Pumpkins and Winter Squash

Recommended Varieties

Varieties are listed by maturity within each type, earliest first (*=hybrid varieties).
Disease resistance or tolerance in parentheses:
BRT=Black Rot tolerant, FR=*Fusarium* Wilt Resistant, PMR=Powdery Mildew Resistant, PMT=Powdery Mildew Tolerant, PR=*Phytophthora* Resistant, ZYMVR=Zucchini Yellow Mosaic Virus Resistant.

Pumpkins

Pumpkins, Less than 1 pound	WeeeeeOne* (PMR)	**Pumpkins 10 to 20 pounds**	Carbonado Gold* (PMT)
	Jill Be Little* (PMR)		Hermes* (PMT)
	Wee-B-Little*		Orange Sunrise* (PMT)
	Casperita		Secretariat* (PMR)
			HSC151 (edible seeds)
Pumpkins 1 to 3 pounds	Jack Sprat* (PMT)	**Pumpkins More than 20 pounds**	Cronos* (PMT)
	Baby Bear*		Kratos* (PMT)
	Little Giant* (PMT)		Gladiator* (PMT)
	Touch of Autumn* (PMT)		Aladdin* (PMT)
Pumpkins 2 to 10 pounds	Prankster* (PMT)		Gold Medal*
	Cinnamon Girl (PMT)		Rhea* (PMT)
	Cannonball* (hard shell)		Solid Gold*
	Iron Man* (FR, PR, PMT) (hard shell)		Captain Jack*
	Field Trip*(PMT)	**Pumpkins More than 50 pounds**	Atlantic Giant
	Orange Smoothie* (hard shell)		Prizewinner
	Fall Splendor Plus*(PMT)	**Pumpkins, Ornamental**	Scarface* (PMT)
	Mystic Plus* (PMT) (5-6 lb, plant at closer spacing to reduce size)		Goosebumps II*
		Pumpkins, Processing	Neck Pumpkin Types
	Small Sugar (BRT)		Autumn Buckskin*
	Blaze (orange/yellow striped) (PMT)		Dickenson Field Types
	Grizzly Bear (warty, 6-10 lb) (PMT)		
	Naked Bear (ornamental, edible seeds)		

Winter Squash

Winter Squash Acorn Type	Table Ace*	**Winter Squash Hubbard Type**	Green Hubbard
	Taybelle* (semi bush, PMT)		Golden Hubbard
	Table Gold		New England Blue Hubbard
	Table Star* (PMT)		Blue Ballet
	Autumn Delight* (PMT)		Other Hubbard Types
	Celebration* (PMT, specialty)		Boston Marrow Types
Winter Squash Butternut Type	Honeynut	**Spaghetti Squash**	Pinnacle
	Prism* (restricted vine)		Primavera*
	Metro* (restricted vine, PMR)		Vegetable Spaghetti
	Quantum*	**Processing Squash**	Atlas*
	Waltham Butternut		Genesis*
Winter Squash Buttercup Type	Sunshine*(orange)		Other Butternut Types
	Buttercup		
	Sweet Mama*		
	Bonbon*		

Recommended Nutrients Based on Soil Tests

In addition to using the table below, check the suggestions on rate, timing, and placement of nutrients in your soil test report and Chapter B Soil and Nutrient Management. Your state's soil test report recommendations and/or your farm's nutrient management plan supersede the recommendations found below. *(continued next page)*

Recommended Nutrients Based on Soil Tests *- continued*

		Soil Phosphorus Level				Soil Potassium Level				
		Low	Med	High (Opt)	Very High	Low	Med	High (Opt)	Very High	
Pumpkins and Winter Squash[1]	**N (lb/A)**	**P_2O_5 (lb/A)**				**K_2O (lb/A)**				**Nutrient Timing and Method**
	50-100	150	100	50	0[2]	200	150	100	0[2]	Total nutrient recommended
	25-50	150	100	50	0[2]	200	150	100	0[2]	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 ft.

[1]Apply 20-30 lb/A of sulfur (S) for most soils.

[2]In VA, crop replacement values of 25 lb/A of P_2O_5 and 50 lb/A of K_2O are recommended on soils testing Very High.

Seed Treatment

Check if seed has been treated with an insecticide and fungicide. See Disease Control below.

Planting and Spacing

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

Small vine/bush with fruit less than 8 lb: Rows 5-6 ft apart with 2 ft between plants in the row.
Large/medium vine with fruit 8-15 lb: Rows 6-7.5 ft apart with 3-4 ft between plants in the row.
Large vine with fruit 12 to 25 lb: Rows 7.5-9 ft apart with 4 ft between plants in the row.
Large vine with fruit over 30 lb: Rows 10-12 ft apart with 5-6 ft 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 postemergence 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. Postemergence control of grasses can be accomplished with Poast or Select. Sandea is labeled for postemergence control of yellow nutsedge and certain annual broadleaf weeds. Sandea can cause pumpkin stunting, see comments section below for more information. Sandea is an ALS inhibitor (Group 2) and is at high risk for weed resistance development. **Not recommended in NJ 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 and Weed Management

Preplant field considerations.

The best chance of success with no-till requires a thick mat of residue on the soil surface. While small grain stubble can be used, often there will not be sufficient surface cover and weeds can become a problem later in the season. The other requirement for success is control of weeds, particularly perennials, in the summer before pumpkins are to be grown.

The most commonly used no-till method is to seed fields in the fall with winter cereal rye at 2.5-3.5 bu/A. Use higher rates when seeding later in the fall. Hairy vetch can be mixed with rye to provide some nitrogen for the pumpkins but be sure to seed earlier in the fall (3-4 weeks before the average frost date) to allow the vetch to become established. Adjust soil pH before the cover crop is seeded as tillage will not be performed before pumpkin planting. Application of P and K before seeding the cover crop is optional, depending on soil test results. When using rye alone, plan to apply 25 lb N/A in the early spring to increase tillering and rye growth prior to termination.

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

Termination of the Cover Crop

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
9	Roundup PowerMax3 4.8L "Generic" glyphosate 3L	19 to 29 fl oz/A 24 to 48 fl oz/A	**glyphosate**	0.75 to 1.13 lb acid equivalent/A	--	4
-Allow at least 5-7 days between application and planting. Some glyphosate formulations may require an adjuvant, refer to the label. -Glyphosate is not very effective for control of legumes (hairy vetch or crimson clover); glyphosate is preferred for the control of grass cover crops. Glyphosate-resistant horseweed is widespread in the region and will **not** be controlled with glyphosate. -Repeat applications are allowed, with maximum application of 5.3 qt/A per year.						
22	Gramoxone SL 3.0*	1.7 to 2.7 pt/A	**paraquat**	0.6 to 1 lb/A	--	24
-Apply before planting, a second application maybe required for complete control. -Always include an adjuvant (nonionic surfactant or crop oil concentrate). -Apply in 20 to 60 gal/A for control of emerged annual weeds. Spray coverage is essential for optimum control. -Add 16 to 32 oz non-ionic surfactant/100 gal of spray. -Phosphate-containing liquid fertilizer solutions diminish paraquat activity if used as a carrier. -Use appropriate precautions when handling paraquat to minimize exposure to the herbicide. -Rainfastness 30 min. -A maximum of 3 applications per year are allowed. -***Restricted-use pesticide***. Only certified applicators, who successfully complete the paraquat-specific training, can mix, load, or apply paraquat. Application of paraquat "under the direct supervision" of a certified applicator is no longer allowed. Required training link (*https://campus.extension.org/enrol/index.php?id=2201*); certified applicators must repeat training every three years.						

