

This is a section from the

**2016**

**Mid-Atlantic**

# **Commercial Vegetable Production Recommendations**

The manual, which is published annually, is NOT for home gardener use.

The full manual, containing recommendations specific to New Jersey, can be found on the Rutgers NJAES website in the Publications section  
[njaes.rutgers.edu](http://njaes.rutgers.edu)

The label is a legally-binding contract between the user and the manufacturer.

The user must follow all rates and restrictions as per label directions.

The use of any pesticide inconsistent with the label directions is a violation of Federal law.

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# PUMPKINS AND WINTER SQUASH

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## Varieties<sup>1</sup>

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### Pumpkins (less than 1 pound)

WeeeeeOne\* (PMR)  
Munchkin  
Wee-B-Little\*  
Baby Boo

### Pumpkins (1 to 3 pounds)

Baby Pam  
Baby Bear\*  
Touch of Autumn\* (PMT)  
Rockafellow\* (PMT)

### Pumpkins (2 to 6 pounds)

Prankster\* (PMT)  
Cannonball\* (hard shell)  
Iron Man \* (FR, PR, PMT) (hard shell)  
Field Trip\*(PMT)  
Orange Smoothie\* (hard shell)  
Hybrid Pam\*  
Fall Splendor\*(PMT)  
Mystic Plus\* (PMT)  
(5-6 pounds, plant at closer spacing to reduce size)  
Small Sugar (BRT)  
Kakai (edible seeds)

### Pumpkins (10 to 20 pounds)

Magic Lantern\* (PMT)  
Bus Stop\*  
Magician\* (PMR, ZYMV)

### Pumpkins (more than 20 pounds)

#### Cronos\* (PMT)

Howden Biggie  
Gladiator\* (PMT)  
Aladdin (PMT)  
Gold Medal\*  
Rhea\* (PMT)  
Solid Gold\*  
Capt. Jack

### Exhibition Pumpkins (more than 50 pounds)

Atlantic Giant  
Prize Winner

### Ornamental Pumpkins

Knuckle Head\*  
Goose Bumps II\*

### Winter Squash (Acorn Type)

Table Ace\*  
Taybelle\* (semi bush, PMT)  
Table Gold  
Table Queen  
Table Star \* (PMT)  
Autumn Delight \* (PMT)

### Winter Squash (Butternut Type)

Butterboy\* (restricted vine)  
Puritan Butternut  
Metro\* (restricted vine, PMR)  
Quantum \*  
Waltham Butternut

### Winter Squash (Buttercup Type)

Sunshine\*  
Buttercup  
Sweet Mama  
Bon Bon (green)

### Winter Squash (Hubbard Type)

Hubbard Types  
Boston Marrow Types

### Spaghetti Squash

Tivoli\*  
Stripetti\*  
Vegetable Spaghetti

### Processing

Neck Pumpkin Types  
Atlas\* & Other Butternut Types

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<sup>1</sup> Varieties are listed by maturity within each type, earliest first.

\* Indicates hybrid varieties.

Letters in parentheses indicate disease resistance possessed by varieties. See the "Abbreviations" section in front portion of this publication.

### Recommended Nutrients Based on Soil Tests

Before using the table below, refer to important notes in the Soil and Nutrient Management chapter in Section B and your soil test report. These notes and soil test reports provide additional suggestions to adjust rate, timing, and placement of nutrients. Your state’s soil test report recommendations and/or your farm’s nutrient management plan supercede recommendations found below.

	Pounds N per Acre	Soil Phosphorus Level				Soil Potassium Level				Nutrient Timing and Method
		Low	Med	High	Very High	Low	Med	High	Very High	
				(Opt.)	High			(Opt.)	High	
Pumpkins and Winter Squash	50-100	150	100	50	0 <sup>1</sup>	200	150	100	0 <sup>1</sup>	Total nutrient recommended.
	25-50	150	100	50	0 <sup>1</sup>	200	150	100	0 <sup>1</sup>	Broadcast and disk-in.
	25-50	0	0	0	0	0	0	0	0	Sidedress when vines start to run.

For crops grown on plastic mulch, fertilization rates are based on a standard row spacing of 6 feet.

<sup>1</sup>In Virginia, crop replacement values of 25 lbs. P<sub>2</sub>O<sub>5</sub> and 50 lbs. K<sub>2</sub>O per acre are recommended on soils testing Very High.

#### Seed Treatment

Check with your seed company to determine if seed has been treated with an insecticide and fungicide. See the Disease section for more information in treating seed to prevent disease.

#### Planting and Spacing

Seed or transplant in the field between June 15 and July 5 in cooler areas, and between June 15 and July 15 in warmer, southern areas.

Base plant spacing on vine habit and average fruit size of the variety. **Note.** Fruit size may be decreased at closer spacings.

*Large vine with fruit over 30 pounds:* Rows 10 to 12 feet apart with 5 to 6 feet between plants in the row.

*Large vine with fruit 12 to 25 pounds:* Rows 7.5 to 9 feet apart with 4 feet between plants in the row.

*Large/medium vine with fruit 8 to 15 pounds:* Rows 6 to 7.5 feet apart with 3 to 4 feet between plants in the row.

*Small vine/bush with fruit less than 8 pounds:* Rows 5 to 6 feet apart with 2 feet between plants in the row.

#### Conservation Tillage (No-Till) Pumpkins

Seed or transplanted no-till pumpkins planted into small grain cover crop or stubble, hairy vetch, or fallow ground has produced commercially acceptable yields. A cover crop on the soil surface will reduce dirty pumpkins at harvest, provide some weed suppression, and minimize fruit rot by creating a barrier between pumpkins and the soil. Since cultivation is not an option in a no-till planting system and few post-emergence herbicides are available to control escaped weeds, choose fields carefully for no-till production. The performance of residual preemergence herbicides depends on rainfall or overhead irrigation for activation. Moisture for activation is more critical in no-till fields consisting of a trash or straw layer. Inadequate activating moisture for residual preemergence herbicides can lead to weed control failures. Control grasses postemergence with Poast or Select, and use Sandea to control yellow nutsedge and certain annual broadleaf weeds postemergence. Sandea is an ALS inhibitor (group 2), and is at high risk for weed resistance development. ALS resistant weed biotypes have been identified for common ragweed, common cocklebur, Palmer amaranth, and other pigweed species in the mid-Atlantic region. Sandea will NOT control certain pigweed species, common lambsquarters, annual morningglory, Eastern black nightshade, or any ALS resistant weed. Suggested cultural

procedures are outlined below. **Not recommended in New Jersey due to the high risk of weed resistance development and the lack of postemergence control options for certain pigweed species, common lambsquarters, annual morningglory, Eastern black nightshade, or any ALS resistant weed.**

#### Cover Crop Establishment

**Small grain stubble provides an ideal crop-mulch for pumpkins.** Be sure the combine distributes straw uniformly. No other manipulation of the crop residue is required before planting pumpkins. An alternative crop-mulch is hairy vetch. Seed hairy vetch in the fall 3 to 4 weeks before the average frost date at the rate of 20 to 25 pounds per acre with a grain drill or broadcast spreader. On sloping ground, mix a winter-killed variety of spring oats (0.5 bushel per acre) with the vetch to decrease the time required for ground cover to reduce soil erosion. Adjust soil pH before the vetch is seeded because tillage will not be performed before pumpkin planting. Application of phosphorus and potassium before seeding vetch is optional, depending on soil test results.

#### Cover Crop and Weed Management

**Soil Moisture.** Soil moisture prior to planting is a critical factor for successful establishment of pumpkins. The living, hairy vetch cover crop may remove soil moisture and prevent pumpkin germination and growth. If irrigation is not available, kill the vetch 10 to 14 days prior to planting in order for rainfall to provide adequate soil moisture for seeding or transplanting. If rainfall is excessive, hairy vetch may remove water to facilitate timely planting. Irrigation will eliminate the concerns about soil moisture for pumpkin seeding and germination.

**Contact Herbicides.** Hairy vetch is difficult to terminate. Glyphosate is not very effective for control of hairy vetch. Apply Gramoxone SL 2.0 (2.4 pints 2SC per acre) 10 to 14 days before planting, followed by a second application after seeding but before pumpkin seedlings emerge or before transplanting. For sequential applications of Gramoxone SL 2.0 or OLF, the rates may be reduced slightly. Two applications, each at 1.1 pound of glyphosate acid equivalent per acre (3.0 pints per acre of Roundup Ultra, Glyphomax Plus, or Touchdown IQ, or 2.4 pints per acre of Roundup Ultra Max), are required for effective hairy vetch control. Glyphosate is required for control of some weeds such as horseweed and smartweed. **Caution:** glyphosate-resistant horseweed has been identified and become widespread in numerous fields in the mid Atlantic region. This weed will not be adequately controlled by any

glyphosate product. Glyphosate has the potential to remain on foliage of weeds until washed off by rainfall or irrigation which could cause injury to germinating pumpkin seedlings or transplants. Allow at least 3 days between application and planting. A glyphosate product or Gramoxone SL 2.0 or OLF may be applied singularly, sequentially, or alternately to control specific weeds and cover crops.

