## Cucurbit Crops — Squash and Pumpkin

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Golden Zucchini</th>
<th>Goldfinger, Gold Rush, Golden Delight, Golden Glory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer Squash</td>
<td>Middle Eastern</td>
<td>Lita, Bonita</td>
</tr>
<tr>
<td></td>
<td>Yellow Crookneck</td>
<td>Dixie, Prelude 2</td>
</tr>
<tr>
<td></td>
<td>Yellow Straightneck</td>
<td>Lemondrop L, Multipick, General Patton, Monet, Liberator III, Fortune, Lazor, Enterprise, Goldprize</td>
</tr>
<tr>
<td></td>
<td>Zucchini</td>
<td>Revenue, Dividend, Spineless Beauty, Jaguar, Puma, Independence III, Lynx, Spineless King, Spineless Perfection</td>
</tr>
</tbody>
</table>

| Winter Squash     | Acorn                                       | Table Ace, Seneca Autumn Queen, Taybelle, Table Star (PM*), Mesa Queen |
|                   | Butternut                                    | Butternut Supreme, Zenith, Waltham, Early Butternut, Butterboy         |
|                   | Buttercup                                    | Autumn Cup, BonBon, Buttercup, Burgess, Sweet Mama (Kabocha hybrid)     |
|                   | Hubbard                                      | Blue Hubbard, Red Kuri (small, red fruits)                                 |
|                   | Spaghetti                                    | Vegetable Spaghetti, Tivoli                                               |
|                   | Other                                        | Bush Delicata, Sugar Loaf, Carnival, Sweet Dumpling                        |

| Pumpkin           | Miniature                                    | Apprentice (PM*), Baby Boo (white), Crunchkin (mottled, attractive orange-yellow skin), Gold Dust (PM*), Gold Speck (PM*), Jack Be Little, Lil’ Ironsides, Lil’ Orangemon, Lil’ Pump-ke-mon, Mini-Jack, Munchkin, Sweetie Pie, Wee-B Little |
|                   | For trial                                    | Little Giant, Mischief                                                    |
|                   | Small size                                   | Baby Bear, Cannonball (PM*), Field Trip (PM*), Gargoyle (PM*), Hybrid Pam, Iron Man (PM*), Mystic Plus (PM*), Orange Smoothie (smooth skin), Oz, Pik-A-Pie, Prankster (PM*), Small Sugar, Spookie, Spooktacular, Touch of Autumn (PM) |
|                   | Medium size                                  | Gold Fever, Gold Standard, Magician (PM*), Sorcerer, Tom Fox, Wizard      |
|                   | For trial                                    | New Rocket                                                                |
|                   | Medium-large and large size                  | 18 Karat Gold (PM*), 20 Karat Gold (PM*), Aladdin (PM*), Appalachian, Captain Jack, (30+ lb), Diablo, Dependable, Gladiator (PM*), Gold Challenger, Gold Medallion, Harvest Time, Howden Biggie, Magic Lantern (PM*), Magic Wand (PM*), Merlin (PM*), Phat Jack, Phatso Jr, Phatso II, Pro Gold 510, Solid Gold |
|                   | For trial                                    | Autumn King, Big Rock, Camaro (PM*), Expert (PM*), King Midas, Mr. Wrinkles, Mustang PMR (PM*), Phatso III (PM*), Spartan (PM*), Super Herc (PM*), Trojan, Warlock (PM*) |
|                   | Very large size                              | Atlantic Giant, Big Max, Big Moon, Prize Winner                            |
|                   | Specialty types                              | Buckskin, Fairytale, Jarradale, Rouge Vif D’Etampes (Cinderella), Superfreaks: Goosebumps (Lots of bumps, smaller and more round than Knucklehead), Superfreaks: Knucklehead (Lots of bumps), White: Moonshine |
|                   | Hull-less/naked seed                          | Trick-or-Treat, Triple Treat, Snack Jack                                   |

*PM=partially resistant to powdery mildew.
**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<sub>2</sub>O<sub>5</sub>; 0-150 pounds per acre; K<sub>2</sub>O: 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.

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**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<sup>®</sup> and Manzate<sup>®</sup> 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 107.

**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.

Disease organism 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 non-solanaceous crops, and practice fall tillage. May be seedborne. Avoid problem fields.

**Planting:** Treat with fixed copper compounds if symptoms are present.

**Vine Touch:** If disease threatens, 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. Keep symptomatic fruit dry.

**Recommended Products**

Copper applications at 7-day intervals beginning when fruit are approximately 2 inches in diameter. Applying copper mixed with mancozeb (Dithane<sup>®</sup>, Manzate<sup>®</sup>) 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). 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 section on Transplant Production, page 22.

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**

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

**Catamaran** at 6 pts. per acre. 1-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 Ultra®** at 4-8 fl. oz. per acre. 0-day PHI.

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

**Previcur Flex®** at 1.2 pts. per acre. 2-day PHI.

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

**Revus 2.09SC®** at 8 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.

**Downy Mildew**

The downy mildew pathogen does not survive in the Midwest, so it usually arrives in the Midwest via the wind. Downy mildew may not occur in the Midwest until August or September and in some years, does not occur in the Midwest at all.