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 coulter on the seeding unit is essential to cut through the vetch or straw stems. Mount a 3-inch wide waffle coulter ahead of pot-transplanters to provide effective penetration of the cover crop and plant placement.

Fertility

Hairy vetch will normally supply all the N requirements for pumpkins. However, if N deficiency symptoms appear before fruit production, topdress with 20-30 lb N/A. P and K 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 P, K, lime, and other nutrients based on soil tests before planting. N 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 section A 6. Conservation Tillage Crop Production.

Pollination (see also sections A 12. Pollination and D 6.3.1. Protection of Pollinators).

Honey bees, squash bees, bumble bees 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. Check the pesticide tables below for relative toxicity to bees.

Harvest and Post-Harvest Considerations

Disease-free fruit following a regular fungicide program during crop production will minimize post-harvest 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 and 85°F (27-29°C) with a relative humidity of 75-80% 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 types, can be stored at 55°F (13°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 types 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 (10°C). 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

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of Chapter F.

Recommended Herbicides

1. Identify the weeds in each field and select recommended herbicides. More information is available in the "Herbicide Effectiveness on Common Weeds in Vegetables" (Table E-3) in Chapter E Pest Management.

2. Minimize herbicide resistance development. Identify the herbicide mode of action group number and follow recommended good management practices; **bolded group numbers in tables below are herbicides at higher risk for selecting resistant weed populations.** Include non-chemical weed control whenever possible.

Labeled Application Sites for Pumpkins

Herbicide (*=Restricted Use)	HRAC group number	Plastic mulch production					Bareground production		
		Soil-Applied		Postemergence					
		Under Plastic	Row Middles	Over Plastic	Row Middles	Post-Harvest	Soil-applied	POST	Post-harvest
Sandea	2		YES		YES		YES	YES	
Curbit	3		YES				YES		
Prefar	8	YES	YES				YES		
Command	13		YES				YES		
Strategy			YES				YES		
Reflex[1]	14		YES				YES[2]		
Dual	15		YES				YES[2]		
Select / Select Max Shadow 3EC	1			YES				YES	
Poast	1			YES				YES	
Gramoxone*[4]	22				YES	YES	YES[3]		YES

[1]Special Local Needs Label 24(c), be sure it is registered for the specific state and for the intended use. [2]Dual and Reflex are labeled for bareground only if the spray is directed to the row middles. [3]Apply preplant or after seeding but before crop emergence. [4]Supplemental Label, be sure it is registered for the specific state and for the intended use.

1. Pre-Transplant Over Plastic

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
22	Gramoxone SL 3.0*	1.3 to 2.7 pt/A	**paraquat**	0.5 to 1.0 lb/A	--	24

-Gramoxone can be used for preplant weed control over the top of plastic mulch. Sufficient rainfall or sprinkler irrigation is needed to wash off the Gramoxone prior to planting to prevent damage to the crop.

-***Restricted-use pesticide***. Only certified applicators, who successfully complete the paraquat-specific training, can mix, load, or apply paraquat. Application of paraquat "under the direct supervision" of a certified applicator is no longer allowed. Required training link (*https://campus.extension.org/enrol/index.php?id=2201*); certified applicators must repeat training every three years.

-Do not exceed 8 pt/A per season. Rainfastness is 30 min.

2. Soil Applied

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
2	Sandea 75DF	0.5 to 1 oz/A	**halosulfuron**	0.023 to 0.047 lb/A	30	12

-**Plasticulture** row middles application only: apply before or after weed emergence; apply as a shielded application to avoid contact with the crop. If weeds have emerged, use a non-ionic surfactant at 0.25% v/v or include a non-selective herbicide.

-**Bareground**: apply broadcast after seeding but before crop emergence or no sooner than 7 days before transplanting.

-Suppresses or controls yellow nutsedge and certain broadleaf weeds. Sandea provides both residual and postemergence control of susceptible weed species. Effective postemergence control requires an adjuvant.

-Sandea is an ALS inhibiting herbicide and resistant weed populations are common in the region. **Do not** use Group 2 herbicides repeatedly in the same field. -**Do not** apply Sandea to crops treated with a soil applied organophosphate insecticide or use a foliar applied organophosphate insecticide within 21 days before or 7 days after a Sandea application.

-Maximum number of Sandea applications per year is 2 and **do not** exceed 2 oz/A during the crop season.

3	Curbit 3EC	1 to 3 pt/A	**ethalfluralin**	0.38 to 1.13 lb/A	--	24

-**Plasticulture**: row middles only: apply as a banded spray after crop emergence or transplanting. **Do not** soil incorporate.

-**Bareground**: apply broadcast after direct-seeding but prior to crop emergence; **do not** use on transplanted pumpkins.

-Controls annual grasses and certain annual broadleaf weeds, including carpetweed and pigweed sp.

-Use lower rate for coarse-textured soils or soils with low organic matter.

