Peppers

Recommended Varieties[1]

Variety (all hybrids)		Color[2]	Disease Resistance[3]							
			BLSR	CMV	PVY	PHY	TEV	TM	TMV	TSWV
Bell Type	Archimedes	G/R	0-3, 7, 8			T		R		
	Aristotle	G/R	1-3			T		R		
	Declaration	G/R	1-3, 5			T				T
	Delerio	G/O							R	R
	Early Sunsation	G/Y	1-3							
	Intruder	G/R	1-3			T	R		R	
	Karisma	G/R	1-3	T	R				R	
	Mecate	G/Y	1-3						R	
	Mercer	G/R	0-3, 7, 8			T			R	
	Paladin	G/R				R/T		R		
	Playmaker	G/R	0-10			T		R		
	Red Knight	G/R	1-3		R					
	Revolution	G/R	1-3, 5	T		T				
	Turnpike	G/R	0-5, 7-9			T				
	1819	G/R	1-5			T				
	9325	G/R	0-10							
Cherry Type	Fireball (hot)	G/R								
	Grandi (hot)	G/R								
	Super Sweet Cherry	G/R							T	
Sweet Frying Type	Aruba	LG				T				
	Biscayne	LY								
	Carmen	G/R								
	Key West	LG/R	1-3							
	Red Crest	G/R								
	Yellow Crest	G/Y								
Hot Type	Campeon (Jalapeno)	G/R	0-3, 7, 8		R					
	Charger (Anaheim)	G/DR								I
	Compadre (Jalapeno)	G/R								
	El Jefe (Jalapeno)	G/R	0-3, 7, 8		R		T			
	Grande (Jalapeno) (processing)	G/R			R		R			
	Mesilla (Cayenne)	G/R			R		R		R	
	Nainari (Cayenne)	G/R								
	Numex Joe E. Parker (Anaheim)	G/R								
	Rayo (Jalapeno, processing)	G/R	1-3							
Non-Hot Type	Pace 105 (Jalapeno, processing)	G/R								
	P115 (Jalapeno, processing)	G/R	1-3							
	SV8066HJ (Jalapeno, processing)	G/R								
Banana Pepper	Doblon	Y/R							R	R
	Ethem	Y/R								
	Inferno (hot)	Y/R								
	Pagaent	Y/R	1-3							
	Sopron	Y/R	1-3							
	Sweet Savannah	Y/R								
	Sweet Sunset	Y/R	1-3							

[1]Varieties listed alphabetically within type. [2]G/O=Green to Orange, G/R=Green to Red, G/DR=Green to Dark Red, G/Y=Green to Yellow, LG=Light Green, LG/R=Light Green to Red, LY=Light Yellow, Y/R Yellow to Red. [3]Information provided by seed companies; T=tolerant and R=resistant. BLSR=Bacterial Leaf Spot Resistance (races listed), CMV=Cucumber Mosaic Virus, PHY=*Phytophthora capsici*, PVY=Potato Virus Y, TEV=Tobacco Etch Virus, TM=Tobamovirus, TMV=Tobacco Mosaic Virus, TSWV=Tomato Spotted Wilt Virus.

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 recommendations found below.

		Soil Phosphorus Level				Soil Potassium Level				
		Low	Med	High (Opt)	Very High	Low	Med	High (Opt)	Very High	
	N (lb/A)	P_2O_5 (lb/A)				K_2O (lb/A)				Nutrient Timing and Method
Peppers	100-180[1]	200	150	100	0[2]	200	150	100	0[2]	Total nutrient recommended
	50	200	150	100	0[2]	200	150	100	0[2]	Broadcast and disk-in or follow fertigation schedule
	50	0	0	0	0	0	0	0	0	Sidedress after first fruit set or follow fertigation schedule
	25-30	0	0	0	0	0	0	0	0	Sidedress later in season if needed or follow fertigation schedule

Apply 1 lb/A of boron (B) with broadcast fertilizer; see also Table B-7 in chapter B Soil and Nutrient Management. [1]If crop is mulched with plastic but not drip/trickle fertilized, broadcast 150 lb/A of N with P and K fertilizer. [2]In VA, crop replacement values of 50 lb/A of P_2O_5 and 50 lb/A of K_2O are recommended on soils testing Very High.

Fertigation Schedule Examples

This table provides examples of fertigation schedules based on two common scenarios – sandy coastal plain soils and heavier upland soils. Modify according to specific soil tests and base fertility.

