if not used properly.
[2]X=permitted for at least one crop.
[3]X=may be used for that crop. State-specific labels not indicated.
*=Processing crops only.

Insect Control for All Cucurbits

Seedcorn Maggots and Cucumber Beetles (in seed beds)

Treat seeds with a combination fungicide/insecticide, such as FarMore FI400®. Early clean plowing of cover crops will generally result in less damage to seedling plants in the field.

Aphids and Leafhoppers

Conserve natural enemies: limiting insecticide use will conserve predators and parasites that help control aphid populations. Monitor: look for the presence of predators or parasitized aphids. Several predators per aphid colony will probably bring the aphid population under control without insecticide. Killing aphids with insecticides cannot prevent the virus diseases they carry.

Recommended Products

Actara® (25WDG) at 1.5-3 oz. per acre. *Aphids only.* Do not exceed 11 oz. per acre per season. See pollinator precautions. 0-day PHI.

Admire Pro® (4.6DF) at 7.0-10.5 fl. oz. per acre. See label for application methods. Do not exceed 10.5 fl. oz. per acre per season. See pollinator precautions. 21-day PHI.

Ambush 2EC® at 6.4-12.8 fl. oz. per acre. *Leafhoppers only.* Apply a minimum of 4 gals. finished spray per acre by air, or 20 gals. finished spray per acre with ground equipment. Do not exceed 102.4 fl. oz. per acre per season. 0-day PHI. R*UP.*

Asana XL® (1.6) at 5.8-9.6 fl. oz. per acre. *Leafhoppers only.* Do not exceed 48 fl. oz. per acre per season. 3-day PHI. *RUP.*

Assail 30SG® at 2.5-4 oz. per acre. Do not exceed 5 applications per season. 0-day PHI.

Baythroid XL® (1EC) at 0.8-1.6 fl. oz. per acre. *Potato leafhoppers only.* Do not exceed 11.2 fl. oz. or 4 applications per acre per season. Allow 7 days between applications. 0-day PHI. *RUP.*

Belay® (2.13SC) at 3-4 fl. oz. per acre. See label for application methods. See pollinator precautions. Do not exceed 12 fl. oz. per acre per season. See label for PHI information.

Beleaf 50SG® at 2-2.8 oz. per acre. *Aphids only.* Do not exceed 3 applications per season. 0-day PHI.

Brigade® (2EC) at 2.6-6.4 fl. oz. per acre (do not exceed 19.2 fl. oz. per acre per season), or **Brigade**® (WSB) at 8-16 oz. per acre (do not exceed 48 oz. per acre per season). *Leafhoppers only.* 3-day PHI. *RUP.*

Dimethoate 400® **or Dimethoate 4E**® at 0.5-1 pt. per acre, or **Dimethoate 2.67EC**® at 0.75-1.5 pts. per acre. *Cantaloupe and watermelon only.* 3-day PHI.

Exirel® (0.83E) at 13.5-20.5 fl. oz. per acre. *Aphids only.* Do not exceed 61 fl. oz. per acre per season. See pollinator precautions. 1-day PHI.

Fulfill® (50WDG) at 2.75 oz. per acre. *Aphids only.* Do not exceed 5.5 oz. per acre per season. 0-day PHI.

Lannate SP® at 0.5-1 lb. per acre. *Aphids only. Not for pumpkin or winter squash.* 1-day PHI for applications of 0.5 lb. 3-day PHI for applications of more than 0.5 lb. *RUP.*

Malathion 5EC® at 1.5-2.8 pts. per acre, or **Malathion 57EC**® at 1.5 pts. per acre. *Aphids only.* 1-day PHI.

M-Pede® at 1-2% by volume. *Aphids only*. Must contact aphids to be effective. 0-day PHI.

Platinum® (2SC) at 5-11 fl. oz. per acre. See label for application methods. Do not exceed 11 fl. oz. per acre per season. See pollinator precautions. 30-day PHI.

Pounce 25WP® at 6.4-12.8 oz. per acre. *Leafhoppers only.* Apply a minimum of 4 gallons finished spray per acre by air, or 20 gallons finished spray per acre with ground equipment. *Cantaloupe:* Do not exceed 3.2 lbs. per acre. *All others:* do not exceed 4.8 lbs. per acre. 0-day PHI. *RUP.*

Sivanto 200SL® at the following rates:

Soil application: 21-28 fl. oz. per acre. 21-day PHI.

Foliar application: 7-12 fl. oz. per acre. 1-day PHI.

Venom® (70SG) at the following rates:

Foliar application: 1-4 oz. per acre. Do not exceed 6 oz. per acre per season. *Leafhoppers only.* See pollinator precautions. 1-day PHI.

Soil application: 5-7.5 oz. per acre. See pollinator precautions. Do not exceed 12 oz. per acre per season. L*eafhoppers only.* 21-day PHI.

Verimark® (1.67SC) at 10-13. 5 fl. oz. per acre via drip irrigation or soil injection. Do not exceed 2 applications per season. 1-day PHI.