2. Soil Applied - Curbit - continued next page

***2. Soil Applied - Curbit** - continued*

-Where overhead irrigation is available, activate Curbit with 0.5 inch of irrigation within 2 days after application; if no irrigation or rainfall occurs within 5 days of application, activity of Curbit can be reduced. -Available as a pre-mix herbicide Strategy. Strategy at 3 pt/A= Curbit at 26 fl oz/A (0.6 lb ai) and Command at 8 fl oz/A (0.188 lb ai) -Maximum applications per season: not specified						
3 + 13	Strategy 2.1SC	1.5 to 6 pt/A	**ethalfluralin *plus* clomazone**	0.39 to 1.58 lb/A	45	24
-**Plasticulture**: row middles application only. -**Bareground**: apply broadcast just before planting or after planting but before crop emergence. -Strategy is a prepackage mixture of Curbit 3EC and Command 3ME. Refer to individual products for comments. -Clomazone spray or vapor drift may injure susceptible crops and other vegetation, refer to Command 3ME for comments. -**Do not** apply prior to planting the crop. **Do not** soil incorporate. -Certain crop varieties may have the potential for injury or loss with this product. Consult qualified crop advisors for information pertaining to varieties in your area. -Maximum applications per season: not specified.						
8	Prefar 4E	5 to 6 qt/A	**bensulide**	5 to 6 lb/A	--	12
-**Plasticulture**: under plastic: apply in a band under the plastic, immediately before laying the mulch. Allow 7 days before making transplant holes to allow condensation to incorporate the herbicide. Plasticulture: row middles application is labeled. -**Bareground**: apply preemergence or preplant incorporated. -Preemergence applications should be followed by irrigation within 36 h (apply enough water to wet the soil at least 2 to 4 inches deep). Preplant incorporated applications should be incorporated 1 to 2 inches deep (deeper than 2 inches will result in reduced weed control). -Provides control/suppression of some annual grass weeds and some broadleaves including pigweeds, purslane, and lambsquarters. -**Do not** apply within 45 days of harvesting squash. -**Do not** apply more than 6 lb ai/A per season.						
13	Command 3ME Up-Stage 3CS	0.67 to 2 pt/A 0.67 pt/A	**clomazone**	0.25 to 0.75 lb/A 0.25 lb/A	45	12
-**Command is labeled for winter squash and processing pumpkins; not labeled for jack-o-lantern pumpkins. Up-Stage is labeled for all pumpkin types.** -**Plasticulture**: row middles application only. -**Bareground**: apply broadcast just before planting but before crop emergence, or just before transplanting. Use the lower rate when used on coarse-textured soils low in organic matter, when weed pressure is light, or to minimize herbicide carryover that could affect subsequent crops. -Controls annual grasses and many broadleaf weeds including common lambsquarters, velvetleaf, spurred anoda, and jimsonweed. Carpetweed, morningglory sp., pigweed sp., and yellow nutsedge will **not** be controlled. Higher rates will improve control (or expand number of species controlled) such as common cocklebur, common ragweed, or jimsonweed (refer to label for specific weeds and rates). -**WARNINGS**: 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 adjacent to sensitive crops (see label) or vegetation, or under unfavorable wind or weather conditions. Command may limit subsequent cropping options, see the label. -Available as a pre-mix herbicide Strategy: Strategy at 3 pt/A= Command at 8 fl oz/A (0.188 lb ai) and Curbit at 26 fl oz/A (0.6 lb ai) -Maximum number of Command applications per year: 1.						
14	Reflex 2SL	8 to 10 fl oz/A	**fomesafen**	0.13 to 0.38 lb/A	32	24
-For pumpkins ONLY. -Special Local Needs Label 24(c) for the use of Reflex 2SL to control weeds in pumpkins in DE (no expiration date), NJ (expires 12/31/2027), and pending in PA. The use of this product is legal ONLY if a waiver of liability has been completed (see: *https://www.syngenta-us.com/labels/indemnified-label-login*). -**Rates differ by States, soil types, and planting method.** Rates as low as 10 fl oz/A can cause injury on coarse-textured soils. -**Plasticulture**: row middles application only, apply prior to transplanting. -**Bareground**: apply broadcast within 24 h after direct-seeding and follow with 0.2 to 0.5 inches of overhead irrigation at least 36 h before pumpkin begin to crack through the soil. For transplants, apply Reflex and then irrigate with 0.2 to 0.5 inches of water and then transplant. **Do not** prepare transplant holes until after Reflex application and irrigation. -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 rates accordingly. -Reflex provides both residual and postemergence control of susceptible weed species. Effective postemergence control requires an adjuvant. **Pumpkin varieties may vary in their response to Reflex**. Treat small acreages first to determine tolerance, especially when applying to a new variety. -Reflex rates lower than 16 fl oz/A may not provide full-season control and should be used with other herbicides and/or other methods of weed control. -Consider rotational crops when applying fomesafen. If the crop is replanted, **do not** re-apply Reflex. Refer to 24(c) label for specifics on rotational restrictions. -Maximum for Reflex application is 24 fl oz/A **IN ALTERNATE YEARS.**						
15	Dual Magnum 7.62E	1 to 1.33 pt/A	**s-metolachlor**	0.95 to 1.27 lb/A	30	24
-**For pumpkins ONLY. Plasticulture**: row middles application only. -**Bareground**: apply as an inter-row or inter-hill spray, leaving 1 ft of untreated area over the row. -**Do not** use as an over the top application. **Do not** soil incorporate. -Suppresses or controls annual grasses, yellow nutsedge, and certain annual broadleaf weeds including nightshade species. -Dual Magnum will not control emerged weeds. Cultivate and/or hoe or tank mix with Gramoxone to control emerged weeds before treatment. -Use the lower rate on fields with coarse-textured soils low in organic matter. Use the higher rates on fields with fine-textured soil and those with high organic matter. Maximum applications per season: not specified.						

3. Postemergence

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
1	Shadow 3EC Select 2EC Select Max 0.97EC	4 to 5.33 fl oz/A 6 to 8 fl oz/A 9 to 16 fl oz/A	**clethodim**	0.07 to 0.125 lb/A	14	24
	Poast 1.5EC	1 to 1.5 pt/A	**sethoxydim**	0.19 to 0.28 lb/A	14	12
-**Select 2EC**: use crop oil concentrate (COC) at 1% v/v (1 gal/100 gal of spray solution). **Select Max 0.97EC**: use nonionic surfactant (NIS) at 0.25% v/v (1 qt/100 gal of spray solution). **Shadow 3EC**: use crop oil concentrate (COC) at 1% v/v (1 gal/100 gal of spray solution) for large or stressed grasses; use nonionic surfactant (NIS) at 0.25% v/v (1 qt/100 gal of spray solution) when crop safety is a concern. **Poast 1.5EC**: use COC at 1.0% v/v. -**General comments:** -The use of COC may increase the risk of crop injury when hot or humid conditions prevail. To reduce the risk of crop injury, switch to NIS when grasses are small and soil moisture is adequate. -Use lower labeled rates for annual grass control and higher labeled rates for perennial grass control. For best results, treat annual grasses when they are actively growing and before tillers are present. -Yellow nutsedge, wild onion, wild garlic, and broadleaf weeds will **not** be controlled with these herbicides. -These herbicides control many annual and certain perennial grasses. Clethodim is best on annual bluegrass; while Poast is preferred for goosegrass control. -Repeated applications may be necessary to control certain perennial grasses. If repeat applications are necessary, allow 14 days between applications. -Rainfastness is 1 h. -**Do not** tank mix with or apply within 2 to 3 days of any other pesticide, unless labeled, as this may increase the risk of crop injury or reduce the control of grasses. **Do not** apply more than 8 fl oz/A of Select 2EC in a single application and **do not** exceed 32 fl oz/A for the season; d**o not** apply more than 16 fl oz/A of Select Max in a single application and **do not** exceed 64 fl oz/A for the season. **-Do not** apply more than 5.33 fl oz/A of Shadow 3EC in a single application and **do not** exceed 21.33 fl oz/A for the season. -**Do not** apply more than 1.5 pt/A Poast in a single application and **do not** exceed 3 pt/A for the season.						
2	Sandea 75DF	0.5 to 1 oz/A	**halosulfuron**	0.023 to 0.047 lb/A	30	12
-**Plasticulture**: row middles application only. -**Bareground**: broadcast for bareground. Apply Sandea after the crop has at least 3 to 5 true leaves but before first female flowers appear and no sooner than 14 days after transplanting. If weeds have emerged, use a non-ionic surfactant at 0.25% v/v (1 qt/100 gal). -Suppresses or controls yellow nutsedge and certain broadleaf; control of weeds taller than 3 inches may not be adequate. Sandea will not control common lambsquarters or eastern black nightshade if applied postemergence; for row middle application, tank mix with a non-selective herbicide to increase spectrum of control. -Sandea provides both residual and postemergence control of susceptible weed species. -Sandea is an ALS inhibiting herbicide and resistant weed populations are common in the region. **Do not** use Group 2 herbicides repeatedly in the same field. -**Do not** apply Sandea to crops treated with a soil applied organophosphate insecticide or use a foliar applied organophosphate insecticide within 21 days before or 7 days after a Sandea application. -Rainfastness is 4 h. Maximum number of Sandea applications per year is 2 and **do not** exceed 2 oz/A during the crop season						
22	Gramoxone SL 3.0*	1.3 pt/A	**paraquat**	0.49 lb/A	14	24
-**Supplemental Label for postemergence weed control in DE, MD, NJ, PA, and VA. -**Row middles as a shielded application. Apply as a directed spray in a minimum of 20 gal spray mix/A to control emerged weeds between the rows after crop establishment. Include a nonionic surfactant at 0.25% v/v. -Use shields or hoods to prevent spray contact with the crop and low spray pressure (maximum of 30 psi) to reduce small droplets that are prone to drift. See the label for additional information and warnings. -Rainfastness is 30 min. A maximum of 3 applications per year are allowed. -***Restricted-use pesticide***. Only certified applicators, who successfully complete the paraquat-specific training, can mix, load, or apply paraquat. Application of paraquat "under the direct supervision" of a certified applicator is no longer allowed. Required training link (*https://campus.extension.org/enrol/index.php?id=2201*); certified applicators must repeat training every three years.						