To kill standing small grains or weeds in small grain stubble, make one application of glyphosate. Glyphosate is preferred for the control of grasses. Gramoxone SL 2.0 or OLF is acceptable for small grasses and for morningglory control. (See glyphosate caution above.)

**Residual Herbicides for Pumpkins.** Prefar (bensulide) may be applied alone or in combination with the first application of either Gramoxone or glyphosate to control germinating weeds as the mulch cover dies. Curbit (**not labeled in all states; see Pumpkin Weed Control Sections above for details**) should not be applied until after seeding and it should not be used for transplanted pumpkins. Prefar can be applied to the soil surface before transplanting pumpkins.

Strategy (clomazone *plus* ethalfluralin) or Curbit (ethalfluralin), may be used alone or in combinations with Prefar (bensulide). **Curbit is not labeled in all states (see Pumpkin Weed Control “clomazone” and “ethalfluralin” sections above for details).** Strategy, Curbit and Prefar may allow late season grass escapes which can be controlled by Select (clethodim) or Poast (sethoxydim) postemergence. Certain broadleaf weeds and yellow nutsedge can be controlled with a postemergence application of Sandea (halosulfuron). Broadleaf weed escapes not controlled by preemergence or postemergence herbicides should be hand weeded before the canopy closes to reduce the weed seed load for following crops.

### Pumpkin Planting

See the herbicide recommendations for pumpkins for further discussion.

Use “no-till” corn planters equipped with coulters to cut through straw or cover crop stems killed by contact herbicides. Planters with finger pickup or air/vacuum units function well for seeding pumpkins. Plate planters may damage seed and should be evaluated carefully before use. Cole plate planters are satisfactory. A disk coulters on the seeding unit is essential to cut through the vetch or straw stems. Mount a 3-inch wide waffle coulters ahead of pot-transplanters to provide for effective penetration of the cover crop and plant placement.

### Fertility

Hairy vetch will normally supply all the nitrogen requirements for pumpkins. However, if nitrogen deficiency symptoms appear before fruit production, topdress with 20 to 30 pounds nitrogen per acre. Phosphorus and potassium amendments can be applied (based on soil tests) to the soil surface before planting cover crop or before planting pumpkins. When planting pumpkins into non-legume cover crops for grain stubble, apply the recommended phosphorus, potassium, lime, and other nutrients based on soil tests before planting. Nitrogen rate recommendations may need to be increased based on fertilizer source, fertilizer application method, crop residue amount, and amount of time in a conservation tillage (no-till) production system. See Conservation Tillage Crop Production in section A.

### Pollination

Honeybees, squash bees, bumblebees and other wild bees are important for proper set and pollination. Populations of pollinating insects may be adversely affected by insecticides applied to flowers or weeds in bloom. Apply insecticides only in the evening hours or wait until bloom is completed before application. See section on “Pollination” in the General Production Recommendations and/or Table D-6 for relative toxicity of various pesticides for hazard to bees.

### Harvesting and Post Harvest Considerations

Disease-free fruit following a regular fungicide program during crop production will minimize postharvest fruit rots. Harvest when fruits are mature and prior to frost. Use care in handling fruit to prevent wounds. Wounding can negate benefits from a season-long fungicide program. Cure fruit after harvest at temperatures between 80° to 85°F (26.7° to 29.40°C) with a relative humidity of 75 to 80% for approximately 10 days. Temperatures below 50°F (10°C) cause chilling injury. The hard-shelled squashes, such as Butternut, Delicious, Spaghetti, and the Hubbard strains, can be stored. Store at 55°F (12.8°C) and 50 - 70% relative humidity. Acorn squash will store for 5-8 weeks; pumpkins for 2-3 months and other hard-shelled squashes will store for 3 months except hubbard that may hold for 5-6 months. Remove squash from the field before they have chilling injury and do not allow fruits to be exposed to extended periods below 50°F. Handle fruits carefully to eliminate bruising or damage and remove stems from squash like butternuts that can damage adjacent fruit. Store winter squash in a cool, dry, well-ventilated area. The longer keeping winter squash types can be kept in saleable condition through late winter, into spring (3-6 months). Research has not documented any benefit to post-harvest fruit fungicide dips.

### Weed Control

Section 18 Emergency Label requests may be submitted to supplement weed control recommendations in pumpkins and winter squash.

Identify the weeds in each field and select recommended herbicides that control those weeds. See Tables E-3 and E-4.

Match preplant incorporated and preemergence herbicide rates to soil type and percent organic matter in each field.

Apply postemergence herbicides when crop and weeds are within the recommended size and/or leaf stage.

Determine the preharvest interval (PHI) for the crop. See Table E-4 and consult the herbicide label.

Find the herbicides you plan to use in the Herbicide Resistance Action Committee’s (HRAC) **Herbicide Site of Action Table E-8** and follow the recommended good management practices to minimize the risk of herbicide resistance development by weeds in your fields.

### For Weed Control Under Plastic Mulch

Black plastic mulch effectively controls most annual weeds by preventing light from reaching the germinated seedling. Herbicides are used under plastic mulch to control weeds around the planting hole, and under the mulch when plastic mulch is used. Trickle irrigation tubing left on the soil surface may cause weed problems by leaching herbicide away at the emitters. The problem is most serious when clear plastic mulch is used. Bury the trickle tubing several inches deep in the bed to reduce this problem.

1. Complete soil tillage, and form raised beds, if desired, prior to applying herbicide(s). Do not apply residual herbicides before forming beds, or herbicide rate and depth of incorporation may be increased, raising the risk of crop injury. When beds are formed and plastic mulch laid in a single pass, the herbicide should be applied after the bed is formed, as a part of the same operation.
2. Apply herbicide(s) recommended for use under plastic mulch in a band as wide as the mulch. Condensation that forms on the underside of the mulch will activate the herbicide. Use the trickle irrigation to provide moisture if the soil is too dry for condensation to form on the underside of the mulch.
3. Complete by laying the plastic mulch and trickle irrigation tubing, if used, immediately after the herbicide application. Delay punching the planting holes until seeding or transplanting.

Bensulide--5.0 to 6.0 lb/A. Apply 5.0 to 6.0 quarts per acre Prefar 4E preemergence in a band under the plastic, immediately before laying the mulch. Condensation that forms on the underside of the mulch will activate the herbicide. Annual grasses and certain annual broadleaf weeds will be suppressed or controlled under the mulch and around the plant hole. Use the maximum recommended rate to improve control of annual broadleaf weeds including common lambsquarters, smooth pigweed, and common purslane.

**Note.** All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft<sup>2</sup>).

**For Soil Strips Between Rows of Plastic Mulch (Directed and Shielded Band Applications)**

Use the following land preparation, treatment, planting sequences, and herbicides labeled for the crop to treat **Soil Strips Between Rows of Plastic Mulch**, or crop injury and/or poor weed control may result.

1. Complete soil preparation, apply herbicide(s) under the mulch (see above), and lay plastic and trickle irrigation (optional) before herbicide application between the rows.
2. Spray preemergence herbicide(s) registered and recommended for use on the crop in bands onto the soil and the shoulders of the plastic mulch before planting and weeds germinate, **OR** apply after planting as a shielded spray combined with a postemergence herbicide to control emerged weeds. **DO NOT broadcast spray over the plastic mulch at any time!**
3. Incorporate preemergence herbicide into the soil with 1/2 to 1 inch of rainfall or overhead irrigation within 48 hours of application.
4. Apply Gramoxone in bands to the soil strips between the plastic mulch before the crop emerges or is transplanted, **AND/OR** as a shielded spray postemergence to control emerged weeds. Use in combination with residual herbicides that are registered for use.

**Note.** All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft<sup>2</sup>).

**Preemergence**

Bensulide--5.0 to 6.0 lb/A. Apply 5.0 to 6.0 quarts per acre Prefar 4E as a banded directed shielded spray preemergence to the weeds and activate with one-half inch of sprinkler irrigation within 36 hours to control most annual

grasses. Use the maximum recommended rate preemergence followed by irrigation to suppress certain annual broadleaf weeds including common lambsquarters, smooth pigweed, and common purslane.