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 Fungicide Resistance Management (page 74) 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®) if disease is observed in the area. Applying chlorothalonil before infection delays downy mildew occurrence.

**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.

**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 Ultra®** at 4-8 fl. oz. per acre. 0-day PHI.

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

**Previcur Flex®** at 1.2 pts. per acre. 2-day PHI.

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

**Revus 2.09SC®** at 8 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. Pumpkins grown in cover crops may help lessen the impact of this 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. See Fungicide Resistance Management (page 74) for more information. 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 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**
- **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.
- **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.

*Planting:* Direct-seeded crops benefit from fungicide-treated seed. Treat seed with Apron XL LS® prevent Phytophthora infection for 5 weeks from time of seeding. Do not use contaminated water with Phytophthora.

*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®** at 6.4 fl. oz. per 100 lbs. seed. Only for direct-seeded plants.
- **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 Ultra®** at 4-8 fl. oz. per acre. 0-day PHI.
- **Presidio 4SC®** at 3-4 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.

- **Revus 2.09SC®** at 8 fl. oz. per acre. Suppression only. 0-day PHI.
- **Zampro®** at 14 fl. oz. per acre. 0-day PHI.

This is a reduced-risk pesticide. See page 36 for details.
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®, and Topsin®. Alternate fungicides between MOA groups.

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® at 12-16 fl. oz. per acre. 1-day PHI.
Inspire Super® at 16-20 fl. oz. per acre. 7-day PHI.
Merivon® at 4-5.5 fl. oz per acre. Must have supplemental label. 0-day PHI.
Microthiol 80DF® at 5-10 lbs. per acre. 0-day PHI.
Monsoon® at 8 fl. oz per acre. 7-day PHI.
Pristine 39WG® 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. Supplemental label required. 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.
Vibe® at 8 fl. oz. per acre. 7-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
Cabrio® at 12-16 oz. per acre. 0-days PHI.
Flint® at 1.5-2.0 oz. per acre. 0-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 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-applied. 7-day plant back interval.
Telone II® or Telone C-35®. See labels for rates. RUP.
Vydate L® at 1-2 gals. per acre in 20 gals. of water broadcast. Incorporate 2-4 inches. RUP.
Vapam®. See label for rates.

This is a reduced-risk pesticide. See page 36 for details.
**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.

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### Common Cucurbit Viruses and Transmission Sources

<table>
<thead>
<tr>
<th>Virus</th>
<th>Host Range</th>
<th>Transmission Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cucumber Mosaic Virus</td>
<td>wide</td>
<td>aphids[^1]</td>
</tr>
<tr>
<td>Papaya Ring Spot Virus</td>
<td>Cucurbitaceae</td>
<td>aphids[^1]</td>
</tr>
<tr>
<td>Squash Mosaic Virus</td>
<td>Cucurbitaceae, Chenopodiaceae</td>
<td>seeds, cucumber beetles</td>
</tr>
<tr>
<td>Watermelon Mosaic Virus</td>
<td>Cucurbitaceae, weeds</td>
<td>aphids[^1]</td>
</tr>
<tr>
<td>Zucchini Yellow Mosaic Virus</td>
<td>Cucurbitaceae</td>
<td>aphids[^1]</td>
</tr>
</tbody>
</table>

[^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.

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### Weed Control for Squash and Pumpkin

For combined weed control options in cucurbits, see page 112.

### Insect Control for Squash and Pumpkin

For combined insect control options in cucurbits, see page 116.
Cucurbit Crops — Cantaloupe, Cucumber, and Watermelon

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.

<table>
<thead>
<tr>
<th>CANTALOUPE Varieties</th>
<th>Season</th>
<th>Quality</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aphrodite</td>
<td>early-mid</td>
<td>excellent</td>
<td>Good shipper, 6-9 lbs.</td>
</tr>
<tr>
<td>Athena</td>
<td>early-mid</td>
<td>excellent</td>
<td>Medium net, oval very firm flesh</td>
</tr>
<tr>
<td>Crescent Moon</td>
<td>early-mid</td>
<td>good</td>
<td>Heavy net, oval, deep sutures</td>
</tr>
<tr>
<td>Eclipse</td>
<td>mid-late</td>
<td>excellent</td>
<td>Heavy net, round, very firm flesh</td>
</tr>
<tr>
<td>Odyssey</td>
<td>early-mid</td>
<td>excellent</td>
<td>Round to oval, firm, local market only</td>
</tr>
<tr>
<td>Saticoy</td>
<td>late</td>
<td>very good</td>
<td>Good eating quality for direct sales</td>
</tr>
<tr>
<td>Starfire (HM 2608)</td>
<td>mid-late</td>
<td>very good</td>
<td>Very large fruit, good netting</td>
</tr>
<tr>
<td>Starship</td>
<td>early-mid</td>
<td>very good</td>
<td>Excellent size and net, uniform fruit</td>
</tr>
<tr>
<td>Superstar</td>
<td>early</td>
<td>good</td>
<td>Very large fruit, excellent netting</td>
</tr>
<tr>
<td>Vienna</td>
<td>early-mid</td>
<td>excellent</td>
<td>Oblong, shallow sutures, holds well</td>
</tr>
</tbody>
</table>

Green-fleshed cantaloupes: Galileo, Levigal, Passport
Honeydew melons for trial: Daybreak, Early Dew, Moonshine.