Fertigation recommendations for 75 lb N and 125 lb K_2O[1,2] For soils with organic matter content less than 2% or coarse texture and low to medium or deficient K								
			Nitrogen			**Potash**		
Preplant (lb/A)[3]			**50**			**100**		
			N	**N**	**N**	**K_2O**	**K_2O**	**K_2O**
Stage and Description	Weeks	Days	lb/day	lb/week	lb/stage	lb/day	lb/week	lb/stage
1 Early vegetative	1-2	1-14	0.5	3.5	7	0.5	3.5	7
2 Late vegetative	3-4	15-28	0.7	4.9	9.8	0.7	4.9	9.8
3 Early Flowering	5-6	29-42	1.0	7	14	1	7	14
4 Fruit Development	7-8	43-56	1.5	10.5	21	1.5	10.5	21
5 Harvest Period[4]	9-14	56-98	1.8	12.6	75.6	1.8	12.6	75.6
Fertigation recommendations for 75 lb N and 75 lb K20[1,2] For soils with organic matter content greater than 2% or fine texture and high or optimum K								
			Nitrogen			**Potash**		
Preplant (lb/A)[3]			**50**			**50**		
			N	**N**	**N**	**K_2O**	**K_2O**	**K_2O**
Stage and Description	Weeks	Days	lb/day	lb/week	lb/stage	lb/day	lb/week	lb/stage
1 Early vegetative	1-2	1-14	0.25	1.75	3.5	0.25	1.75	3.5
2 Late vegetative	3-4	15-28	0.35	2.45	4.9	0.35	2.45	4.9
3 Early Flowering	5-6	29-42	0.5	3.5	7	0.5	3.5	7
4 Fruit Development	7-8	43-56	0.75	5.25	10.5	0.75	5.25	10.5
5 Harvest Period[4]	9-14	56-98	1.25	7.7	46.2	1.1	7.7	46.2

[1]Based on 7,260 linear bed ft/A (6 ft bed spacing). If beds have a different width, adjust fertilizer rates. Drive rows should not be used in acreage calculations (see section C 3 Fertigation in the Irrigation Management chapter). [2]Base overall application rate on soil tests. [3]Applied under plastic mulch to effective bed area using modified broadcast method. [4]For extended harvest after 10 w continue fertigation at this rate.

Plant Tissue Testing

Plant tissue testing can be a valuable tool to assess crop nutrient status during the growing season to aid with in-season fertility programs or to evaluate potential deficiencies or toxicities. Critical bell pepper tissue test values for most recently matured leaves prior to fruit set: N 3-5 %, P 0.3-0.5 %, K 2.5-5 %, Ca 0.9-1.5%, Mg 0.3-0.5% and S 0.3-0.6 %. For additional nutrients and other growth stages consult with a tissue testing laboratory or this web link at the University of Florida: *http://edis.ifas.ufl.edu/ep081*.

Seed Treatment

Check with your seed company if seed is hot water-treated. Purchase hot water treated seed if possible or request hot water seed treatment - see also Disease Control below.

Transplant Production

Sow seed in the greenhouse 6-8 weeks before field planting. Seven ounces of seed are necessary to produce 10,000 plants per acre. Optimum temperature for germination is 85°F. Seed in 72-200 cell trays, depending on desired earliness and greenhouse space. Larger cell sizes are easier to maintain and result in better transplants, but are more expensive to produce.

Planting and Spacing

Pepper is a warm-season crop that grows best at temperatures between 70-75°F. Peppers are sensitive to temperature extremes. Poor fruit set and blossom drop can be expected when night temperatures drop below 60°F or day temperatures rise above 85°F. Transplant into the field May 1-30 for summer harvest. In Southern New Jersey, transplants can be set until July 1. In VA and warm areas, transplant July 25 to August 1 for fall harvest. Space rows 4-5 feet apart. Set plants 12-18 inches apart in single or double rows. Select fields with good drainage. Plant on raised, beds to aid in disease management. To minimize sunscald when growing peppers on sandy soils and on plastic mulch without drip irrigation, plant varieties that have excellent fruit cover from foliage.