Ethalfuralin--0.38 to 1.12 lb/A. Apply 1.0 to 3.0 pints per acre Curbit 3E as a banded directed shielded spray preemergence to control annual grasses and certain annual broadleaf weeds, including carpetweed and pigweed sp. Control of many other broadleaf weeds, including common lambsquarters, jimsonweed, morningglory sp., ragweed sp., mustard sp., and others may not be acceptable. Dry weather following application may reduce weed control. Cultivate to control emerged weeds if rainfall or irrigation does not occur prior to weed emergence. **DO NOT** preplant incorporate. **DO NOT** apply under plastic mulch or tunnels. **DO NOT** use when soils are cold or wet. Crop injury may result!

Ethalfuralin *plus* Clomazone (jug-mix)--0.394 to 1.575 lb/A. Apply 1.5 to 6.0 pints per acre of Strategy 2.1SC as a banded directed shielded spray preemergence to control annual grasses and many annual broadleaf weeds. Use the lowest recommended rates on coarse-textured sandy soils low in organic matter. Higher rates should only be used on medium- and fine-textured soils and sites that have been heavily manured.

Strategy is a **jug-mix** of ethalfuralin (Curbit 3E) and clomazone (Command 3ME). Refer to the chart below to determine the amount of each herbicide at commonly used rates:

**Curbit and Command Active Ingredients (ai) in Commonly Used Strategy Rates**

Strategy pints/A	Ethalfuralin (Curbit) lb ai/A	Clomazone (Command) lb ai/A
1.5	0.3	0.094
2.0	0.4	0.125
3.0	0.6	0.188
4.0	0.8	0.250
5.0	1.0	0.312
6.0	1.2	0.375

Labeled for use in all the Mid-Atlantic states. Read and follow all the recommendations and warnings (above) for ethalfuralin (Curbit) and clomazone (Command).

S-metolachlor--0.95 to 1.27 lb/A. Apply 1.00 to 1.33 pints of Dual Magnum 7.62E per acre as a directed and shielded spray between the rows of plastic mulch in pumpkins to suppress or control annual grasses, yellow nutsedge, and certain annual broadleaf weeds including nightshade species. Leave 1 foot (12 inches) of untreated area between the spray and any emerged pumpkin foliage. Do NOT apply Dual Magnum under the plastic or spray the plastic mulch. Tank-mix with other herbicides to improve the number of annual broadleaf weeds controlled. Dual Magnum will not control emerged weeds. Tank-mix with Gramoxone SL 2.0 and apply as a directed shielded spray if weeds have emerged. Use the lowest recommended rates on coarse-textured sandy soils low in organic matter. Higher rates should only be used on medium-and fine-textured soils and sites that have been heavily manured. **Dual magnum is labeled for use ONLY in pumpkins. Dual Magnum is NOT Labeled and should NOT be used on winter squash.**

### Postemergence

Carfentrazone--0.008 to 0.031 lb/A. Apply 0.5 to 2.0 fluid ounces of Aim 2EC as a banded directed shielded spray between the rows of plastic mulch to suppress or control broadleaf weeds including morningglory species, pigweed species, common lambsquarters, and nightshade species when the crop has 2 to 5 true leaves but has not yet begun to bloom or run. Aim, applied postemergence, will not control annual or perennial grasses. Add nonionic surfactant to be 0.25 percent of the spray solution (1.0 quart per 100 gallons of spray solution), or oil concentrate or methylated seed oil to be 1-2% percent of the spray solution (1.0 to 2.0 gallons per 100 gallons of spray solution). **The shielded (hooded) sprayer must be designed to prevent spray or drift from contacting the stems, leaves, flowers or fruit of the crop, or severe injury may occur.**

Halosulfuron--0.023 to 0.031 lb/A. Apply 0.50 to 0.66 dry ounce Sandea 75WG as a banded directed shielded spray between the rows of plastic mulch to suppress or control yellow nutsedge and broadleaf weeds including common cocklebur, redroot pigweed, smooth pigweed, ragweed species, and galinsoga when the crop has 2 to 5 true leaves but has not yet begun to bloom or run. Sandea applied postemergence will not control common lambsquarters or eastern black nightshade. Add nonionic surfactant to be 0.25 percent of the spray solution (1.0 quart per 100 gallons of spray solution). DO NOT use oil concentrate. Susceptible broadleaf weeds usually exhibit injury symptoms within 1 to 2 weeks of treatment. Typical symptoms begin as yellowing in the growing point that spreads to the entire plant and is followed by death of the weed. Injury symptoms are similar when yellow nutsedge is treated but may require 2 to 3 weeks to become evident and up to a month for the weed to die. Occasionally, slight yellowing of the crop may be observed within a week of Sandea application. When observed, recovery is rapid with no effect on yield or maturity. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. DO NOT apply Sandea to crops treated with a soil applied organophosphate (OP) insecticide, or use a foliar applied organophosphate (OP) insecticide within 21 days before or 7 days after a Sandea application. **Do NOT exceed total of 0.047 pounds per acre, equal to 1.0 dry ounce of Sandea, applied postemergence, per crop-cycle. DO NOT exceed a total of 0.094 pound per acre, equal to 2.0 dry ounces of Sandea applied to multiple crops in one year.**

Paraquat--0.6 lb/A. A **Special Local-Needs 24(c) label has been approved for the use of or Gramoxone SL 2.0 or OLF postemergence as a banded directed shielded spray between the rows of plastic mulch in Delaware, Maryland, New Jersey, Pennsylvania, and Virginia.** Apply 2.4 pints per acre Gramoxone SL 2.0 or OLF as a banded directed shielded spray to control emerged weeds between the rows after crop establishment. Add nonionic surfactant according to the labeled instructions. Do not allow spray or

spray drift to contact the crop or injury may result. Use shields to prevent spray contact with the crop plants. Do not exceed a spray pressure of 30 psi. See the label for additional information and warnings.

Clethodim--0.094 to 0.125 lb/A. Apply 6.0 to 8.0 fluid ounces per acre Select 2EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) or 12.0 to 16.0 fluid ounces of Select Max 0.97EC with nonionic surfactant to be 0.25% of the spray solution (1.0 quart per 100 gallons of spray solution) postemergence to control many annual and certain perennial grasses, including annual bluegrass. Select will not consistently control goosegrass. The use of oil concentrate with Select 2EC may increase the risk of crop injury when hot or humid conditions prevail. To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 14 days.

Sethoxydim--0.2 to 0.3 lb/A. Apply 1.0 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) postemergence as a banded directed shielded spray to control annual grasses and certain perennial grasses. **The use of oil concentrate may increase the risk of crop injury when hot or humid conditions prevail.** To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 14 days and apply no more than 3.0 pints per acre in one season.

### For Seeding Into Soil Without Plastic Mulch (Broadcast Applicators)

Use the following land preparation, treatment, planting sequences, and herbicides labeled for the crop when **Seeding into Soil Without Plastic Mulch**, or crop injury and/or poor weed control may result.

1. Complete soil tillage, apply preplant incorporated herbicide(s), and incorporate. Use a finishing disk or field cultivator that sweeps at least 100% of the soil surface twice, at right angles, operated at a minimum of 7 miles per hour (mph), OR a PTO driven implement once, operated at less than 2 miles per hour (mph).
2. Seed and apply preemergence herbicide(s) immediately after completing soil tillage, and mechanical incorporation

of preplant herbicides. Irrigate if rainfall does not occur, to move the herbicide into the soil and improve availability to germinating weed seeds within 2 days of when the field was last tilled, or plan to control escaped weeds by other methods.

**Note.** All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft<sup>2</sup>).

### Preplant Incorporated

Clomazone--0.25 to 0.50 lb/A. **For pumpkins ONLY**, apply 0.5 to 1.0 pint per acre Command 4EC preplant. Incorporate immediately after application. For best results, use equipment that will provide shallow, thorough incorporation. Poor incorporation technique may result in excessive crop injury in streaks throughout the field. Use lower rates on fields with coarse-textured soils that are low in organic matter and when planting short-season varieties. Use higher rates when planting full-season varieties in fine-textured soils and those with high organic matter. Expect some temporary injury after seedling emergence, seen as a partial whitening of leaf and/or stem of the crop. Complete recovery from early injury will occur without affecting yield or delaying maturity. Command is an excellent broad-spectrum herbicide that will control annual grasses and most broadleaf weeds, except pigweed sp., carpetweed, morningglory sp., and yellow nutsedge.

**WARNING: Command spray or vapor drift may injure sensitive crops and other vegetation up to several hundred yards from the point of application. Immediate incorporation will reduce or eliminate vapor drift. Do not apply when wind or weather conditions favor herbicide drift. Do not apply to fields adjacent to horticultural, fruit, vegetable, or other sensitive crops (see label). Drift injury from offsite Command movement is extremely apparent; therefore, do not use Command on fields near sensitive locations.**

Herbicide residues may limit subsequent cropping options when Command is used. See planting restrictions on the label or consult your local Cooperative Extension office for information regarding subsequent cropping options when Command is used for weed control.