<table>
<thead>
<tr>
<th>WATERMELON varieties</th>
<th>Maturity (days)</th>
<th>Ring Color and Pattern</th>
<th>Shape</th>
<th>Approx. wt. (lb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crimson Sweet (open pollinated)</td>
<td>88</td>
<td>green, striped</td>
<td>blocky round</td>
<td>20-30</td>
</tr>
<tr>
<td>Denver</td>
<td>85</td>
<td>green, striped</td>
<td>round to oval</td>
<td>20-24</td>
</tr>
<tr>
<td>Fiesta</td>
<td>88</td>
<td>dark green, striped</td>
<td>blocky</td>
<td>22-26</td>
</tr>
<tr>
<td>Jamboree</td>
<td>88</td>
<td>dark green, broken light green stripes</td>
<td>long blocky</td>
<td>23-27</td>
</tr>
<tr>
<td>Olé</td>
<td>85</td>
<td>dark green, striped</td>
<td>oblong/blocky</td>
<td>22-25</td>
</tr>
<tr>
<td>Raspa</td>
<td>83</td>
<td>medium green, dark green stripes</td>
<td>blocky</td>
<td>22-24</td>
</tr>
<tr>
<td>Regency</td>
<td>82</td>
<td>dark green, striped</td>
<td>blocky oblong</td>
<td>18-22</td>
</tr>
<tr>
<td>Royal Majesty</td>
<td>90</td>
<td>green, thin stripes</td>
<td>long oval</td>
<td>30</td>
</tr>
<tr>
<td>Royal Sweet</td>
<td>85</td>
<td>light green, striped</td>
<td>blocky oval</td>
<td>20-25</td>
</tr>
<tr>
<td>Sangria</td>
<td>85</td>
<td>dark green, striped</td>
<td>long blocky oval</td>
<td>20-26</td>
</tr>
<tr>
<td>Stars and Stripes</td>
<td>88</td>
<td>dark green, striped</td>
<td>long, blocky, oval</td>
<td>20-26</td>
</tr>
<tr>
<td>Summer Flavor 500</td>
<td>88</td>
<td>medium green, striped</td>
<td>blocky oblong</td>
<td>25-35</td>
</tr>
<tr>
<td>Summer Flavor 790</td>
<td>88</td>
<td>dark green, light green stripes</td>
<td>oblong blocky</td>
<td>24-28</td>
</tr>
<tr>
<td>Summer Flavor 800</td>
<td>88</td>
<td>dark green, striped</td>
<td>blocky oval</td>
<td>22-26</td>
</tr>
<tr>
<td>Top Gun</td>
<td>83</td>
<td>medium green, dark green stripes</td>
<td>globe</td>
<td>21-24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Large, Red-Fleshed, Seedless</th>
<th>Maturity (days)</th>
<th>Ring Color and Pattern</th>
<th>Shape</th>
<th>Approx. wt. (lb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afternoon Delight</td>
<td>87</td>
<td>mottled stripe</td>
<td>Round</td>
<td>16-20</td>
</tr>
<tr>
<td>Crunchy Red</td>
<td>88</td>
<td>medium green stripes, light background</td>
<td>round to oval</td>
<td>15-18</td>
</tr>
<tr>
<td>Cooperstown</td>
<td>85</td>
<td>medium green stripes, green background</td>
<td>round to oval</td>
<td>16-22</td>
</tr>
<tr>
<td>Fresh Cut</td>
<td>83</td>
<td>dark green, no stripes</td>
<td>round to blocky</td>
<td>18-20</td>
</tr>
<tr>
<td>Genesis</td>
<td>85</td>
<td>dark green, striped</td>
<td>round</td>
<td>15-18</td>
</tr>
<tr>
<td>Gypsy</td>
<td>85</td>
<td>light green, striped</td>
<td>round to globe</td>
<td>13-17</td>
</tr>
<tr>
<td>Imagination</td>
<td>80</td>
<td>solid dark green</td>
<td>round</td>
<td>12-15</td>
</tr>
<tr>
<td>Indiana</td>
<td>76</td>
<td>Jubilee stripe/dark background</td>
<td>round-oval</td>
<td>13-15</td>
</tr>
<tr>
<td>Millionaire</td>
<td>90</td>
<td>light green, striped</td>
<td>oblong</td>
<td>13-20</td>
</tr>
<tr>
<td>Revolution</td>
<td>84</td>
<td>wide dark stripes on medium background</td>
<td>blocky</td>
<td>18-22</td>
</tr>
<tr>
<td>SummerSweet 5244</td>
<td>90</td>
<td>light green, striped</td>
<td>round oval</td>
<td>16-20</td>
</tr>
<tr>
<td>SummerSweet 7167</td>
<td>90</td>
<td>light green, striped</td>
<td>oval</td>
<td>15-17</td>
</tr>
<tr>
<td>SummerSweet 7197</td>
<td>86</td>
<td>dark green stripes, medium background</td>
<td>oval</td>
<td>16-20</td>
</tr>
<tr>
<td>SW 4502</td>
<td>84</td>
<td>allsweet type</td>
<td>oval</td>
<td>16-20</td>
</tr>
<tr>
<td>Sweet Delight</td>
<td>88</td>
<td>light green with dark green stripes</td>
<td>oval</td>
<td>17-19</td>
</tr>
<tr>
<td>Trillion</td>
<td>95</td>
<td>light green, striped</td>
<td>oval</td>
<td>16-18</td>
</tr>
<tr>
<td>Tri-X-313</td>
<td>90</td>
<td>light green, striped</td>
<td>round oval</td>
<td>16-20</td>
</tr>
<tr>
<td>Tri-X-Palomar</td>
<td>86</td>
<td>medium green, striped</td>
<td>round</td>
<td>14-17</td>
</tr>
<tr>
<td>Troubadour</td>
<td>80</td>
<td>dark green stripes, medium green background</td>
<td>blocky</td>
<td>14-17</td>
</tr>
<tr>
<td>Wrigley</td>
<td>90</td>
<td>light green with dark green stripes</td>
<td>oval</td>
<td>16-20</td>
</tr>
</tbody>
</table>