Drip/Trickle Fertilization

Before mulching, adjust soil pH to approximately 6.5 and then apply enough fertilizer to supply 25-50% of total crop N and K_2O requirements and thoroughly incorporate into the soil. Apply all P_2O_5 pre-plant and incorporate into the soil. Apply the balance of N and K_2O through the drip irrigation system throughout the season. On soils testing low and low to medium in boron, also include 0.25 lb/A of actual boron in each soluble fertilizer application.

The first soluble fertilizer application should be applied through the trickle irrigation system within 1 week after field transplanting peppers. The same rate of soluble fertilizer should be applied about every 3 weeks during the growing season for a total of 6 applications through the trickle irrigation system. The soluble fertilizer may be delivered in 12 equally timed applications provided the soluble nutrients are applied at half the above suggested rates per application so that the total seasonal rates of N, P_2O_5, and K_2O and B are the same. The number of fertilizer applications can be reduced for late plantings and in areas where the growing season is short. These rates were developed on sandy loam soils with a cation exchange capacity (CEC) of 3--5. If your soil has a lower CEC, you may wish to increase the total seasonal soluble fertilizer nutrient rates by at least one-third. On very coarse, very low CEC soils, it may be profitable to increase the total seasonal soluble fertilizer nutrient rates two-thirds over the first suggestion. On the heavier textured soils with higher CEC, you may wish to decrease the total seasonal soluble fertilizer nutrients by one-half. Review the tables above for suggested application rates and timing.

Mulching

The use of black plastic mulch with drip irrigation and double rows can greatly increase yields and percentage of large fruit. Use opaque, white plastic when planting in the summer for fall harvest. Plant double rows 12-15 inches apart with plants staggered 12-18 inches apart in each of the double rows. Use 5-ft wide plastic for double rows and 4-ft wide plastic for single row peppers. Do not use plastic mulch without trickle irrigation on coarse or sandy soils.

Staking

Staking peppers helps protect fruit from sunburn by holding the plants in an upright position. Use 2-2½ ft long by 1¼ x 1½-inch Honduran pine stakes (half-length tomato stakes). Drive stakes 6-8 inches into the soil every 4-5 ft in the plant row. Tie plants with polyethylene string that is used for staked tomatoes. Tie the first string 7-9 inches above the soil when plants are 10-12 inches tall or at first fruit set. For single row peppers, run the string on one side of the row, looping and tightening string around each stake for about 100 ft. Then run the string back on the opposite side of the plant row using the same procedure. Allow 3-4 ft untied breaks every 100 ft to make harvesting easier. For double rows of peppers, use one row of stakes in each row of peppers. Tie each row separately as described above for single row peppers.

A second tie should be made at 6 to 8 inches above the first string and before peppers enlarge and fall over the first string. Use the same procedure described above. An alternate method for applying the second string in single and double rows is to run a single string in the center of the plant canopy of each row, allowing the branches to grow up through the string and be caught and supported by the string.

Consider the cost of staking versus reduction in losses and increases in quality and price received. The higher price offered for red peppers increases the potential for profit when staking for the red compared to the green market.

Physiological Disorders

Blossom End Rot:

This physiological disorder is caused by reduced Calcium (Ca) uptake and movement into fruit at low soil moisture. To control blossom end rot, maintain proper soil Ca, nutrient balance, and uniform, favorable soil moisture. This is especially important when cropping in raised beds for Phytophthora control, because soil in raised beds will dry more quickly than in flat bed culture.

Skin separation or "silvering" of bell pepper fruit:

Skin separation or "silvering" in bell pepper fruit reduces aesthetic fruit quality. Research in NJ has shown that phytophthora-tolerant bell pepper cultivars (such as 'Paladin' and 'Aristotle') are more prone to the development of "silvering" than phytophthora-susceptible varieties such as 'Alliance' or 'Camelot'.

Sunscald:

To reduce sunscald, select varieties with good foliage cover. Maintain vigorous vegetative growth by following the recommended fertilizer (especially N) program and timely irrigation. Harvest carefully to avoid damaging stems, branches, and foliage.

Stip:

In late summer and fall when temperatures drop into the 40's, pepper stip disorder can be a problem in bell peppers causing them to be unmarketable. It is particularly a problem on peppers taken to ripe stage such as red bells but can also be an issue on green immature fruit. It causes gray, brown, black, or green spots that are slightly sunken and are ¼ inch or smaller in diameter. Pepper varieties vary considerably in their susceptibility to stip. Reduce N fertilization in late plantings to reduce stip and avoid stip susceptible varieties for fall production.