### Preplant Incorporated or Preemergence

Bensulide--5.0 to 6.0 lb/A. Apply 5.0 to 6.0 quarts per acre Prefar 4E before planting and incorporate 1 to 2 inches deep with power-driven rotary cultivators, or apply preemergence and activate with one-half inch of sprinkler irrigation within 36 hours to control most annual grasses. Use the maximum recommended rate preemergence followed by irrigation to suppress certain annual broadleaf weeds including common lambsquarters, smooth pigweed, and common purslane.

### Preemergence

Clomazone--0.25 to 0.50 lb/A. **For winter squash ONLY**, apply 0.66 to 1.30 pints per acre Command 3ME preemergence to control annual grasses and many annual broadleaf weeds, except pigweed sp., carpetweed, annual morningglory sp., and yellow nutsedge. Some temporary injury, seen as a partial whitening of leaf and/or stem of the crop, may be observed after seedling emergence. Complete recovery from early injury will occur without affecting yield or delaying maturity.

**WARNING: Command spray or vapor drift may injure sensitive crops and other vegetation up to several**

**hundred yards from the point of application. Do not apply when wind or weather conditions favor spray drift. Preemergence applications are restricted to after June 15 in Maryland to reduce the risk of drift injury to rapidly growing sensitive spring foliage. Avoid preemergence applications when fields are adjacent to horticultural fruit, vegetable, or other sensitive crops (see label). Drift injury from off-site Command movement is extremely apparent; therefore, do not use Command on fields near sensitive locations. Follow all label restrictions that require buffer zones between treated fields and sensitive crops.**

Herbicide residues may limit subsequent cropping options when Command is used for weed control. See planting restrictions on the label or consult your local Cooperative Extension office for information regarding subsequent cropping options when Command has been used.

Ethalfuralin--0.56 to 0.94 lb/A. **A Special Local Needs Label 24(c) has been approved for the use of Curbit 3E on winter squash and pumpkins in Delaware, Maryland, Pennsylvania, and Virginia.** Apply 1.5 to 2.5 pints per acre Curbit 3E preemergence to control annual grasses and certain annual broadleaf weeds, including carpetweed and pigweed sp. Control of many other broadleaf weeds, including common lambsquarters, jimsonweed, morningglory sp., ragweed sp., mustard sp., and others, may not be acceptable. Dry weather following application may reduce weed control. Cultivate to control emerged weeds if rainfall or irrigation does not occur prior to weed emergence. DO NOT preplant incorporate. DO NOT apply under plastic mulch or tunnels. DO NOT use on transplanted pumpkin or winter squash. DO NOT use when soils are cold or wet. Crop injury may result!

Ethalfuralin *plus* Clomazone (jug-mix)--0.394-1.575 lb/A. Apply 1.5 to 6 pints per acre of Strategy 2.1SC preemergence to control annual grasses and many annual broadleaf weeds. Use the 2 pint rate on coarse-textured sandy soils low in organic matter. Higher rates should only be used on medium- and fine-textured soils and sites that have been heavily manured.

Strategy is a **jug-mix** of ethalfuralin (Curbit 3E) and clomazone (Command 3ME). Refer to the chart under Ethalfuralin *plus* clomazone (jug-mix) in the section **For Soil Strips Between Rows of Plastic Mulch** to determine the amount of each herbicide at commonly used rates.

Read and follow all the recommendations and warnings (above) for ethalfuralin (Curbit) and clomazone (Command).

Fomesafen--0.125 to 0.375 lb/A. ***For pumpkins ONLY.*** **A Special Local-Needs Label 24(c) has been approved for the use of Reflex 2E to control weeds in pumpkin in Delaware, Maryland, and Virginia. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, "farmassist.com". Go to the website "farmassist.com" and register (or sign in if previously registered), then under "products" on the toolbar, click on indemnified labels and follow the instructions.** Rates differ by states, soil types, and planting method. Refer to special label for the specific state. Rates as low as 10 fl oz caused injury on coarse-textured soils. Direct seeding: apply within 24 hours of planting followed by 0.2

to 0.5 inch of overhead irrigation or rainfall at least 36 hours prior to pumpkin cracking the ground. Transplants: apply and irrigate with 0.5 to 0.5 inch to activate the herbicide then prepare plant holes and transplant, do not punch holes until after Reflex application and irrigation has occurred. Not recommended for pumpkins planted into a killed cover crop. Avoid overhead irrigation during soil cracking and emergence. Foliar application of Reflex will severely damage or kill pumpkin. The potential of crop injury is greater on lighter textured soils combined with intensive irrigation programs or high amounts of rainfall, therefore, adjust use rates accordingly. Pumpkin varieties may vary in their response to Reflex; therefore, treat small acreages first to determine crop tolerance, especially when applying to a new variety. Reflex rates less than 16 fl oz/A are not intended to be used as a stand-alone weed control program and should be used with other herbicides and/or other methods of weed control. A maximum of 1.5 pint of Reflex (or a maximum of 0.375 lb ai/A of fomesafen from any product containing fomesafen) may be applied per acre in ALTERNATE years in Delaware, Maryland, and Virginia, be sure to consider rotational crops when deciding to apply fomesafen. If crop is replanted do not re-apply Reflex. Rotational restrictions are dependent on whether fomesafen was applied under the plastic, bare ground, or over plastic mulch, refer to 24(c) label for specifics. Do not apply within 32 days of harvest.

S-metolachlor--0.95 to 1.27 lb/A. Apply 1.00 to 1.33 pints of Dual Magnum 7.62E per acre as an inter-row or inter-hill spray in pumpkins to suppress or control annual grasses, yellow nutsedge, and certain annual broadleaf weeds including nightshade species. **Do NOT apply Dual Magnum over the pumpkin row or hill!** Leave 1 foot (12 inches) of untreated area over the row or hill (six inches on each side) and between the spray and any emerged pumpkin foliage. Dual Magnum application over the row may result in moderate to severe injury when seeding and application is followed by rainfall or irrigation before crop emergence. Dual Magnum injury appears as dark green healthy looking foliage on emerged seedlings that are stunted and recover only slowly. Injury may result in reduced yield and/or delayed maturity. Tank-mix with other herbicides to improve the number of annual broadleaf weeds controlled. Dual Magnum will not control emerged weeds. Tank-mix with Gramoxone and apply as a directed shielded spray if weeds have emerged. Use the lowest recommended rates on coarse-textured sandy soils low in organic matter. Higher rates should only be used on medium- and fine-textured soils and sites that have been heavily manured. **Dual Magnum is labeled for use ONLY in pumpkins. Dual Magnum is NOT Labeled and should not be used on winter squash.**

### Postemergence

Paraquat--0.6 lb/A. A **Special Local-Needs 24(c) label has been approved for the use of Gramoxone SL 2.0 postemergence as a directed shielded spray in Delaware, Maryland, New Jersey, Pennsylvania, and Virginia.** Apply 2.4 pints per acre Gramoxone SL 2.0 as a directed spray to control emerged weeds between the rows after crop establishment. Add nonionic surfactant according to the labeled instructions. Do not allow spray or spray drift to contact the crop or injury may result. Use shields to prevent spray contact with the crop plants. Do not exceed a spray

pressure of 30 psi. See the label for additional information and warnings.

Clethodim--0.094 to 0.125 lb/A. Apply 6.0 to 8.0 fluid ounces per acre Select 2EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) or 12.0 to 16.0 fluid ounces of Select Max 0.97EC with nonionic surfactant to be 0.25% of the spray solution (1 quart per 100 gallons of spray solution) postemergence to control many annual and certain perennial grasses, including annual bluegrass. Select will not consistently control goosegrass. The use of oil concentrate with Select 2EC may increase the risk of crop injury when hot or humid conditions prevail. To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 14 days.

Halosulfuron--0.023 to 0.031 lb/A. Apply 0.50 to 0.66 dry ounces of Sandea 75WG to suppress or control yellow nutsedge and broadleaf weeds, including common cocklebur, redroot pigweed, smooth pigweed, ragweed species, and galinsoga when the crop has 2 to 5 true leaves, but has not yet begun to "run" or bloom. Sandea applied postemergence will not control common lambsquarters or eastern black nightshade. Add nonionic surfactant to be 0.25% of the spray solution (1 quart per 100 gallons of spray solution). Susceptible broadleaf weeds usually exhibit injury symptoms within 1 to 2 weeks of treatment. Typical symptoms begin as yellowing in the growing point that spreads to the entire plant, and is followed by death of the weed. Injury symptoms are similar when yellow nutsedge is treated, but may require 2 to 3 weeks to become evident, and up to a month for the weed to die. Occasionally slight yellowing of the crop may be observed within a week of Sandea application. When observed, recovery is rapid, with no effect on yield or maturity. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. **DO NOT apply Sandea to crops treated with a soil applied organophosphate (OP) insecticide, or use a foliar applied organophosphate (OP) insecticide within 21 days before or 7 days after a Sandea application. DO NOT exceed total of 0.047 pounds per acre, equal to 1.0 dry ounce of Sandea, applied postemergence, per crop-cycle. DO NOT exceed a total of 0.094 pound per acre, equal to 2.0 dry ounces of Sandea applied to multiple crops in one year.**

Sethoxydim--0.2 to 0.3 lb/A. Apply 1.0 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the



spray solution (1 gallon per 100 gallons of spray solution) postemergence to control annual grasses and certain perennial grasses. **The use of oil concentrate may increase the risk of crop injury when hot or humid conditions prevail.** To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 14 days and apply no more than 3 pints per acre in one season.