1 Pollenizers must be planted with seedless varieties. Use a long watermelon, such as Royal Jubilee, Royal Sweet, Sangria, or SF 500 as the pollinating variety. Crimson Sweet works well as a pollenizer, but its fruit will be seeded and have a similar appearance to most seedless varieties. Fruitless pollenizer varieties are available. Check with Extension specialists or seed company representatives for more information.
### Watermelon Variety Maturity, Color, and Shape

<table>
<thead>
<tr>
<th>Variety</th>
<th>Maturity (days)</th>
<th>Ring Color and Pattern</th>
<th>Shape</th>
<th>Approx. wt. (lb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jade Star</td>
<td>72</td>
<td>dark green</td>
<td>round</td>
<td>10-12</td>
</tr>
<tr>
<td>Sweet Beauty</td>
<td>77</td>
<td>dark green, striped</td>
<td>oblong</td>
<td>5-7</td>
</tr>
<tr>
<td>Tiger Baby</td>
<td>80</td>
<td>light green, striped</td>
<td>round</td>
<td>7-10</td>
</tr>
<tr>
<td>Bibo</td>
<td>77</td>
<td>medium green, striped</td>
<td>round</td>
<td>5-7</td>
</tr>
<tr>
<td>Miniput</td>
<td>80</td>
<td>dark green</td>
<td>round</td>
<td>6-10</td>
</tr>
<tr>
<td>Petite Perfection</td>
<td>77</td>
<td>medium green, striped</td>
<td>round</td>
<td>5-7</td>
</tr>
<tr>
<td>AU-Golden Producer</td>
<td>88</td>
<td>light green, striped</td>
<td>blocky round</td>
<td>20-30</td>
</tr>
<tr>
<td>Yellow Baby</td>
<td>68</td>
<td>light green, striped</td>
<td>round</td>
<td>9-12</td>
</tr>
<tr>
<td>Amarillo</td>
<td>80</td>
<td>medium green, striped</td>
<td>round</td>
<td>12-14</td>
</tr>
<tr>
<td>Butterball</td>
<td>90</td>
<td>light green, striped</td>
<td>round</td>
<td>15-18</td>
</tr>
<tr>
<td>Treasure Chest</td>
<td>80</td>
<td>light green with narrow dark stripes</td>
<td>round</td>
<td>10-15</td>
</tr>
</tbody>
</table>

### Watermelon Variety Resistance to Fusarium Wilt

<table>
<thead>
<tr>
<th>Variety</th>
<th>Company</th>
<th>Type</th>
<th>Resistance²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afternoon Delight</td>
<td>Dwayne Palmer</td>
<td>triploid</td>
<td>+1/2</td>
</tr>
<tr>
<td>Crunchy Red</td>
<td>Harris Moran</td>
<td>Triploid</td>
<td>++</td>
</tr>
<tr>
<td>Distinction</td>
<td>Syngenta seeds</td>
<td>Triploid</td>
<td>++++</td>
</tr>
<tr>
<td>Fascination</td>
<td>Syngenta Seeds</td>
<td>triploid</td>
<td>++++</td>
</tr>
<tr>
<td>Fiesta</td>
<td>Syngenta Seeds</td>
<td>diploid</td>
<td>++1/2</td>
</tr>
<tr>
<td>Indiana</td>
<td>Seedway</td>
<td>triploid</td>
<td>++</td>
</tr>
<tr>
<td>Liberty</td>
<td>triploid</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>Palomar</td>
<td>Syngenta Seeds</td>
<td>triploid</td>
<td>+</td>
</tr>
<tr>
<td>Matrix</td>
<td>triploid</td>
<td>+++1/2</td>
<td></td>
</tr>
<tr>
<td>Melody</td>
<td>triploid</td>
<td>+++</td>
<td></td>
</tr>
<tr>
<td>Regency</td>
<td>Seminis</td>
<td>diploid</td>
<td>++++</td>
</tr>
<tr>
<td>Revolution</td>
<td>triploid</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Royal Sweet</td>
<td>Seminis</td>
<td>diploid</td>
<td>++</td>
</tr>
<tr>
<td>Summer Sweet 5244</td>
<td>Abbott &amp; Cobb</td>
<td>triploid</td>
<td>++</td>
</tr>
<tr>
<td>Summer Sweet 7167</td>
<td>Abbott &amp; Cobb</td>
<td>triploid</td>
<td>+</td>
</tr>
<tr>
<td>SW 4502</td>
<td>Seedway</td>
<td>triploid</td>
<td>+1/2</td>
</tr>
<tr>
<td>Trillion</td>
<td>Abbott &amp; Cobb</td>
<td>triploid</td>
<td>+1/2</td>
</tr>
<tr>
<td>Triple Threat</td>
<td>triploid</td>
<td>+++</td>
<td></td>
</tr>
<tr>
<td>Tri-X-313</td>
<td>Syngenta Seeds</td>
<td>triploid</td>
<td>+1/2</td>
</tr>
<tr>
<td>Troubadour</td>
<td>Harris Moran</td>
<td>Triploid</td>
<td>++</td>
</tr>
<tr>
<td>Vagabond</td>
<td>triploid</td>
<td>+++1/2</td>
<td></td>
</tr>
</tbody>
</table>