4. Postharvest

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
22	Gramoxone SL 3.0*	1.5 to 2 pt/A	**paraquat**	0.56 to 0.75 lb/A	--	24
-**Supplemental Label in DE for postharvest application to desiccate the crop.** -For bareground or plasticulture, apply after the last harvest. -Always include an adjuvant. Spray coverage is essential for optimum effectiveness. -See the label for additional information and warnings. -Rainfastness 30 min. A maximum of 2 applications for crop desiccation are allowed. -***Restricted-use pesticide***. Only certified applicators, who successfully complete the paraquat-specific training, can mix, load, or apply paraquat. Application of paraquat "under the direct supervision" of a certified applicator is no longer allowed. Required training link (*https://campus.extension.org/enrol/index.php?id=2201*); certified applicators must repeat training every three years.						

5. Other Labeled Herbicides

These products are labeled but limited local data are available; and/or are labeled but not recommended in our region due to potential crop injury concerns.

Group	Product Name (*=Restricted Use)	Active Ingredient
14	Aim (hooded or directed application only)	**carfentrazone**
14	Vida	**pyraflufen**

Insect Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of Chapter F.

Recommended Insecticides

Note: For **premixes**, the group number (representing the mode of action) and active ingredient that contributes the most to control is generally listed first. In some cases, only one ingredient in a premix provides control.

Seed and At-Plant Treatments for Seedcorn Maggot

Farmore DI-400 as a commercially applied seed treatment which contains thiamethoxam (Group 4A). Verimark (cyantraniliprole, Group 28) applied no earlier than 72 hours prior to planting, at 10-13.5 oz/A using in-furrow spray, transplant tray drench, transplant water treatment, hill drench, or surface band. Bifenthrin products also have seed maggots on their label for use in-furrow. **Note:** The use of neonicotinoid insecticides (Group 4A) at planting may help reduce seedcorn maggot populations. See also Maggots in section E 3.1. Soil Pests - Detection and Control.

Aphids

Note: Aphids transmit Mosaic Virus.

Apply one of the following formulations: **Note: Thorough spray coverage beneath leaves is important. Treat seedlings every 5-7 days, or as needed.**						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1B	Malathion 57 EC	1.5 pt/A	malathion	1	12	H
4A	Neonicotinoid insecticides registered for use on Pumpkins and Winter Squash: see table at the end of Insect Control.					
4C	Transform WG	0.75 oz/A	sulfoxaflor	1	24	H
4C + 3A	Ridgeback*	5.5 to 13.8 fl oz/A	sulfoxaflor + bifenthrin	3	24	H
4D	Sivanto Prime	7. to 14.0 fl oz/A	flupyradifurone - **foliar**	1	4	M
4D	Sivanto Prime	21.0 to 28.0 fl oz/A	flupyradifurone - **soil**	21	4	M
9B	Fulfill	2.75 oz/A	pymetrozine	0	12	L
9B	PQZ	2.4 to 3.2 fl oz/A	pyrifluquinazon	1	12	L
9D	Sefina	3.0 fl oz/A	afidopyropen	0	12	L
21A	Torac	17.0 to 21.0 fl oz/A	tolfenpyrad	1	12	H
28	Exirel	13.5 to 20.5 fl oz/A + adjuvant	cyantraniliprole	1	12	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28	Verimark	Soil, at planting: 6.75 to 13.5 fl oz/A Drip chemigation: 6.75 to 10 fl oz/A	cyantraniliprole	1	4	H
28 + 6	Minecto Pro*[1]	10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H
29	Beleaf 50SG	Foliar: 2.0 to 2.8 oz/A Drip: 2.8 to 4.28 oz/A	flonicamid	0	12	L

[1]Use of a non-sticker adjuvant is required. [Insecticides with Suppression Only on the label: Venom 70SG]

Cucumber Beetles

Young plants need to be protected from cucumber beetle feeding as the beetles can transmit the causal agent of bacterial wilt. Cucumber beetles also cause direct damage to pumpkin and winter squash rinds. Management of adult cucumber beetles early in the season may help reduce damage to rinds later in the season. Seeds pretreated with a neonicotinoid seed treatment such as Farmore DI400 should provide up to 14 days of control of cucumber beetle. **Note:** Some populations in Delaware may exhibit reduced pyrethroid susceptibility. Otherwise, apply one of the following formulations:

Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Sevin XLR Plus	1.0 qt/A	carbaryl	3	12	H
3A	Pyrethroid insecticides registered for use on Pumpkins and Winter Squash: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Pumpkins and Winter Squash: see table at the end of Insect Control.					
28	Exirel	20.5 fl oz/A	cyantraniliprole	1	12	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28	Verimark	Soil, at planting: 13.5 fl oz/A Drip chemigation: 10 fl oz/A	cyantraniliprole	1	4	H

[Insecticides with suppression on the label: Torac]

Cutworms

See also section E 3.1. Soil Pests - Detection and Control.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
3A	Pyrethroid insecticides registered for use on Pumpkins and Winter Squash: see table at the end of Insect Control.					
11A	DiPel DF, others (OMRI)	0.5 to 2.0 lb/A	*Bacillus thuringiensis kurstaki*	0	4	N
11A	XenTari (OMRI)	0.5 to 2.0 lb/A	*Bacillus thuringiensis aizawai*	0	4	N

Leafminers

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
4A	Neonicotinoid insecticides registered for use on Pumpkins and Winter Squash: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	6.0 to 8.0 fl oz/A	spinosad	3	4	H
5	Radiant SC	6.0 to 10.0 fl oz/A	spinetroram	3	4	H
6	Agri-Mek SC*[1]	1.75 to 3.5 fl oz/A	abamectin	7	12	H
15	Rimon 0.83EC	9.0 to 12.0 fl oz/A	novaluron	1	12	M
15 + 4A	Cormoran	12.0 fl oz/A	novaluron + acetamiprid	1	12	M
17	Trigard	2.66 oz/A	cyromazine	0	12	H
28	Coragen 1.67SC Coragen eVo	5.0 to 7.5 fl oz/A 1.7 to 2.5 fl oz/A	chlorantraniliprole **- soil and foliar - larvae**	1	4	L
28	Exirel	13.5 to 20.5 fl oz/A + adjuvants	cyantraniliprole	1	12	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28	Verimark	Soil, at planting: 6.75 to 13.5 fl oz/A Drip chemigation: 10 fl oz/A	cyantraniliprole	1	4	H
28 + 6	Minecto Pro*[1]	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H
30	Incipio	2.1 to 4.1 fl oz/A	isocycloseram	1	12	H

[1]Use of a non-sticker adjuvant is required. [Insecticides with suppression on the label: Proclaim]

Lepidopteran Pests including Armyworms (AW), Cabbage Loopers (CL), Melonworms (MW) and Pickleworms (PW), and Lepidopteran "Rindworms"