### Postharvest With or Without Plastic Mulch

Paraquat--0.6 lb/A. **A Special Local-Needs 24(c) label has been approved for the use of Gramoxone SL 2.0 or OLF for postharvest desiccation of the crop in Delaware, New Jersey and Virginia.** Apply 2.4 pints per acre Gramoxone SL 2.0 or OLF as a broadcast spray after the last harvest. Add nonionic surfactant according to the labeled instructions. Use to prepare plastic mulch for replanting, or to aid in the removal of the mulch. See the label for additional information and warnings.

**Note.** All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft<sup>2</sup>).

### Insect Control

**THE LABEL IS THE LAW. PLEASE REFER TO THE LABEL FOR UP TO DATE RATES AND RESTRICTIONS**

**NOTE:** Copies of specific insecticide product labels can be downloaded by visiting websites [www.CDMS.net](http://www.CDMS.net) or [www.greenbook.net](http://www.greenbook.net). Also, specific labels can be obtained via web search engines.

### Seed Corn Maggot

See Section E, "Maggots" section in Soil Pests--Their Detection and Control.

### Aphids

Apply one of the following formulations:

**Note.** Aphids transmit mosaic virus. Thorough spray coverage beneath leaves is important. Treat seedlings every 5 to 7 days or as needed. Also, mosaic-resistant winter squash cultivars are available.

acetamiprid--2.5 to 4.0 oz/A Assail 30G  
 clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC; **foliar** 3.0 to 4.0 fl oz/A Belay 2.13SC  
 flonicamid--2.0 to 2.8 oz/A Beleaf 50SG  
 flupyradifurone--7.0 to 12.0 fl oz/A Sivanto 200SL  
 imidacloprid--**soil only** 7.0 to 10.5 fl oz/A Admire PRO 4.6SC (or OLF)  
 lambda-cyhalothrin+thiamethoxam--4.5 fl oz/A Endigo ZC  
 oxamyl--2.0 to 4.0 pts/A Vydate 2L  
 pymetrozine--2.75 oz/A Fulfill 50WDG  
 thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SG ; **foliar** 1.5 to 3.0 oz/A Actara 25WDG (or other labelled mixtures containing thiamethoxam like Durivo and Voliam Flexi)

zeta-cypermethrin+ avermectin B1--19.0 fl oz/A Gladiator

### Cabbage Looper

Apply one of the following formulations:

*Bacillus thuringiensis*--0.5 to 2.0 lb/A DiPel (or OLF)  
 beta-cyfluthrin--1.6 to 2.4 fl oz/A Baythroid XL 1EC  
 bifenthrin--2.6 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)  
 chlorantraniliprole--**soil/drip/foliar** 3.5 to 5.0 fl oz/A Coragen 1.67SC (or other labelled mixtures containing chlorantraniliprole like Voliam flexi)  
 cyfluthrin--1.6 to 2.4 fl oz/A Tombstone 2EC (or OLF)  
 esfenvalerate--5.8 to 9.6 fl oz/A Asana XL  
 fenpropathrin--10.67 to 16.0 fl oz/A Danitol 2.4EC  
 flubendiamide--1.5 fl oz/A Belt 4SC (or other labelled mixtures containing flubendiamide like Vetica)  
 indoxacarb--2.5 to 6.0 oz/A Avaunt 30WDG  
 lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy EC, LambdaT CS, or OLF)  
 lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress  
 lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo ZC  
 methoxyfenozide--4.0 to 10.0 fl oz/A Intrepid 2F  
 permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2 EC (or OLF)  
 spinetoram--5.0 to 10.0 fl oz/A Radiant 1SC  
 spinosad--4.0 to 8.0 fl oz/A Entrust 2SC  
 zeta-cypermethrin--2.8 to 4.0 fl oz/A Mustang Maxx 0.8EC  
 zeta-cypermethrin+ avermectin B1--14.0 to 19.0 fl oz/A Gladiator  
 zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

### Cucumber Beetle

Cucumber beetles commonly carry bacterial wilt bacteria on their mandibles. Therefore, when plants are young, they need to be protected from cucumber beetle feeding to manage bacterial wilt. Cucumber beetles also cause direct damage to pumpkin and winter squash rinds. Fall treatments with foliar insecticides to prevent feeding damage may also reduce the incidence of black rot. Seeds pretreated with a neonicotinoid seed treatment such as Farmore DI-400 should provide up to 21 days of control of cucumber beetle.

Otherwise, apply one of the following formulations:

acetamiprid--2.5 to 5.3 oz/A Assail 30SG  
 beta-cyfluthrin--2.4 to 2.8 fl oz/A Baythroid XL 1EC  
 bifenthrin--2.6 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)  
 carbaryl--1.0 qt/A Sevin XLR Plus  
 clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC, **foliar** 3.0 to 4.0 fl oz/A Belay 2.13SC  
 cyfluthrin--2.4 to 2.8 fl oz/A Tombstone 2EC (or OLF)  
 dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL; **foliar** 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG  
 esfenvalerate--5.8 to 9.6 fl oz/A Asana XL  
 fenpropathrin--10.67 to 16.00 fl oz/A Danitol 2.4EC  
 imidacloprid--**soil only** 7.0 to 10.5 fl oz/A Admire PRO 4.6SC(or OLF)  
 lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy EC (LambdaT CS, or OLF)  
 lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress  
 lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo ZC  
 permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2 EC (or OLF)

thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SG; **foliar** 3.0 to 5.5 oz/A Actara 25WDG  
 thiamethoxam+chlorantraniliprole--**soil** 10.0 to 13.0 fl oz/A Durivo; **foliar** 4.0 to 7.0 oz/A Voliam Flexi  
 zeta-cypermethrin--2.8 to 4.0 fl oz/A Mustang Maxx 0.8EC  
 zeta-cypermethrin+ avermectin B1--14.0 to 19.0 fl oz/A Gladiator  
 zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

**Cutworms** (Also see the "Cutworms" section in Soil Pests-- Their Detection and Control.)

Apply one of the following formulations:

beta-cyfluthrin--0.8 to 1.6 fl oz/A Baythroid XL 1EC  
 bifenthrin--2.6 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)  
 cyfluthrin--0.8 to 1.6 fl oz/A Tombstone 2EC (or OLF)  
 esfenvalerate--5.8 to 9.6 fl oz/A Asana XL  
 flubendiamide--1.5 fl oz/A Belt 4SC (or other labelled mixtures containing flubendiamide like Vetica)  
 lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy EC (LambdaT CS, or OLF) (or other labeled mixtures containing lambda-cyhalothrin like Endigo ZC)  
 lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress  
 permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2 EC (or OLF)  
 zeta-cypermethrin--1.28 to 4.00 fl oz/A Mustang Maxx 0.8EC  
 zeta-cypermethrin+ avermectin B1--6.0 to 19.0 fl oz/A Gladiator  
 zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

### Leafminers

Apply one of the following formulations:

abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7 SC ( or OLF)  
 chlorantraniliprole--**soil/drip** 5.0 to 7.5 fl oz/A Coragen 1.67SC; **foliar** 5.0 to 7.0 fl oz/A Coragen 1.67SC  
 clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC  
 cyromazine--2.66 oz/A Trigard 75WSP  
 dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL or 5.0 to 6.0 oz/A Venom 70SG ; **foliar** 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG  
 lambda-cyhalothrin+chlorantraniliprole--9.0 fl oz/A Voliam Xpress  
 lambda-cyhalothrin+thiamethoxam--4.5 fl oz/A Endigo ZC  
 oxamyl--2.0 to 4.0 pts/A Vydate 2L  
 spinetoram--6.0 to 10.0 fl oz/A Radiant 1SC  
 spinosad--6.0 to 8.0 fl oz/A Entrust 2SC (**OMRI listed**)  
 thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SC ; **foliar** 3.0 to 5.5 oz/A Actara 25WDG  
 thiamethoxam+chlorantraniliprole--**soil** 10.0 to 13.0 fl oz/A Durivo; **foliar** 4.0 to 7.0 oz/A Voliam Flexi  
 zeta-cypermethrin+avermectin B1--19.0 fl oz/A Gladiator