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.

### Pollenizer Watermelon Resistance to Fusarium Wilt

<table>
<thead>
<tr>
<th>Variety</th>
<th>Type</th>
<th>Resistance¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ace</td>
<td>pollenizer</td>
<td>+</td>
</tr>
<tr>
<td>Companion</td>
<td>pollenizer</td>
<td>+++1/2</td>
</tr>
<tr>
<td>Jenny</td>
<td>pollenizer/edible</td>
<td>++1/2</td>
</tr>
<tr>
<td>Mickey Lee</td>
<td>pollenizer/edible</td>
<td>++1/2</td>
</tr>
<tr>
<td>Pinnacle</td>
<td>pollenizer</td>
<td>+1/2</td>
</tr>
<tr>
<td>Polimax 6017</td>
<td>pollenizer</td>
<td>++</td>
</tr>
<tr>
<td>Sidekick</td>
<td>pollenizer</td>
<td>+++1/2</td>
</tr>
<tr>
<td>SP-5</td>
<td>pollenizer</td>
<td>+++</td>
</tr>
<tr>
<td>Regency</td>
<td>pollenizer/edible</td>
<td>+++</td>
</tr>
</tbody>
</table>

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.
**Pollenizer Watermelon Resistance to Anthracnose**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Type</th>
<th>Resistance¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accomplice</td>
<td>pollenizer</td>
<td>++1/2</td>
</tr>
<tr>
<td>Ace</td>
<td>pollenizer</td>
<td>+</td>
</tr>
<tr>
<td>Mickey Lee</td>
<td>pollenizer/edible</td>
<td>++</td>
</tr>
<tr>
<td>Patron</td>
<td>pollenizer</td>
<td>++</td>
</tr>
<tr>
<td>Pollen pro</td>
<td>pollenizer</td>
<td>+++</td>
</tr>
<tr>
<td>Pollimax 6017</td>
<td>pollenizer</td>
<td>++</td>
</tr>
<tr>
<td>Royal Sweet</td>
<td>edible</td>
<td>++</td>
</tr>
<tr>
<td>Sweet Harmony</td>
<td>pollenizer</td>
<td>++1/2</td>
</tr>
<tr>
<td>SP-4</td>
<td>pollenizer</td>
<td>+++</td>
</tr>
<tr>
<td>SP-5</td>
<td>pollenizer</td>
<td>+++</td>
</tr>
<tr>
<td>SP-6</td>
<td>pollenizer</td>
<td>+++</td>
</tr>
</tbody>
</table>

¹The resistance ratings provided here are the averages based on two years of field research. In that research, watermelon varieties were observed after inoculation with race 2 of the disease. ++++ = good resistance; +++ = moderate resistance; ++ = some resistance; + = little or no resistance.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Type</th>
<th>Season</th>
<th>Spine Color</th>
<th>Disease Resistance¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dasher II</td>
<td>early</td>
<td></td>
<td></td>
<td>1-2-3-4-5-6</td>
</tr>
<tr>
<td>General Lee</td>
<td>main</td>
<td></td>
<td></td>
<td>3-4-5-6</td>
</tr>
<tr>
<td>Lightning</td>
<td>very early</td>
<td></td>
<td></td>
<td>3-4-6</td>
</tr>
<tr>
<td>Speedway</td>
<td>very early</td>
<td></td>
<td></td>
<td>1-2-3-4-5-6</td>
</tr>
<tr>
<td>Thunder</td>
<td>very early</td>
<td></td>
<td></td>
<td>3-4-6-7</td>
</tr>
</tbody>
</table>

Beit alpha type (for trial): Socrates
Burpless (for trial): Tasty Green, Burpless 26. Staking recommended. Tasty Green has tolerance to powdery mildew.

¹Degree of resistance varies according to variety. Disease resistance codes are: 1=angular leaf spot, 2=anthracnose, 3=cucumber mosaic virus, 4=scab, 5=downy mildew, 6=powdery mildew, 7=zucchini yellow mosaic virus.