Various armyworm species and cabbage loopers can be found feeding on melon leaves. Defoliation seldom reaches the 25% threshold that justifies control measures. However, armyworms may feed on rinds as well as other various Lepidopteran pests where they are collectively labeled 'rindworm' on some labels. This complex includes corn earworm, leafrollers, webworms, and armyworms. Proper pest identification and fruit scouting is important because not all species that cause rind feeding damage are susceptible to pyrethroids. **Beet armyworm and corn earworm are resistant to pyrethroids (Group 3A) and there are resistance concerns with BAW to diamides (Group 28). Check product rates for a given Lepidopteran pest.**

Note: Not all products with the above species on their label will prevent rind feeding. Cucumber beetles, wireworm, and white grubs will also feed on rinds, the location and appearance differs from Lepidopteran rind feeders. Consult your local cooperative extension service for additional guidance.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl	1-3	48	H
1A	Sevin XLR Plus	0.5 to 1.0 qt/A	carbaryl **- MW and PW only**	3	12	H
3A[1, 2]	Pyrethroid insecticides registered for use on Musk and Mixed Melons: see table at the end of Insect Control					
5	Entrust SC (OMRI)	4.0 to 8.0 fl oz/A	spinosad	3	4	H
5	Radiant SC	5.0 to 10.0 fl oz/A	spinetoram	3	4	H
6	Proclaim 5SG*	3.0 to 4.8 oz/A	emamectin benzoate	7	12	H
11A	DiPel DF, others (OMRI)	0.5 to 2.0 lb/A	*Bacillus thuringiensis kurstaki* **- CL and AW only**	0	4	N
11A	XenTari (OMRI)	0.5 to 2.0 lb/A	*Bacillus thuringiensis aizawai* **- CL and AW only**	0	4	N
15	Rimon 0.83EC	9.0 to 12.0 fl oz/A	novaluron	1	12	M
15+4A	Cormoran	12.0 fl oz/A	novaluron + acetamiprid	1	12	M
18	Intrepid 2F	4.0 to 10.0 fl oz/A	methoxyfenozide	3	4	L
22	Avaunt 30WDG, Avaunt eVo	2.5 to 6.0 oz/A	indoxacarb	3	12	H

Lepidopteran Pests - continued next page

Lepidopteran Pests including Armyworms (AW), Cabbage Loopers (CL), Melonworms (MW) and Pickleworms (PW), and Lepidopteran "Rindworms" *- continued*

28[1]	Coragen 1.67SC Coragen eVo	2.0 to 7.5 fl oz/A 0.7 to 2.5 fl oz/A	chlorantraniliprole	1	4	L
28[1]	Exirel	7.0 to 17.0 fl oz/A	cyantraniliprole	1	12	H
28[1]	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28[1]	Verimark	5.0 to 13.5 fl oz/A	cyantraniliprole - soil	1	4	H
28[1]**+3A**[1,2]	Besiege*	6.0 to 9.0 fl oz/A	chlorantraniliprole + lambda cyhalothrin	1	24	H
28[1]**+3A**[1,2]	Elevest*	5.6 to 9.6 fl oz/A	chlorantraniliprole + bifenthrin	3	24	H
28[1]**+4A**	Durivo	10.0 to 13.0 fl oz/A	thiamethoxam + chlorantraniliprole **- MW and PW only**	30	12	H
28[1]**+4A**	Voliam Flexi	4.0 to 7.0 oz/A	thiamethoxam + chlorantraniliprole - **CL only**	1	12	H
28[1] **+ 6**	Minecto Pro*[3]	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H
30	Incipio	2.1 to 4.1 fl oz/A	isocycloseram **- MW and PW only**	1	12	H

[1]Resistance concerns with beet armyworm.
[2]Resistance concerns with corn earworm.
[3]Use of a non-sticker adjuvant is required.
[Insecticides with suppression on the label: Torac]

Mites

Mite infestations generally begin around field margins and grassy areas. **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 10-15% 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. Addition of crop oils or organosilicon spray additives will increase miticide effectiveness.						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
6	Agri-Mek SC*[1]	1.75 to 3.5 fl oz/A	abamectin	7	12	H
6 + 28	Minecto Pro*[1]	5.5 to 10.0 fl oz/A	abamectin + cyantraniliprole	7	12	H
10B	Zeal Miticide	2.0 to 3.0 oz/A	etoxazole	7	12	L
20B	Kanemite 15SC	31.0 fl oz/A	acequinocyl	1	12	L
20D	Acramite 50WS	0.75 to 1.0 lb/A	bifenazate	3	12	M
21A	Magister SC	24.0 to 36.0 fl oz/A	fenazaquin	3	12	H
23	Oberon 2SC	8.5 fl oz/A	spiromesifen	7	12	M
30	Incipio	2.1 to 4.1 fl oz/A	isocycloseram	1	12	H

[1]Use of a non-sticker adjuvant is required.

Squash Bugs

Begin treatments if more than one egg mass per plant is present. Sprays should target nymphal stages. Under leaf coverage is essential.

Apply one of the following formulations: Note: Under-leaf spray coverage is essential.						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Sevin XLR Plus	1.0 qt/A	carbaryl	3	12	H
3A	Pyrethroid insecticides registered for use on Pumpkins and Winter Squash: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Pumpkins and Winter Squash: see table at the end of Insect Control.					
4D	Sivanto Prime	10.5 to 14.0 fl oz/A	flupyradifurone - **foliar**	1	4	M
15	Rimon 0.83EC	12.0 fl oz/A	novaluron - **nymphs only**	1	12	M
15 + 4A	Cormoran	12.0 fl oz/A	novaluron + acetamiprid	1	12	M
30	Incipio	2.1 to 4.1 fl oz/A	isocycloseram	1	12	H

[Insecticides with suppression on the label: Harvanta]

Squash Vine Borers

When vines begin to run, apply one of the following formulations to plant stems at regular intervals. Pheromone traps for squash vine borer are commercially available and can be used to indicate when moth activity begins. Moth activity generally begins around 1,000 degree days, and parts of the mid-Atlantic may have 2 generations per year. **Note:** Use of chlorantraniliprole, isocycloseram, spinosad, or spinetoram for foliar Lepidopteran pest control will reduce squash vine borer populations. *(continued next page)*

Squash Vine Borers *- continued*

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
3A	Pyrethroid insecticides registered for use on Pumpkins and Winter Squash: see table at the end of Insect Control.					
15 + 4A	Cormoran	12.0 fl oz/A	novaluron + acetamiprid	1	12	M

Thrips

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
3A[1]	Pyrethroid insecticides registered for use on Pumpkins and Winter Squash: see table at the end of Insect Control.					
4A[2]	Neonicotinoid insecticides registered for use on Pumpkins and Winter Squash: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	6.0 to 8.0 fl oz/A	spinosad	3	4	H
5	Radiant SC	6.0 to 10.0 fl oz/A	spinetoram	3	4	H
15	Rimon 0.83EC	12.0 fl oz/A	novaluron	1	12	M
21A	Torac	21.0 fl oz/A	tolfenpyrad	1	12	H
29	Beleaf 50SG	Drip: 2.8 to 4.28 oz/A	flonicamid	0	12	L
30	Incipio	3.1 to 4.1 fl oz/A	isocycloseram	1	12	H

[1]Resistance concerns with western flower thrips.
[2]Resistance concerns with tobacco thrips.
[Insecticides with suppression on the labe: Torac Harvanta, Minecto Pro, and Transform WG]