### Mites

Mite infestations generally begin around field margins and grassy areas. **CAUTION: DO NOT** mow or maintain these areas after midsummer to prevent mites from moving into the crop. Localized infestations can be spot-treated. Begin treatment when 10 to 15 percent of the crown leaves are infested early in the season. Apply one of the following formulations:

**Note.** Continuous use of carbaryl or pyrethroids may result in mite outbreaks.

**Note.** The addition of crop oils or organosilicon spray additives will increase miticide effectiveness.

abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7 SC (or OLF)  
 bifenazate--0.75 to 1.00 lb/A Acramite 50 WS  
 etoxazole--2.0 to 3.0 oz/A Zeal Miticide<sup>1</sup>  
 spiromesifen--7.0 to 8.5 fl oz/A Oberon 2SC  
 zeta-cypermethrin+avermectin B1--19.0 fl oz/A Gladiator

### Pickleworm, Melonworm

When using foliar materials make one treatment prior to fruit set, and then treat weekly. If using soil or drip applications follow instructions on the label.

acetamiprid--2.5 to 5.3 oz/A Assail 30SG  
 beta-cyfluthrin--1.6 to 2.4 fl oz/A Baythroid XL 1EC  
 bifenthrin--2.6 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)  
 carbaryl--0.5 to 1.0 qt/A Sevin XLR Plus  
 chlorantraniliprole--(melonworm) **drip** 2.0 to 3.5 fl oz/A Coragen 1.67SC, **foliar** 2.0 to 5.0 fl oz/A Coragen 1.67SC; (pickleworm) **drip/foliar** 3.5 to 5.0 fl oz/A Coragen 1.67SC (or other labeled mixtures containing chlorantraniliprole like Voliam flexi)  
 cyfluthrin--1.6 to 2.4 fl oz/A Tombstone 2EC (or OLF)  
 esfenvalerate (**pickleworm only**)--5.8 to 9.6 fl oz/A Asana XL  
 flubendiamide--1.5 fl oz/A Belt 4SC (or other labelled mixtures containing flubendiamide like Vetica)  
 indoxacarb--2.5 to 6.0 oz/A Avaunt 30WDG  
 lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy EC (LambdaT CS, or OLF)  
 lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress  
 lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo ZC  
 methoxyfenozide--4.0 to 10.0 fl oz/A Intrepid 2F  
 permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2 EC (or OLF)  
 spinetoram--5.0 to 10.0 fl oz/A Radiant 1SC  
 spinosad--4.0 to 8.0 fl oz/A Entrust 2SC (**OMRI listed**)  
 zeta-cypermethrin--2.8 to 4.0 fl oz/A Mustang Maxx 0.8EC  
 zeta-cypermethrin +avermectin B1--14.0 to 19.0 fl oz/A Gladiator  
 zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

### Rindworms

Damage to the rinds may result from a complex of insect pests including cucumber beetle, wireworms, and a number of "worm" species, (beet army worm, etc). Management of adult cucumber beetles early in the season may help reduce damage. See cucumber beetle section for labeled products.

For Lepidopteran rindworms, use one of the following formulations:

beta-cyfluthrin--1.6 to 2.4 fl oz/A Baythroid XL 1EC  
 bifenthrin--2.6 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)  
 cyfluthrin--1.6 to 2.4 fl oz/A Tombstone 2EC (or OLF)  
 esfenvalerate--5.8 to 9.6 fl oz/A Asana XL  
 flubendiamide--1.5 fl oz/A Belt 4SC  
 flubendiamide+buprofezin--12.0 to 17.0 fl oz/A Vetica  
 lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy EC (LambdaT CS, or OLF)  
 lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress  
 lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo ZC  
 methoxyfenozide--4.0 to 10.0 fl oz/A Intrepid 2F

PUMPKINS AND WINTER SQUASH

permethrin--4.0 to 8.0 fl oz/A Perm-Up 3.2EC (or OLF)  
 spinetoram--5.0 to 10.0 fl oz/A Radiant 1SC  
 spinosad--4.0 to 8.0 fl oz/A Entrust 2SC (**OMRI listed**)  
 thiamethoxam+chlorantraniliprole—**foliar** 4.0 to 7.0 oz/A  
 Voliam Flexi  
 zeta-cypermethrin--2.8 to 4.0 fl oz/A Mustang Maxx 0.8EC  
 zeta-cypermethrin+ avermectin B1--14.0 to 19.0 fl oz/A  
 Gladiator  
 zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

**Squash Bug**

Begin treatments if greater than one egg mass per plant is present. Sprays should target nymphal stages. For best squash bug control, under leaf spray coverage is essential.

Apply one of the following formulations:

acetamiprid--5.3 oz/A Assail 30SG  
 bifenthrin--2.6 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)  
 carbaryl--1.0 qt/A Sevin XLR Plus  
 clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC  
 dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL or 5.0  
 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl  
 oz/A Scorpion 35SL or 1.0 to 4.0 fl oz/A Venom 70SG  
 esfenvalerate--5.8 to 9.6 fl oz/A Asana XL  
 flupyradifurone--10.5 to 14.0 fl oz/A Sivanto 200SL  
 lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to  
 3.84 fl oz/A Lambda-Cy EC (LambdaT CS, or OLF) (or  
 other labeled mixtures containing lambda-cyhalothrin like  
 Voliam Xpress)  
 lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo  
 ZC  
 zeta-cypermethrin--2.8 to 4.0 fl oz/A Mustang Maxx 0.8EC  
 zeta-cypermethrin + avermectin B1--14.0 to 19.0 fl oz/A  
 Gladiator  
 zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz Hero EC

**Squash Vine Borer**

When vines begin to run, apply to bases of plants four times at 7-day intervals. Pheromone traps for squash vine borer are commercially available. These traps can be used to indicate when moth activity begins. Apply one of the following formulations:

**Note:** Use of spinosad or spinetoram for looper control will reduce squash vine borer populations.

acetamiprid--5.3 oz/A Assail 30SG  
 bifenthrin--2.6 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)  
 esfenvalerate--5.8 to 9.6 fl oz/A Asana XL  
 flubendiamide--1.5 fl oz/A Belt 4SC  
 flubendiamide+buprofezin--12.0 to 17.0 fl oz/A Vetica  
 lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56  
 to 3.84 fl oz/A Lambda-Cy EC (LambdaT CS, or OLF)  
 (or other labeled mixtures containing lambda-cyhalothrin  
 like Endigo ZC)  
 lambda-cyhalothrin+chlorantraniliprole---6.0 to 9.0 fl oz/A  
 Voliam Xpress  
 zeta-cypermethrin--2.8 to 4.0 fl oz/A Mustang Maxx 0.8EC  
 zeta-cypermethrin+ avermectin B1--14.0 to 19.0 fl oz/A  
 Gladiator  
 zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

**Thrips**

Apply one of the following formulations:  
 clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC

dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL or 5.0  
 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A  
 Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG  
 imidacloprid--**soil only** 7.0 to 10.5 fl oz/A Admire PRO  
 4.6SC (or OLF)  
 lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56  
 to 3.84 fl oz/A Lambda-Cy EC (LambdaT CS, or OLF)  
 lambda-cyhalothrin+chlorantraniliprole---6.0 to 9.0 fl oz/A  
 Voliam Xpress  
 lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo  
 ZC  
 oxamyl--2.0 to 4.0 pts/A Vydate 2L  
 spinetoram--6.0 to 10.0 fl oz/A Radiant 1SC  
 spinosad--6.0 to 8.0 fl oz/A Entrust 2SC (**OMRI listed**)  
 thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SG  
 thiamethoxam+chlorantraniliprole--**soil** 10.0 to 13.0 fl oz/A  
 Durivo

**Whiteflies**

Apply one of the following formulations:

clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC; **foliar**  
 3.0 to 4.0 fl oz/A Belay 2.13SC  
 dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL or 5.0  
 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A  
 Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG  
 flonicamid--**greenhouse** 2.8 oz/A Beleaf 50SG  
 flubendiamide+buprofezin--14.0 to 17.0 fl oz/A Vetica  
 flupyradifurone--7.0 to 10.5 fl oz/A Sivanto 200SL  
 imidacloprid--**soil only** 7.0 to 10.5 fl oz/A Admire PRO  
 4.6SC (or OLF)  
 lambda-cyhalothrin+thiamethoxam--4.5 fl oz/A Endigo ZC  
 pymetrozine--2.75 oz/A Fulfill 50WDG  
 pyriproxyfen--8.0 to 10.0 fl oz/A Knack  
 spiromesifen--7.0 to 8.5 fl oz/A Oberon 2SC  
 thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SG; **foliar**  
 3.0 to 5.5 oz/A Actara 25WDG  
 thiamethoxam+chlorantraniliprole—**soil** 10.0 to 13.0 fl oz/A  
 Durivo; **foliar** 4.0 to 7.0 oz/A Voliam Flexi