Warrior II® at 1.28-1.92 fl. oz. per acre. Do not exceed 11.5 fl. oz. per acre per season. 1-day PHI. *RUP.*

Cucumber Beetles only (preplant)

Recommended Products

Admire Pro® (4.6F) at 7.0-10.5 fl. oz. per acre. See label for application methods. Do not exceed 24 fl. oz. per acre per season. See pollinator precautions. 21-day PHI.

Platinum® at 5-11 fl. oz. per acre. See label for application methods. See pollinator precautions. 30-day PHI.

Cucumber Beetles, Squash Bugs, and Squash Vine Borers

Cantaloupe growers may consider using unbaited AM Yellow Sticky Traps for sampling cucumber beetles. Monitor fields frequently (2-3 times per week) to detect mass emergence of beetles in the spring. Focus insecticide applications on periods of heavy beetle activity. Evening sprays will reduce bee kill.

Striped Cucumber Beetle Thresholds

Cantaloupe	1 beetle/plant
Cucumber	1 beetle/plant
Watermelon	1 beetle/plant
Squash	5 beetles per plant
Pumpkin	5 beetles per plant

There are various reasons the thresholds for treatment vary among the types of cucurbit crops. The threshold for cantaloupe and cucumber is lower because those crops are susceptible to bacterial wilt, which is vectored by striped cucumber beetles. The threshold for squash and pumpkin is higher because those crops are not susceptible to bacterial wilt, so the only concern is direct feeding damage. The previous threshold for watermelon was 5 beetles per plant because it, too, is not susceptible to bacterial wilt. However, we recently discovered that striped cucumber beetle larvae will feed on the bottom of developing watermelon fruit. Therefore, we reduced the threshold so beetles will be killed before they mate and lay eggs in the field.

Recommended Products

Apply throughout the season when beetles exceed threshold.

Actara® (25WDG) at 3-5.5 oz. per acre. Do not exceed 11 oz. per acre per season. See pollinator precautions. 0-day PHI.

Admire Pro® (4.6F) at 7-10.5 fl. oz. per acre. See label for application methods. Do not exceed 10.5 fl. oz. per acre per season. See pollinator precautions. 21-day PHI.

Ambush® (2EC) at 6.4-12.8 fl. oz. per acre. Do not exceed 102.4 fl. oz. per acre per season. 0-day PHI. *RUP.*

Asana XL® (1.6) at 5.8-9.6 fl. oz. per acre. Do not exceed 48 fl. oz. per acre per season. 3-day PHI. *RUP*.

Assail 30SG® at 2.5-5.3 oz. per acre. Do not exceed 5 applications per season. 0-day PHI.

Azera® at the following rates:

Squash bug nymphs: 32 fl. oz. per acre.

Adult squash bugs and cucumber beetles: 48 fl. oz. per acre.

Use higher rates (48 fl. oz. per acre) when pest pressure is extreme or plant canopy is dense. Do not exceed 10 applications per season. Do not reapply within 3 days except under extreme pest pressure. 0-day PHI.

Baythroid XL® (1EC) at 2.4-2.8 fl. oz. per acre. *Cucumber beetles only.* Do not exceed 11.2 fl. oz. per acre per season. Allow 7 days between applications. 0-day PHI. *RUP.*

Belay (2.13SC) at 3-4 fl. oz. per acre. *Not for squash vine borers.* See label for application methods. See pollinator precautions. Do not exceed 12 fl. oz. per acre per season. See label for PHI information.

Brigade® (2EC) at 2.6-6.4 fl. oz. per acre (do not exceed 19.2 fl. oz. per acre per season), or **Brigade®** (WSB) at 8-16 oz. per acre (do not exceed 48 oz. per acre per season). 3-day PHI. *RUP*.

Danitol 2.4EC® at 10.67-16 fl. oz. per acre. *Cucumber beetles only*. Do not exceed 42.67 fl. oz. per acre per season. 7-day PHI. *RUP*.

Mustang Maxx® (0.8EC) at 2.8-4 fl. oz. per acre. Do not exceed 24 fl. oz. per acre per season. 1-day PHI. *RUP*.

Pounce 25WP® at 6.4-12.8 oz. per acre. *Not for cucumbers.* Apply a minimum of 4 gals. finished spray per acre by air, or 20 gals. finished spray per acre with ground equipment. Cantaloupe: do not exceed 3.2 lbs. per acre. All others: do not exceed 4.8 lbs. per acre. 0-day PHI. *RUP*.

Prokil Cryolite 50D® at 15-30.5 lbs. per acre. Do not exceed 153 lbs. per acre per season. 7-day PHI for summer squash. 14-day PHI for all others.

Sevin XLR PLUS® (4F) at 1 qt. per acre. *Not for squash vine borer*. When applied during hot, humid conditions, carbaryl may cause some phytotoxicity, especially on seedlings and newly set plants. See pollinator precautions. Do not exceed 6 qts. per acre per season. 3-day PHI.

Warrior II® (2.08CS) at 1.28-1.92 fl. oz. per acre. Do not exceed 11.5 fl. oz. per acre per season. 1-day PHI. *RUP*.