Whiteflies

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
4A	Neonicotinoid insecticides registered for use on Pumpkins and Winter Squash: see table at the end of Insect Control.					
4C	Transform WG	2.0 to 2.25 oz/A	sulfoxaflor	1	24	H
4D	Sivanto Prime	10.5 to 14.0 fl oz/A	flupyradifurone - **foliar**	1	4	M
7C	Knack	8.0 to 10.0 fl oz/A	pyriproxyfen	7	12	L
9B	Fulfill	2.75 oz/A	pymetrozine	0	12	L
9B	PQZ	2.4 to 3.2 fl oz/A	pyrifluquinazon	1	12	L
9D	Sefina	14.0 fl oz/A	afidopyropen	0	12	L
15	Rimon 0.83EC	12.0 fl oz/A	novaluron	1	12	M
23	Oberon 2SC	8.5 fl oz/A	spiromesifen	7	12	M
28	Exirel	13.5 to 20.5 fl oz/A	cyantraniliprole	1	12	H
28	Verimark	6.75 to 13.5 fl oz/A	cyantraniliprole – **soil**	1	4	H
28 + 6	Minecto Pro*[1]	10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H
29	Beleaf 50SG	Foliar: 2.8 oz/A Drip: 2.8 to 4.28 oz/A	flonicamid	0	12	L

[1]Use of a non-sticker adjuvant is required. [Insecticides with suppression on the label: Harvanta]

Group 3A Pyrethroid Insecticides Registered for Use on Pumpkins and Winter Squash

Apply one of the following formulations (check if the product label lists the insect you intend to spray; the label is the law):					
Product Name (*=Restricted Use)	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
Asana XL*	5.8 to 9.6 fl oz/A	esfenvalerate	3	12	H
Baythroid XL*	0.8 to 2.8 fl oz/A	beta-cyfluthrin	0	12	H
Brigade 2EC*, others	2.6 to 6.4 fl oz/A	bifenthrin	3	12	H
Danitol 2.4EC*	10.67 to 16.0 fl oz/A	fenpropathrin	7	24	H
Declare*	1.02 to 1.54 fl oz/A	gamma-cyhalothrin	1	24	H
Fastac CS	1.4 to 3.8 oz/A	alpha-cypermethrin	1	12	H
Hero*	4.0 to 10.3 fl oz/A	zeta-cypermethrin + bifenthrin	3	12	H
Lambda-Cy 1EC*, others	2.56 to 3.84 fl oz/A	lambda-cyhalothrin	1	24	H
Mustang Maxx*	1.28 to 4.0 fl oz/A	zeta-cypermethrin	1	12	H
Permethrin*, others	4.0 to 8.0 fl oz/A	permethrin	0	12	H
Tombstone*	0.8 to 2.8 fl oz/A	cyfluthrin	0	12	H
Warrior II*	1.28 to 1.92 fl oz/A	lambda-cyhalothrin	1	24	H

Group 3A Pyrethroid Insecticides Registered for Use on Pumpkins and Winter Squash - continued next page

Group 3A Pyrethroid Insecticides Registered for Use on Pumpkins and Winter Squash *- continued*

Combo products containing a pyrethroid					
Besiege*	6.0 to 9.0 fl oz/A	lambda-cyhalothrin + chlorantraniliprole (Group 28)	1	24	H
Elevest*	5.6 to 9.6 fl oz/A	bifenthrin + chlorantraniliprole (Group 28)	3	12	H
Endigo ZC and ZCX*	4.0 to 4.5 fl oz/A	lambda-cyhalothrin + thiamethoxam (Group 4A)	1	24	H
Ridgeback*	5.5 to 13.8 fl oz/A	bifenthrin + sulfoxaflor (Group 4C)	3	24	H
Savoy EC*	6.0 to 12.9 fl oz/A	bifenthrin + acetamiprid (Group 4A)	3	12	H

Group 4A Neonicotinoid Insecticides Registered for Use on Pumpkins and Winter Squash

Apply one of the following formulations (check if the product label lists the insect you intend to spray; the label is the law):

Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Actara 25 WDG	1.5 to 5.5 oz/A	thiamethoxam	0	12	H
Admire Pro	7.0 to 10.5 fl oz/A	imidacloprid - **soil**	21	12	H
Assail 30SG	2.5 to 5.3 oz/A	acetamiprid	0	12	M
Assail 30SC	2.1 to 4.5 oz/A	acetamiprid	0	12	M
Belay 2.13SC	9 .0 to 12.0 fl oz/A	clothianidin - **soil/drip**	21	12	H
Belay 2.13SC	3.0 to 4.0 fl oz/A	clothianidin - **foliar** (PHI note: do not make application after 4th true leaf has unfolded)	see note	12	H
Platinum 75SG	1.66 to 3.67 oz/A	thiamethoxam	30	12	H
Scorpion 35SL	9.0 to 13 fl oz/A	dinotefuran - **soil/drip**	21	12	H
Scorpion 35SL	2.0 to 7.0 fl oz/A	dinotefuran - **foliar**	1	12	H
Venom 70SG	5.0 to 7.5 oz/A	dinotefuran - **soil/drip**	21	12	H
Venom 70SG	1.0 to 4.0 oz/A	dinotefuran - **foliar**	1	12	H
Combo products containing a neonicotinoid					
Cormoran	9.0 to 12.0 fl oz/A	acetamiprid + novaluron (Group 15)	1	12	M
Durivo	10.0 to 13.0 fl oz/A	thiamethoxam + chlorantraniliprole (Group 28)	30	12	H
Endigo ZC* and ZCX*	4.0 to 4.5 fl oz/A	thiamethoxam + lambda-cyhalothrin (Group 3A)	1	24	H
Savoy EC*	6.0 to 12.9 fl oz/A	acetamiprid + bifenthrin (Group 3A)	3	12	H
Voliam Flexi	4.0 to 7.0 oz/A	thiamethoxam + chlorantraniliprole (Group 28)	1	12	H

Disease Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of Chapter F. Recommended Fungicides

Nematodes

See also sections E 1.5. Soil Fumigation and E 1.6. Nematode Control. Use fumigants listed in section E 1.5., or nematicides listed below. Consult the label.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
1A	Vydate L*	1.0 to 2.0 gal/A incorporate into top 2-4 inches of soil, *OR* 2.0 to 4.0 pt/A apply 2 w after planting and repeat 2-3 w later.	oxamyl	1	48	H
7	Velum Prime 4.16SC	6.5 to 6.84 fl oz/A	fluopyram	0	12	--
N-UN	Salibro	15.3 to 23 fl oz/A of product per acre pre-plant incorporated, pre-plant drip, or at-plant drip. In-season drip at 7.7 fl oz/A	fluazaindolizine	1	12	--
--	Nimitz 4EC	3.5 to 5.0 pt/A incorporate or drip-apply 7 d before planting	fluensulfone	n/a	12	--

Seed Treatment

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

Damping-off caused by *Phytophthora*, *Pythium*, and *Rhizoctonia*

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Apply one of the following at-planting (see label for application timing, methods, and restrictions):						
Phytophthora and Pythium Root Rot						
4	Ridomil Gold 4SL	1.0 to 2.0 pt/A at planting 0.25-0.4 pt/A subsequent applications	mefenoxam	5	48	N
49 + **4**	Orondis Gold[1]	28.0 to 55.0 fl oz/A	oxathiapiprolin + mefenoxam	AP	48	--
Pythium and Rhizoctonia Root Rot						
4 + 11	Uniform 3.72SC	0.34 fl oz/1000 ft row. Avoid direct seed contact, which may cause delayed emergence.	mefenoxam + azoxystrobin	AP	0	N
Rhizoctonia root rot						
11	azoxystrobin 2.08F	0.40 to 0.80 fl oz/1000 ft row	azoxystrobin	1	4	N
Pythium root rot						
4	Ultra Flourish 2E	2.0 to 4.0 pt/A at planting 0.5 to 0.8 pt/A subsequent applications	mefenoxam	5	48	N
4	MetaStar 2E AG	4.0 to 8.0 pt/A	metalaxyl	AP	48	N
28	Previcur Flex 6F	1.2 pt/A in transplant water, drip irrigation, or direct spray at base of plant and soil	propamocarb hydrochloride	2	12	N

[1]May cause some yellowing in cucurbit leaves.