Pesticide	Use Category <sup>1</sup>	Hours to Reentry <sup>2</sup>	Days to Harvest <sup>3</sup>
<b>INSECTICIDE</b>			
abamectin	R	12	7
acetamiprid	G	12	0
<i>Bacillus thuringiensis</i>	G	4	0
beta-cyfluthrin	R	12	0
bifenthrin	R	12	3
bifenazate	G	12	3
carbaryl	G	12	3
chlorantraniliprole	G	4	1
clothianidin (soil/foliar)	G	12	21/7
cyfluthrin	R	12	0
cyromazine	G	12	0
dinotefuran (soil/foliar)	G	12	21/1
esfenvalerate	R	12	3
etoxazole	G	12	7
fenpropathrin	R	24	7
flonicamid	G	12	0
flubendiamide	G	12	1
flubendiamide+buprofezin	G	12	1
flupyradifurone	G	12	1
imidacloprid (soil)	G	12	21
indoxacarb	G	12	3
lambda-cyhalothrin	R	24	1
lambda-cyhalothrin + chlorantraniliprole	R	24	1

(table continued next page)

Pesticide	Use Category <sup>1</sup>	Hours to Reentry <sup>2</sup>	Days to Harvest <sup>3</sup>
<b>INSECTICIDE (cont'd)</b>			
lambda-cyhalothrin + thiamethoxam	R	24	1
methomyl	R	48	3
methoxyfenozide	G	4	3
oxamyl	R	48	1
permethrin	R	12	0
pymetrozine	G	12	0
pyriproxyfen	G	12	7
spinetoram	G	4	3
spinosad	G	4	3
spiromesifen	G	12	7
thiamethoxam (soil/foliar)	G	12	30/0
thiamethoxam+chlorantraniliprole	G	12	1
zeta-cypermethrin	R	12	1
zeta-cypermethrin + avermectin B1	R	12	7
zeta-cypermethrin+bifenthrin	R	12	3
<b>FUNGICIDE (FRAC code)</b>			
Aprovia Top (Groups 11 + 3)	G	12	0
Ariston (Groups M5 + 27)	G	12	3
azoxystrobin (Group 11)	G	4	1
Cabrio (Group 11)	G	12	0
chlorothalonil (Group M5)	G	12	0
copper, fixed (Group M1)	G	see label	0
Curzate (Group 27)	G	12	3
Flint (Group 11)	G	12	0
Fontelis (Group 7)	G	12	1
Forum (Group 40)	G	12	0
Gavel (Groups 22 + M3)	G	48	5
Inspire Super (Groups 3 + 9)	G	12	7
Mancozeb (Group M3)	G	24	5
Merivon (Groups 7 + 11)	G	12	0
MetaStar (Group 4)	G	48	AP
Presidio (Group 43)	G	12	2
Previcur Flex (Group 28)	G	12	2
Pristine (Groups 11 + 7)	G	12	0
Procure (Group 3)	G	12	0
Proline (Group 3)	G	12	7
Quadris Top (Groups 11 + 3)	G	12	1
Quintec (Group 13)	G	12	3
Rally (Group 3)	G	24	0
Ranman (Group 21)	G	12	0
Revus (Group 40)	G	4	0
Ridomil Gold (Group 4)	G	48	5
Sulfur Micronized Wettable (Group M2)	G	24	-
Switch (Groups 9 + 12)	G	12	1
Tanos (Groups 11 + 27)	G	12	3
tebuconazole (Group 3)	G	12	7
Torino (Group U6)	G	4	0
Ultra Flourish (Group 4)	G	48	5
Uniform (Groups 4 + 11)	G	0	AP
Vivando (Group U8)	G	12	0
Zampro (Groups 45 + 40)	G	12	0
Zing! (Groups 22 + M5)	G	12	0

See Table D-6.

<sup>1</sup> G = general, R = restricted<sup>2</sup> Chemicals with multiple designations are based on product and/or formulation differences. CONSULT LABEL.<sup>3</sup> AP=At Plant

### Nematode Control

See Chapter E – Pest Management the Nematodes Section under Soil Pests--Their Detection and Control. Use fumigants listed in the "Soil Fumigation" section of the same section or:

Vydate L--1.0 to 2.0 gal 2L/A. Incorporate into the top 2 to 4 inches of soil or 2.0 to 4.0 pints 2L/A applied 2 weeks after planting and repeat 2 to 3 weeks later, or Nimitz 4EC--3.5 to 5.0 pints/A. Incorporate or drip-apply 7 days before planting.

### Disease Control

#### Seed Treatment

Check with your seed company to determine if seed has been treated with an insecticide and fungicide. If it has not been treated, use a mixture of thiram 4.5fl oz 480DP/100 lb and an approved commercially available insecticide.

#### Damping-Off

Apply one of the following in a 7-inch band after seeding. Use formula in the "Calibration for Changing from Broadcast to Band Application" of Section E of Calibrating Granular Application Equipment to determine the amount of Ridomil Gold or Ultra Flourish or MetaStar needed per acre.

mefenoxam (Ridomil Gold--1.0 to 2.0 pt 4SL/A or 2.0 to

4.0 pt Ultra Flourish 2.0 to 4.0 pt 2E/A)

metalaxyl (MetaStar--4.0 to 8.0 pt 2E/A)

Uniform--0.34 fl oz 3.66SE/1000 ft row

Previcur Flex--1.2 pt 6F/A applied in transplant water, drip irrigation, or a spray directed to the base of the plant and soil.

#### Viruses (WMV2, PRSV, ZYMV, and CMV)

The most prevalent virus in the mid-Atlantic region is WMV2, followed by PRSV, ZYMV, and CMV. Use varieties with multiple virus resistance when possible. Plant fields as far away from existing cucurbit plantings as possible to help reduce aphid transmission of viruses from existing fields to new fields.

#### Bacterial Wilt

Controlling striped and spotted cucumber beetles is essential for preventing bacterial wilt. See preceding "Cucumber Beetle" section under Insect Control for specific recommendations. Insecticide applications made at planting may not prevent beetle damage season long, therefore, additional foliar insecticide applications may be necessary.

#### Angular Leaf Spot/Bacterial Leaf Spot

Both diseases can produce foliar symptoms that are often over-looked. Early detection is important, since control of the foliar phase can reduce infections in developing fruit. Infected fruit will become unmarketable. Both diseases are seedborne and can survive on infested debris for at least one year or until the debris decomposes. Rotate away from fields with history of bacterial problems. Incorporate the following into a standard disease management program when leaf spot is first detected, and repeat every 7 to 10 days:

copper, fixed--at labeled rates plus mancozeb

#### Choanophora fruit rot

This disease occurs during warm wet weather and develops predominantly on flowers or fruit near the ground. Management is difficult because disease development is rapid, and weather dependant. Fungicide sprays are not effective because flowers, which open daily, must be protected immediately. Practices that reduce soil moisture or reduce soil contact, such as raised beds and plastic mulch, may be beneficial.

**Powdery Mildew**

Some available varieties have resistance or tolerance to powdery mildew and should be used if possible (see variety Table). The fungus that causes cucurbit powdery mildew has developed resistance to high-risk fungicides. Resistance to strobilurin (FRAC code 11) and DMI (FRAC code 3) fungicides have been reported in the Eastern US. Proper fungicide resistance management should be followed to help delay the development of resistance and minimize control failures.

Powdery mildew generally occurs from mid-July until the end of the season. Powdery mildew development on tolerant varieties will vary from year to year. Planting tolerant varieties will help delay the development of powdery mildew and improve performance of fungicide applications. If Powdery mildew has become well established in the mid-to late part of the season, only apply protectant fungicides such as chlorothalonil or sulfur. Make first application when powdery mildew is observed in the area or is detected by scouting (one lesion on the underside of 45 old leaves).