---

**A. CUCUMBER — Slicing Varieties**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Season</th>
<th>Disease Resistance¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dasher II</td>
<td>early</td>
<td>1-2-3-4-5-6</td>
</tr>
<tr>
<td>General Lee</td>
<td>main</td>
<td>3-4-5-6</td>
</tr>
<tr>
<td>Lightning</td>
<td>very early</td>
<td>3-4-6</td>
</tr>
<tr>
<td>Speedway</td>
<td>very early</td>
<td>1-2-3-4-5-6</td>
</tr>
<tr>
<td>Thunder</td>
<td>very early</td>
<td>3-4-6-7</td>
</tr>
</tbody>
</table>

Beit alpha type (for trial): Socrates
Burpless (for trial): Tasty Green, Burpless 26. Staking recommended. Tasty Green has tolerance to powdery mildew.

¹Degree of resistance varies according to variety. Disease resistance codes are: 1=angular leaf spot, 2=anthracnose, 3=cucumber mosaic virus, 4=scab, 5=downy mildew, 6=powdery mildew, 7=zucchini yellow mosaic virus.

---

**B. CUCUMBER — Pickling Varieties**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Season</th>
<th>Spine Color</th>
<th>Disease Resistance¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calypso</td>
<td>early-mid</td>
<td>white</td>
<td>1-2-3-4-5-6</td>
</tr>
<tr>
<td>Carolina</td>
<td>mid</td>
<td>white</td>
<td>1-2-3-4-5-6</td>
</tr>
<tr>
<td>Fancipak M</td>
<td>early-mid</td>
<td>white</td>
<td>1-2-3-4-5-6</td>
</tr>
<tr>
<td>Green Spear 14</td>
<td>mid</td>
<td>white</td>
<td>1-3-4-5-6</td>
</tr>
<tr>
<td>Score²</td>
<td>early</td>
<td>white</td>
<td>1-2-3-4-5</td>
</tr>
</tbody>
</table>

¹Degree of resistance varies according to variety. Disease resistance codes are: 1=angular leaf spot, 2=anthracnose, 3=cucumber mosaic virus, 4=scab, 5=downy mildew, 6=powdery mildew, 7=zucchini yellow mosaic virus.

²Machine harvest only.

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Female watermelon flowers have an enlarged structure below the petals that will become the fruit if properly pollinated. Male flowers lack this structure.
**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$_{2}$O$_{5}$: 0 to 150 pounds per acre. K$_{2}$O: 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. 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.

**Cantaloupes:** Harvesting is done manually, and great care must be exercised at picking to harvest only the physiologically mature plants. Fruits must be in the
half or full slip state. Fruit harvested prior to the half slip stage will be too green and will not ripen properly. Shipping under mature fruit has been a problem and should be avoided.

**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, ridges appearing on the rind surface, and a hollow or dull sound when "thumped." Melons should be cut from the plant to avoid vine damage and prevent stem-end rot. Leave 1 to 2 inches of stem attached.

### 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 page 75 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**

- **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 8-17 fl. oz. per acre. *Watermelon only*. 7-day PHI.
- **Luna Sensation** at 7.6 fl. oz. per acre. *Watermelon only*. 0-day PHI.
- **Merivon** at 4-5.5 fl. oz. per acre. Must have supplemental label. 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.
- **Satori** at 11-15.5 fl. oz. per acre.
- **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. *Watermelon only*. 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 — some 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.

This is a reduced-risk pesticide. See page 36 for details.
**Recommended Products**

**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 Experience®** at 17 fl. oz. per acre. *Watermelon only*. 7-day PHI.

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

**Merivon®** at 5.5 fl. oz. per acre. Must have supplemental label. 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®** 3.2 pts. 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 near 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 22.

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 downy mildew pathogen does not survive in the Midwest, so it usually arrives in the Midwest via the wind. Downy mildew may not occur in the Midwest until August or September and in some years, does not occur in the Midwest at all.

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 Fungicide Resistance Management (page 74) for more information.

**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 6 pts. per acre. 1-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 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® at 3-4 fl. oz. per acre. 2-day PHI.
- Previcur Flex® at 1.2 pts. per acre. 2-day PHI.

- Ranman® at 2.1-2.75 lbs. per acre. 0-day PHI.
- Revus 2.09SC® at 8 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**

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 found in Indiana and Illinois.

**Fusarium Wilt in Watermelon**

Plant watermelon cultivars with partial resistance. See table on page 103. 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.

**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 Fungicide Resistance Management (page 74) for more information. 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 17 fl. oz. per acre. Watermelon only. 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 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.

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.

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

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. Watermelon only. 7-day PHI.

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

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

Merivon® at 4-5.5 fl. oz. per acre. Must have supplemental label. 0-day PHI.

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

This is a reduced-risk pesticide. See page 36 for details.
Common Cucurbit Viruses and Transmission Sources

<table>
<thead>
<tr>
<th>Virus</th>
<th>Host Range</th>
<th>Transmission Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cucumber Mosaic Virus</td>
<td>wide</td>
<td>aphids¹</td>
</tr>
<tr>
<td>Papaya Ring Spot Virus</td>
<td>Cucurbitaceae</td>
<td>aphids¹</td>
</tr>
<tr>
<td>Squash Mosaic Virus</td>
<td>Cucurbitaceae, Chenopodiaceae</td>
<td>seeds, cucumber beetles</td>
</tr>
<tr>
<td>Watermelon Mosaic Virus</td>
<td>Cucurbitaceae, weeds</td>
<td>aphids¹</td>
</tr>
<tr>
<td>Zucchini Yellow Mosaic Virus</td>
<td>Cucurbitaceae</td>
<td>aphids¹</td>
</tr>
</tbody>
</table>

¹Aphidborne 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.