Bacterial and Fungal Diseases

Angular Leaf Spot/Bacterial Leaf Spot

Both diseases can produce foliar symptoms that are often overlooked. 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 a 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: fixed copper at labeled rates plus mancozeb.

Anthracnose

See Gummy Stem Blight (Black Rot) and Anthracnose below.

Bacterial Wilt

Controlling striped and spotted cucumber beetles is essential for preventing bacterial wilt. See "Cucumber Beetles" in the Cucumber Insect Control section for specific recommendations. Insecticide applications made at planting may not prevent beetle damage season-long; additional foliar insecticide applications may be necessary.

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 dependent. Fungicide sprays are not effective because flowers, which open daily, must be protected immediately. Practices that reduce soil moisture or reduce flower-soil contact, such as raised beds and plastic mulch, may be beneficial.

Downy Mildew

Scout fields for disease incidence on a regular basis. Begin targeted sprays when Downy mildew is predicted for the region. For current status of the disease, check the Cucurbit Downy Mildew Forecasting website at *https://cdm.ipmpipe.org*. Strains of Downy mildew that infect one cucurbit crop may not affect pumpkin or winter squash. Unnecessary fungicide application can be avoided by not spraying until disease is predicted in the region on watermelon. Preventative applications are much more effective than applications made after disease is detected. Materials with different modes of action (FRAC codes) should always be alternated to reduce the chances for fungicide resistance development. *(continued next page)*

***Downy Mildew** - continued*

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Sprays should be applied on a 7-d schedule when disease is forecast or present in the region. Under severe disease conditions and conducive weather, spray interval may be reduced IF the label allows. TANK-MIX one of these products WITH a protectant fungicide such as chlorothalonil 6F or Gavel 75DF:						
49 + 40	Orondis Ultra 2.33SC	5.5 to 8.0 fl oz/A	oxathiapiprolin + mandipropamid	0	4	--
49+M05	Orondis Opti	1.75 to 5 pt/A	oxathiapiprolin + chlorothalonil	0	12	--
21	Ranman 400SC	2.10 to 2.75 fl oz/A (**do not apply with copper**; see label for details)[1]	cyazofamid	0	12	L
Other materials for use in rotations as tank mix partners with a protectant:						
43	Presidio 4SC	4.0 fl oz/A	fluopicolide	2	12	L
28	Previcur Flex 6F	1.2 pt/A	propamocarb hydrochloride	2	12	N
40 + 45	Zampro 525SC	14.0 fl oz/A	dimethomorph + ametoctradin	0	12	--
22	Elumin 4SC	8.0 fl oz/A	ethaboxam	2	12	--
M03+22	Gavel 75DF	1.5 to 2.0 lb/A **contains protectant**	mancozeb + zoxamide	5	48	--
M05+22	Zing! 4.9SC	36 fl oz/A **contains protectant**	chlorothalonil + zoxamide	0	12	M
M05+27	Ariston 42SC	1.9 to 3.0 pt/A **contains protectant**	chlorothalonil + cymoxanil	3	12	M
11 + 27	Tanos 50DF	8.0 oz/A	famoxadone + cymoxanil	3	12	--
27	Curzate 60DF	3.2 to 5.0 oz/A	cymoxanil	3	12	N
29	Omega 500F	12.0 to 24.0 fl oz/A	fluazinam	7	12	N
40	Forum 4.17SC	6.0 fl oz/A	dimethomorph	0	12	N

[1]Ranman should be tank mixed with an organosilicone surfactant when disease is severe, or a non-ionic surfactant or blend of organosilicone and non-ionic surfactant disease is moderate or light.

Fusarium Fruit Rot

This disease is especially destructive in fields where pumpkins are grown every year. Once the pathogen is established in a field, loss 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.

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.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
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. 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, use fungicides from a different FRAC code. Begin the following fungicide program when fruit start to form. Tank mix:						
M05	chlorothalonil 6F	2.0 to 3.0 pt/A (use low rate early in season)	chlorothalonil	0	12	M
WITH one of the following and rotate between fungicides in different FRAC codes:						
3	tebuconazole 3.6F	8.0 fl oz/A	tebuconazole	7	12	N
3	Proline 480SC	5.7 fl oz/A	prothioconazole	7	12	--
3	Rhyme 2.08SC	5.0 to 7.0 fl oz/A	flutriafol	0	12	--
3 + 9	Inspire Super 2.82EW	16.0 to 20.0 fl oz/A	difenoconazole + cyprodinil	7	12	--
3 + 7	Luna Experience 3.34SC[1]	10.0 to 17.0 fl oz/A	tebuconazole + fluopyram	7	12	--
7 + 12	Miravis Prime	9.2 to 11.4 fl oz/A	pydiflumetofen + fludioxonil	1	12	--
9 + 12	Switch 62.5WG	11.0 to 14.0 oz/A	cyprodinil + fludioxonil	1	12	L
3 + 7	Aprovia Top 1.62EC	10.5 to 13.5 fl oz/A	difenoconazole + benzovindiflupyr	0	12	--
7 + **11**	Merivon Xemium[2]	5.5 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
7 + **11**	Pristine 38WG[2]	12.5 to 18.5 oz/A	boscalid + pyraclostrobin	0	12	--
49+M05	Orondis Opti	1.75 to 5 pt/A	oxathiapiprolin + chlorothalonil	0	12	--
Maintain fungicide schedule until harvest (see "Harvest and Post-Harvest Considerations" section above). 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.						

[1]A mild yellowing on leaf margins is sometimes seen following application of Luna Experience in cucurbits.
[2]Tank mixes of additives, adjuvants, and/or other products may result in crop injury.