**Alternate:**

Torino--3.4 fl oz 0.85SC/A *plus* chlorothalonil--2.0 to 3.0 pt 6F/A or OLF

Quintec--6.0 fl oz 2.08 SC/A *plus* chlorothalonil--2.0 to 3.0 pt 6 F/A or OLF

Vivando--15.4 fl oz 2.5SC/A

**With one of the following:**

Fontelis--12.0 to 16.0 fl oz 1.67SC/A *plus* chlorothalonil--2.0 to 3.0 pt 6F/A

Procure--4.0 to 8.0 fl oz 480SC/A *plus* chlorothalonil--2.0 to 3.0 pt 6F/A or OLF

tebuconazole--4.0 to 6.0 fl oz 3.6F/A or OLF *plus* chlorothalonil--2.0 to 3.0 pt 6F/A or OLF

Proline--5.7 fl oz 480 SC/A *plus* chlorothalonil 2.0 or 3.0 pt 6F/A

Inspire Super--16.0 to fl oz 2.8 F/A *plus* chlorothalonil 2.0 to 3.0 pt 6 F/A or OLF

Aprovia Top--10.5 to 13.5 fl oz 1.62EC/A

Rally--5.0 oz 40WSP/A *plus* chlorothalonil--2.0 to 3.0 pt 6F/A or OLF

Pristine--12.5 to 18.5 oz 38WG/A *plus* chlorothalonil--2.0 to 3.0 pts 6F/A or OLF

**Or with:**

Micronized Wettable Sulfur--4.0 lb 80W/A. Sulfur may injure plants, especially at high temperatures. Certain varieties can be more sensitive. Consult label for precautions.

**Downy Mildew**

Scout fields for disease incidence early in the growing season. Begin sprays when vines run or if downy mildew is predicted for the region. For current status of the disease, refer to the Cucurbit Downy Mildew forecasting website <http://cdm.ipmpipe.org/>. **Preventative applications are much more effective than applications made after disease is detected.** The following are the most effective materials: Tank-mix one of the following products with a protectant such as chlorothalonil--1.5 to 3.0 pt 6F/A or Gavel--1.5 to 2.0 lb 75DF/A and alternate between different modes of action (FRAC codes):

Presidio--3.0 to 4.0 fl oz 4SC/A

Ranman--2.10 to 2.75 fl. oz 400 SC/A (plus a non-ionic or organosilicon surfactant; do not apply with copper; see

label for additional precautions)

Revus--8.0 fl oz 2.08SC/A

Zampro--14.0 fl oz 525SC/A

Other materials for use in tank mix or alternation:

Previcur Flex--1.2 pt 6F/A

Tanos--8.0 oz 50DF/A

Forum--6.0 fl oz 4.17SC/A

Curzate--3.2 oz 60DF/A

Zing!--36 fl oz 4.9 SC/A (contains chlorothalonil)

Ariston--3.0 pt 42SC/A (contains chlorothalonil)

Materials with different modes of action (FRAC codes) should always be alternated to reduce the chances for fungicide resistance development.

Sprays should be applied on a 7-day schedule. Under severe disease conditions spray interval may be reduced if label allows.

**Plectosporium Blight (Microdochium blight)**

Research studies have shown that no-till pumpkin production may reduce disease development. Rotate with crops other than cucurbits. It is important to achieve maximum foliage coverage with each fungicide application. Scout fields on a regular basis. Once symptoms appear on petioles or as fruit begins to form, apply one of the following and repeat every 7-10 days:

chlorothalonil--2.0 to 3.0 pt 6F/A or OLF

Quadris Top--12.0 to 14.0 fl oz 2.7F/A

A spray schedule that alternates Cabrio or Flint with chlorothalonil will also provide control.

**Scab**

Use resistant varieties when possible. Scab develops during cool periods. Begin sprays as true leaves form and repeat every 5 to 7 days.

chlorothalonil--2.0 to 3.0 pt 6F/A or OLF

**Gummy Stem Blight (Black Rot) and Anthracnose**

Rotate crops to allow at least 2 years between cucurbit plantings. Pumpkin cv. 'Small Sugar' appears to be the least affected by Black rot. Fungicides with a high-risk for resistance development, such as FRAC code 11 fungicides (Cabrio, Pristine and Quadris), should be tank-mixed with a protectant fungicide. When tank-mixing, use at least the minimum labeled rate of each fungicide in the tank-mix. Do not apply FRAC code 11 fungicides more than 4 times total per season. If resistance to FRAC code 11 fungicides exists in the area, do not apply them. Use fungicides from a different FRAC code.

Begin the following fungicide program when fruit start to form:

**Alternate:**

chlorothalonil--2.0 to 3.0 pt 6F/A or OLF

(use low rate early in season)

**With one of the following:**

Aprovia Top--10.5 to 13.5 fl oz 1.6EC/A

Switch--11.0 to 14.0 oz 62.5 WG/A

Proline--5.7 fl oz 480SC/A

tebuconazole--8.0 fl oz 3.6 F/A or OLF

Inspire Super--16.0 to 20.0 fl oz 2.8 F/A

Pristine--12.5 to 18.5 oz 38WG/A *plus* chlorothalonil--2.0 to 3.0 pt 6F/A or OLF

Fontelis--12.0 to 16.0 fl oz 1.67SC/A

Merivon--5.5 fl oz 500SC/A

Maintain fungicide schedule until harvest. See the “Harvesting and Storage” section. Fungicide application for black rot control will help maintain “handles” on the fruit. Harvest carefully because wounding can negate benefits from a season-long fungicide program.

### Phytophthora Crown and Fruit Rot

Multiple practices should be used to minimize the occurrence of this disease. Rotate away from susceptible crops (such as peppers, eggplants, tomatoes, lima and snap beans, and other cucurbits) for as long as possible. Preplant fumigants will also suppress disease. Fields should be adequately drained to ensure that water does not accumulate around the base of the plant. Mefenoxam (Ridomil Gold or Ultra Flourish) should be applied pre-plant for early season control. Once the canopy closes, subsoil between the rows to allow for faster drainage following rainfall. When conditions favor disease development, tank mix one of the following with fixed copper at labeled rates (for suppression only):

Rotate:

Revus--8.0 fl oz 2.08F/A

Ranman--2.75 fl oz 400 SC/A (plus a non-ionic or organosilicon surfactant; do not apply with copper; see label for additional precautions)

with:

Presidio--4.0 fl oz 4SC/A

Forum--6.0 fl oz 4.17SC/A

Tanos--8.0 to 10.0 oz 50DF/A

Materials with different modes of action (i.e. FRAC codes) should always be alternated to reduce the chances for fungicide resistance development.

### Fusarium Fruit Rot

This disease is especially destructive in fields where pumpkins are grown on an annual basis. Once the pathogen is established in a field losses can be significant. Fruit rot is caused by several *Fusarium* spp., and fungicide applications are not effective. Hard rind cultivars are less susceptible to *Fusarium* fruit rot than other cultivars. Production of pumpkin on a no-till cover crop mulch layer such as winter rye plus hairy vetch has been shown to help reduce disease incidence. Greater disease reductions will occur when the mulch layer is thicker.

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## RADISHES, RUTABAGAS, AND TURNIPS

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**Radishes.** Radishes are a quick-growing, cool-season crop developing its best quality and root shape when grown at temperatures of 50° to 65°F (10° to 18.3°C) in moderate to short day lengths. Crop must be grown rapidly (23 to 28 days) and with an adequate moisture supply. When growth is checked, the radish becomes hot, tough, and pithy. Long days (15 hours) and warm temperatures induce seedstalk formation. Under medium to short day lengths, roots are generally well shaped and tops are small.

**Rutabagas.** A cool-season crop developing best at temperatures of 60° to 65°F (15.6° to 18.3°C). Usually considered a fall crop; it can be grown in the spring.

### Varieties

#### Radish (Red globe; white interior)

Saxa  
Rover\*  
Cherriette\*  
Perfecto  
Rudolf (Crack tolerant)  
Cherry Belle  
Pink Beauty (organic)  
Champion  
Crimson Giant (large globe)

#### Daikon/Specialty Radish

Watermelon (White flesh, red interior, globe)  
Shumkyo Semi Long (Red flesh, white interior, elongated)  
White icicle (White flesh, white interior, elongated)  
Minowase (Daikon)  
Mihashige (Daikon)  
China Rose (Red flesh, white interior, elongated)  
Chinese Winter (Daikon)  
Discovery\* (Daikon)  
Round Black Spanish (Heirloom, Dark flesh, white interior, large globe)  
April Cross\* (Daikon)  
Sakurajima Mammoth (White flesh, white interior, large globe)

#### Rutabaga

American Purple Top (and Improved Strain)  
Helenor  
Laurentian

#### Turnip White

Tokyo Cross\*  
White Lady\*  
Hakeuri\*  
Shogoin  
Just Right\*  
White Ball\*

#### Turnip Purple

Purple Prince\*  
Purple Top White Globe (MR)  
Royal Crown\*

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Varieties listed earliest to latest according to vendors: radish 18 – 45 days; Daikon/Specialty 24 – 80 days; Rutabaga 90 – 100 days; Turnip 35 – 75 days.

\*Indicates F<sub>1</sub> hybrid variety. Disease resistance/tolerance (according to vendor) and/or specialty descriptors in parentheses ( ); MR = mosaic resistant.