Mites

Recommended Products

Acramite 50WS® at 0.75-1 lb. per acre. One application per season only. 3-day PHI.

Agri-Mek 0.15 EC® at 8-16 fl. oz. per acre. Do not exceed 48 fl. oz. per acre per season. Allow at least 7 days between applications. Do not make more than 2 sequential applications. 7-day PHI.

Agri-Mek SC (8%) at 1.75-3.5 fl. oz. per acre. Do not exceed 10.25 fl. oz. per acre per season. Allow at least 7 days between applications. Do not make more than 2 sequential applications. 7-day PHI.

Brigade® (2EC) at 5.12-6.4 fl. oz. per acre. Do not exceed 19.2 fl. oz. per acre per season. 3-day PHI. *RUP.*

Danitol 2.4EC® at 10.67-16 fl. oz. per acre. Do not exceed 42.67 fl. oz. per acre per season. 7-day PHI. *RUP.*

Kanemite 15SC® at 31 fl. oz. per acre. *Melons, watermelon, and cucumbers only.* Do not exceed 2 applications per year. Allow 21 days between applications. 1-day PHI.

Oberon 2SC® at 7.0-8.5 fl. oz. per acre. Do not exceed 3 applications per season. 7-day PHI.

Portal XLO® (0.4EC) at 2 pts. per acre. *Melons and cucumber only.* Do not exceed 2 applications per season. 3-day PHI for melons. 1-day PHI for cucumber.

Zeal® (72WSP) at 2-3 oz. per acre. Do not exceed 1 application per season. 7-day PHI.

Thrips

Recommended Products

Admire Pro® (4.6F) at 7-10.5 fl. oz. per acre. See label for application methods. Do not exceed 10.5 fl. oz. per acre per season. See pollinator precautions. 21-day PHI.

Entrust® (2SC) at 6-8 fl. oz. per acre. Do not exceed 29 fl. oz. per acre per season. 1-day PHI for cucumber. 3-day PHI for all others.

Platinum® at 5-11 fl. oz. per acre. See label for application methods. See pollinator precautions. Do not exceed 11 fl. oz. per acre per season. 30-day PHI.

Radiant SC® (1SC) at 6-10 fl. oz. per acre. Do not exceed 34 fl. oz. per acre per season. 1-day PHI for cucumber. 3-day PHI for all others.

Whiteflies

Recommended Products

Actara® (25WDG) at 3-5.5 oz. per acre. Do not exceed 11 oz. per acre per season. See pollinator precautions. 0-day PHI.

Admire PRO® (4.6F) at 7-10.5 fl. oz. per acre. See label for application methods. Do not exceed 10.5 fl. oz. per acre per season. See pollinator precautions. 21-day PHI.

Assail 30SG® at 2.5-5.3 oz. per acre. Do not exceed 5 applications per season. 0-day PHI.

Beleaf 50SG® at 2-8 oz. per acre. Do not exceed 3 applications per season. 0-day PHI.

Brigade® (2EC) at 5.12-6.4 fl. oz. per acre (do not exceed 19.2 fl. oz. per acre per season), or **Brigade**® (WSB) at 12.8-16.0 oz. per acre (do not exceed 48 oz. per acre per season). 3-day PHI. *RUP.*

Exirel® (0.83E) at 13.5-20.5 fl. oz. per acre. Do not exceed 61 fl. oz. per acre per season. See pollinator precautions. 1-day PHI.

May be acceptable for use in certified organic production. Check with your certifier before use.

Fulfill® (50WDG) at 2.75 oz. per acre. Do not exceed 5.5 oz. per acre per season. 0-day PHI.

Knack® (0.86EC) at 8-10 fl. oz. per acre. Do not exceed 2 applications. 7-day PHI.

M-Pede® at 1-2% by volume. Must contact whiteflies to be effective. 0-day PHI.

Neemix® according to label directions. 0-day PHI.

Oberon 2SC® at 7-8.5 fl. oz. per acre. Do not exceed 3 applications per season. 7-day PHI.

Platinum® at 5-11 fl. oz. per acre. See label for application methods. See pollinator precautions. Do not exceed 11 fl. oz. per acre per season. 30-day PHI.

Scorpion 35SL® at 2-7 fl. oz. per acre. Do not exceed 10.5 fl. oz. per acre per season. 1-day PHI.

Sivanto 200SL® at the following rates:

Soil application: 21-28 fl. oz. per acre. 21-day PHI.

Foliar application: 7-12 fl. oz. per acre. 1-day PHI.

Venom® (70SG) at 1-4 oz. per acre. Do not exceed 6 oz. per acre per season. See pollinator precautions. 1-day PHI.

Verimark 1.67SC ® at 10-13. 5 fl. oz. per acre via drip irrigation or soil injection. Do not exceed 2 applications per season. 1-day PHI.

Wireworm

Recommended Products

Capture LFR® (1.5EC) at 0.39-0.49 fl. oz. per 1,000 linear ft. of row. *Wireworms only.* See label. *RUP.*

May be acceptable for use in certified organic production. Check with your certifier before use.