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. Pre-plant fumigants will also suppress disease. Fields should be adequately drained to ensure that water does not accumulate around the base of the plant. Once the canopy closes, subsoil between the rows to allow for faster drainage following rainfall. Materials with different modes of action (*i.e.*, FRAC codes) should always be alternated to reduce the chances for fungicide resistance development. Apply fungicides when conditions are favorable for disease development. Fruit are susceptible at all growth stages and must be protected season-long.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Apply one of the following formulations pre-plant for early season control:						
4	MetaStar 2E AG (labeled for damping-off and cottony leak caused by *Pythium* spp.)	4.0 to 8.0 pt/A	metalaxyl	AP	48	N
4	Ridomil Gold 4SL	1.0 to 2.0 pt/A at planting 0.25 to 0.4 pt/A subsequent applications	mefenoxam	5	48	N
4	Ultra Flourish 2E (labeled for damping-off, cottony leak, and root rot caused by *Pythium* spp,)	2.0 to 4.0 pt/A at planting 0.5 to 0.8 pt/A subsequent applications	mefenoxam	5	48	N
4 + 11	Uniform 3.72SC (labeled for *Rhizoctonia* and *Pythium* spp.)	0.34 fl oz/1000 ft row	mefenoxam + azoxystrobin	AP	0	N
28	Previcur Flex 6F (labeled for damping-off and root rot caused by *Pythium* spp.)	1.2 pt/A in transplant water, drip irrigation, or spray directed to the base of the plants and soil.	propamocarb hydrochloride	2	12	N
49 + **4**	Orondis Gold[1]	28.0 to 55.0 fl oz/A	oxathiapiprolin + mefenoxam	5	48	--
Apply one of the following fungicides and tank mix with fixed copper at labeled rates when conditions favor disease development (for suppression only):						
49 + 40	Orondis Ultra 2.33SC	5.5 to 8.0 fl oz/A	oxathiapiprolin + mandipropamid	0	4	--
49+M05	Orondis Opti	1.75 to 5 pt/A	oxathiapiprolin + chlorothalonil	0	12	--
21	Ranman 400SC	2.75 fl oz/A (**do not apply with copper**; see label for details)[2]	cyazofamid	0	12	L
40 + 45	Zampro 525SC	14.0 fl oz/A	dimethomorph + ametoctradin	0	12	--
22	Elumin 4SC	8 fl oz/A	ethaboxam	2	12	--
40	Revus 2.08F	8.0 fl oz/A	mandipropamid	0	4	--
40	Forum 4.17SC	6.0 fl oz/A	dimethomorph	0	12	N
43	Presidio 4SC[3]	4.0 fl oz/A	fluopicolide	2	12	L
M05+22	Zing! 4.9SC	36 fl oz/A	chlorothalonil + zoxamide	0	12	M

[1]Do not follow soil applications of Orondis Gold with foliar applications of oxathiapiprolin-containing products. [2]Ranman should be tank mixed with an organosilicone surfactant when disease is severe, or a non-ionic surfactant or blend of organosilicone and non-ionic surfactant disease is moderate or light. [3]Presidio may also be applied through the drip irrigation (see supplemental label). Soil drench followed by drip application has given good results in some trials on crown rot caused by *Phytophthora capsici*.

Plectosporium Blight

Research has shown that no-till pumpkin production may reduce disease. Rotate with crops other than cucurbits. It is important to achieve maximum foliage coverage with each fungicide application. Scout fields regularly.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Once symptoms appear on petioles or as fruit begins to form, apply one of the following and repeat every 7-10 days:						
M05	chlorothalonil 6F	2.0 to 3.0 pt/A	chlorothalonil	0	12	M
3 + 11	Quadris Top 1.67SC[1]	12.0 to 14.0 fl oz/A	difenoconazole + azoxystrobin	1	12	--
3 + 7	Aprovia Top 1.62EC	10.5 to 13.5 fl oz/A	difenoconazole + benzovindiflupyr	0	12	--
3 + 9	Inspire Super 2.82EW	16.0 to 20.0 fl oz/A	difenoconazole + cyprodinil	7	12	--
7 +11	Pristine 38WG[2]	18.5 oz/A	boscalid + pyraclostrobin	0	12	--
7 + **11**	Merivon Xemium[2]	5.5 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
A spray schedule that alternates Cabrio 20EG or Flint Extra 500SC with chlorothalonil will also provide control. Note: do not apply Flint Extra 500SC near Concord grapes, see label.						

[1]**Do not apply near apples**, see label. [2]Tank mixes of additives, adjuvants, and/or other products may result in crop injury.

Powdery Mildew

Some varieties have resistance or tolerance to Powdery mildew and should be used if possible (see table Recommended Varieties above). The fungus that causes cucurbit Powdery mildew has developed resistance to high-risk fungicides. In the Eastern US, resistance to strobilurin (FRAC code 11) and DMI (FRAC code 3) fungicides has been reported. 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. Development of Powdery mildew on tolerant varieties will vary from year to year. Planting tolerant varieties will help delay the development of Powdery mildew and improve the performance of fungicides. 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 per acre).

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
TANK MIX one of these products with a protectant such as chlorothalonil 6F 2.0 to 3.0 pt/A:						
50	Vivando 2.5SC[1]	15.4 fl oz/A	metrafenone	0	12	--
3 + 7	Luna Experience 3.34SC[2]	6.0 to 17.0 fl oz/A	tebuconazole + fluopyram	7	12	--
13	Quintec 2.08SC	4.0 to 8.0 fl oz/A	quinoxyfen	3	12	--
AND ALTERNATE with fungicides from different FRAC codes with a protectant such as chlorothalonil 6F 2.0 to 3.0 pt/A:						
3	tebuconazole 3.6F	4.0 to 6.0 fl oz/A	tebuconazole	7	12	N
3	Procure 480SC	4.0 to 8.0 fl oz/A	triflumizole	0	12	N
3	Proline 480SC	5.7 fl oz/A	prothioconazole	7	12	--
3	Rally 40WSP	2.5 to 5.0 oz/A	myclobutanil	0	24	N
3	Rhyme 2.08SC	5.0 to 7.0 fl oz/A	flutriafol	0	12	--
3 + 9	Inspire Super 2.82EW	16.0 to 20.0 fl oz/A	difenoconazole + cyprodinil	7	12	--
3 + 7	Aprovia Top 1.62EC	10.5 to 13.5 fl oz/A	difenoconazole + benzovindiflupyr	0	12	--
7 + 11	Pristine 38WG[3]	12.5 to 18.5 oz/A	boscalid + pyraclostrobin	0	12	--
7 + **11**	Merivon Xemium[2]	4 to 5.5 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
7 + 12	Miravis Prime	9.2 to 11/4 fl oz/A	pydiflumetofen + fludioxonil	1	12	--
9 + 12	Switch 62.5WG	11.0 to 14.0 oz/A	cyprodinil + fludioxonil	1	12	L
39	Magister 1.6SC[4]	24.0 to 36.0 fl oz/A	fenazaquin	3	12	H
P05	Regalia (OMRI)	4.0 qt/A	Extract of *Reynoutria sachalinensis*	0	4	--
OR WITH (Note: Sulfur may injure plants, especially at high temperatures. Certain varieties can be more sensitive. Consult the label for precautions).						
M02	Micronized Wettable Sulfur 80W[5]	4.0 lb/A	sulfur	--	24	N
U06	Torino 0.85SC	3.4 fl oz/A	cyflufenamid	0	4	--

[1]Do not mix Vivando with horticultural oils.
[2]A mild yellowing on leaf margins is sometimes seen following application of Luna Experience in cucurbits.
[3]Tank mixes of additives, adjuvants, and/or other products may result in crop injury.
[4]Do not make more than one application per year of Magister.
[5]Do not apply when temperature exceeds 90°F or to varieties susceptible to sulfur injury.

Scab

Select scab-resistant varieties. The fungus that causes scab typically occurs during periods of cool, wet weather when temperatures are below normal. Rotate away from fields with a history of scab for at least 2 years.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Begin sprays as true leaves form and repeat every 5 to 7 days:						
M05	chlorothalonil 6F	2.0 to 3.0 pt/A	chlorothalonil	0	12	M

Viruses (WMV, PRSV, ZYMV, and CMV)

The most prevalent virus in the Mid-Atlantic region is WMV, followed by PRSV, ZYMV, and CMV. An easy method for mitigating potential losses are to plant varieties with resistance packages to multiple viruses whenever possible. Plant fields as far away from existing cucurbit plantings as possible to help reduce aphid transmission of viruses.