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.
<table>
<thead>
<tr>
<th>Product</th>
<th>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.</th>
<th>Product (REI/PHI)</th>
<th>Common name</th>
<th>Alternaria leaf blight</th>
<th>Anthracnose</th>
<th>Bacterial leaf &amp; fruit blotch</th>
<th>Bacterial fruit spot</th>
<th>Downy mildew</th>
<th>Gummy stem blight</th>
<th>Black rot</th>
<th>Pectobacterium blight</th>
<th>Phytophthora blight</th>
<th>Powdery mildew</th>
<th>Scab</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actigard* (12/0)</td>
<td>acibenzolar-S-methyl (21)</td>
<td>G P P P</td>
<td>Use with copper applications for bacterial fruit blotch (see page 107).</td>
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<td>Agri-Fos*, Phostrol*, Prophyt*, Rampart* (4/0)</td>
<td>phosphorus acid/phosphite (33)</td>
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<td>Alletta 12/1/2</td>
<td>fosetyl-Al (33)</td>
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<td>Cabrio* (12/0)</td>
<td>pyraclostrobin (11)</td>
<td>G G P P G</td>
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<td>dimethomorph (40)</td>
<td>G G</td>
<td>Do not alternate with Revus*.</td>
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<td>difenoconazole (3), cyprodinil (9)</td>
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<td>Luna Experience* (12/7)</td>
<td>fluopyram (7), tebuconazole (3)</td>
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<td>tebuconazole (3)</td>
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<td>mycolbutanil (3)</td>
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<tr>
<td>Ranman* (12/0)</td>
<td>cyazofamid (21)</td>
<td>G G</td>
<td>Primary use will be for Phytophthora blight in rotation with Revus*.</td>
<td></td>
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<tr>
<td>Revus* (4/0)</td>
<td>mandipropamid (40)</td>
<td>S S S</td>
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<tr>
<td>Switch 62.5WB* (12/1)</td>
<td>cymoxanil (27), fludioxanil (12)</td>
<td>G G F F</td>
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<tr>
<td>Tano* (12/3)</td>
<td>cymoxanil (27), famoxadone (11)</td>
<td>G G S P S</td>
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<tr>
<td>Toppin M* (12/0)</td>
<td>thiophanate-methyl (1)</td>
<td>G F P</td>
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<tr>
<td>Torino* (4/0)</td>
<td>cyflufenamid (U6)</td>
<td>G</td>
<td></td>
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<tr>
<td>Vivando* (12/0)</td>
<td>metrafenone (U8)</td>
<td>G</td>
<td>Must be in possession of supplemental label.</td>
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<tr>
<td>Zampro* (12/0)</td>
<td>ametoctradin (45), dimethomorph (40)</td>
<td>G G</td>
<td>See label for directions for at planting drench.</td>
<td></td>
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<tr>
<td>Zing* (12/0)</td>
<td>zoxamide (22), chlorothalonil (M)</td>
<td>G G F</td>
<td></td>
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</tbody>
</table>

1Fungicide 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.

2REI (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 Table 26 on page 63.
Preemergence Broadleaves and Grasses

Recommended Products

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 and Ohio only: 0.67-1.27 pts. per acre. 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 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. 30-day PHI.

Winter squash in Indiana 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.

Prowl H2O® at 2.1 pts. per acre. Cantaloupe and watermelon only. Apply to row middles only. Use a shielded sprayer. 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 0.5-1 lb. a.i. 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.
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 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. 30-day PHI for cucumber, 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

<table>
<thead>
<tr>
<th>Product (REI/PHI)</th>
<th>Common Name</th>
<th>Timing and Application Location Relative to Crop</th>
<th>Timing Relative to Weeds</th>
<th>Weed Groups Controlled</th>
<th>Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Before seeding</td>
<td>After seeding before emergence</td>
<td>Before transplanting</td>
<td>Post emergence - between rows only</td>
</tr>
<tr>
<td>Aim EC* (12h/-)</td>
<td>carfentrazone</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Command 3ME*</td>
<td>clomazone</td>
<td>X</td>
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</tr>
<tr>
<td>Curbit 3EC* (24h/-)</td>
<td>ethalfluralin</td>
<td>X</td>
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</tr>
<tr>
<td>Daclthal W-75*, Daclthal Flowable* (12h/-)</td>
<td>DCPA</td>
<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>Dual Magnum* (24h/30d)</td>
<td>s-metolachlor</td>
<td>X between rows</td>
<td>X between rows</td>
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<tr>
<td>Gramoxone Inteon 2L* (12h to 24h/-)</td>
<td>parquat</td>
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<td>League* (12h/48d)</td>
<td>imazosulfuron</td>
<td>X</td>
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<tr>
<td>Poast* (12h/14d)</td>
<td>sethoxydim</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Prefar 4E* (12h/-)</td>
<td>bensulide</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Prowl H2O (24h/35d)</td>
<td>pendimethalin</td>
<td>X between rows</td>
<td>X between rows</td>
<td>X between rows</td>
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<tr>
<td>Roundup*, others (12h/14d)</td>
<td>glyphosate</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Sandea* (12h/30d to 57d)</td>
<td>halosulfuron</td>
<td>X</td>
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<tr>
<td>Select Max*, others (12h/14d)</td>
<td>clethodim</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Sinbar* (12h/70d)</td>
<td>terbacil</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Strategy* (24h/ 45d)</td>
<td>clomazone and ethalfluralin</td>
<td>X</td>
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<tr>
<td>Treflan*, others (12h/30d to 60d)</td>
<td>trifluralin</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tr>
</tbody>
</table>

1For effectiveness against specific weeds, see Table 26 on page 63, 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.

*X=permited for at least one crop.*

*X=may be used for that crop.* *=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.

**Seedcorn Maggot and Wireworm**

**Recommended Products**
Capture LFR® at 0.39-0.49 fl. oz. per 1,000 linear ft. of row ft. See label. RUP.

**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. Apply pre-plant in a band 2 inches or less, as an in-furrow spray at planting, as a post-plant drench, as a sidedress application, or through trickle irrigation water. Do not exceed 10.5 fl. oz. per acre per season. See pollinator precautions. 21-day PHI.

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

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. Do not apply during bloom. 7-day PHI.

Beleaf 50SG® at 2-2.8 oz. per acre. Aphids only. 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.

**Cucurbit Crops - Insect Control**
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. 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® at 5-11 fl. oz. per acre. 30-day PHI.

Pounce 25WP® at 12.8 oz. per acre, or Ambush 2EC® at 6.4-12.8 fl. 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. Do not exceed 1.6 lbs. a.i. per acre per season. 0-day PHI. RUP.

Sivanto® (200SL) at 21-28 fl. oz. per acre. Soil application. 21-day PHI.

Verimark 1.67SC® at 10-13. 5 fl. oz. per acre via drip irrigation or soil injection. 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. Apply pre-plant in a band 2 inches or smaller, as an in-furrow spray at planting, as a post-plant drench, as a sidedress application, or through trickle irrigation water. Do not exceed 24 fl. oz. per acre per season. See pollinator precautions. 21-day PHI.

Platinum® at 5-11 fl. oz. per acre. 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.

This is a reduced-risk pesticide. See page 36 for details.
**Recommended Products**

Apply throughout the season when beetles exceed threshold.

- **Admire PRO®** (4.6F) at 7-10.5 fl. oz. per acre. Apply pre-plant in a band 2 inches or less, as an in-furrow spray at planting, as a post-plant drench, as a sidedress application, or through trickle irrigation water. Do not exceed 10.5 fl. oz. per acre per season. See pollinator precautions. 21-day PHI. **RUP.**

- **Ambush 2EC®** at 3.2-12.8 fl. oz. per acre. Apply a minimum of 4 gallons finished spray per acre by air or 20 gallons finished spray per acre with ground equipment. Do not exceed 6.4 lbs. per acre. 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. 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. Do not apply during bloom. 7-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 fl. 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.**

- **Kryocide®** at 8-16 lbs. per acre. Do not exceed 64 lbs. per acre per season. 7-day PHI for summer squash. 14-day PHI for all others.

- **Mustang Maxx®** 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. 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®** 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. Do not apply less than 50 gals. of water per acre. 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. Do not apply less than 20 gallons of water per acre. 7-day PHI.

- **Brigade®** (2EC) at 5.12-6.4 fl. oz. per acre. 3-day PHI. **RU P.**

- **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. **RU P.**

- **Dicofol 4E®** at 1.25 pts. per acre. Squash and cucumber only. 2-day PHI.

- **Oberon 2SC®** at 7.0-8.5 fl. oz. per acre. Do not exceed 25.5 fl. oz. per acre per season. 7-day PHI.

- **Portal®** (0.4EC) at 2 pts. per acre. Melons and cucumber only. 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*

- **Entrust SC®** 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.
- **Exirel® (0.83E)** at 13.5-20.5 fl. oz. per acre. See pollinator precautions. 1-day PHI.
- **Platinum®** at 5-11 fl. oz. per acre. 30-day PHI.
- **Radiant SC®** 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. Apply pre-plant in a band 2 inches or less, as an in-furrow spray at planting, as a post-plant drench, as a sidedress application, or through trickle irrigation water. 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. 0-day PHI.
- **Brigade® (2EC)** at 5.2-6.4 fl. oz. per acre (do not exceed 19.2 fl. oz. per acre per season), or **Brigade® (WSB)** at 12.8-16.0 fl. 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. See pollinator precautions. 1-day PHI.
- **Fulfill® (50WDG)** at 2.75 oz. per acre. Do not exceed 5.5 oz. per acre per season. 0-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 25.5 fl. oz. per acre per season. 7-day PHI.
- **Platinum®** at 5-11 fl. oz. per acre. 30-day PHI.
- **Sivanto® (200SL)** at 21-28 fl. oz. per acre. Soil application. 21-day PHI.
- **Venom®** at 1-4 oz. per acre. See pollinator precautions. 1-day PHI.
- **Verimark 1.67SC®** at 10-13.5 fl. oz. per acre via drip irrigation or soil injection. 1-day PHI.

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Applying an insecticide to manage squash bugs is warranted in the early season when wilting is present, and at early flowering when more than one egg mass per plant is observed.

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This is a reduced-risk pesticide. See page 36 for details.

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