Harvest and Post-Harvest Considerations

Harvest green fruit once they have reached full size and the walls are firm. Harvest every 7-14 days to achieve maximum yields. Harvest red, yellow, or orange peppers after they turn color. Colored pepper production requires 2-4 weeks of additional growing time. Increased attention to insects and diseases is required to produce mature, colored fruit. Harvest hot peppers after they reach full size and the walls are firm for green fruit and after they have turned color for colored fruit.

Peppers are picked by hand using a upward snap and pull motion with part of the stem (peduncle) and fruit cap (calyx) adhering to the fruit; branches of the plant are usually brittle and can break easily if pulled too hard. Hot peppers generally detach from the plant much more easily than sweet peppers and plants are less brittle.

Keep harvested peppers out of direct sunlight to avoid water loss, sunscald, and heat damage. Peppers can be bruised when washed after harvest. If peppers are washed in a dump tank, wash water temperature should be up to 10°F warmer than the peppers. Cold water creates a partial vacuum that draws some water (and potentially bacteria) into the fruit, leading to premature breakdown. Chlorinated water or another labeled surface disinfectant should be used in the wash water. Only first-quality peppers should be packed. Peppers should be selected for uniform maturity, color, shape, and size and for freedom from defects. Any pepper showing signs of sunscald, mechanical or insect damage, or disease should be discarded. Most bell peppers are packed in 1⅑-bushel corrugated cartons that hold 28 to 30 pounds of peppers. Some are packed in 1¼-bushel cartons holding 35 pounds. Peppers can be cooled with room cooling, forced air cooling, forced air with evaporative cooling, or vacuum cooling.

Optimal conditions for storing peppers are 45-50°F with relative humidity of 85-95%. Chilling injury occurs at temperatures below 45°F, and damage may occur even below 50°F depending on variety and other factors. Bell peppers may be stored 2--3 weeks if handled properly. Dried hot peppers are stored at 32-38°F.

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-2) in chapter E Pest Management.

2. Minimize herbicide resistance development. Identify the herbicide site 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 Applications Sites for Peppers

		Plastic mulch production						Bareground production		
		Soil-Applied		Postemergence						
Herbicides	WSSA group number	Under Plastic	Row Middles	Over Plastic	Row Middles	Post-Harvest		Soil-applied	POST	Post-harvest
Sandea	2		YES		YES			directed**		
Prowl H2O	3		YES					YES***		
Treflan	3							YES***		
Prefar	8	YES	YES					YES		
Command	13	YES	YES					YES		
Reflex*	14	YES	YES		YES			YES***		
Dual*	15	YES	YES					YES***		
Devrinol	15	YES	YES					YES		
Select	1			YES					YES	
SelectMax	1			YES					YES	
Poast	1			YES					YES	
Gramoxone*	22				YES	YES				YES

*Special Local Needs Label 24(c), be sure it is registered for the specific state and for the intended use. ** Sandea is labeled for bareground only if the spray is directed to the row middles. ***Transplants only.

1. Soil Applied

Group	Product Name	Product Rate	Active Ingredient (*=Restricted Use)	Active Ingredient Rate	PHI (d)	REI (h)
2	Sandea 75DF	0.5 to 1.0 oz/A	**halosulfuron**	0.023 to 0.047 lb/A	30	12
-**Plasticulture**: row middles only; apply as shield application after crop has been planted. -**Bareground**: apply between rows of direct-seeded or transplants; **Do not** apply as broadcast application; avoid contact of the herbicide with the planted crop -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 Sandea applications per year is 2 and **do not** exceed 2 oz/A during the crop season.						
3	Prowl H2O 3.8CS	1.0 to 3.0 pt/A	**pendimethalin**	0.48 to 1.42 lb/A	70	24
-**Plasticulture**: recommended for row middles only. Labeled for under plastic, but no local data or experience with this application. -**Bareground**: broadcast preplant or preplant incorporated before transplanting; not labeled for direct-seeded crop. -Avoid root contact with Prowl-treated soil when placing transplants into furrow or hole or injury may occur. -Prowl labeled for directed application to transplanted or established direct-seeded peppers; avoid contact with leaves or stems. -Prowl will not control emerged weeds, only provides residual control; row middle applications may be made with Gramoxone using shielded sprayers. -Use the lower rate on coarse-textured or sandy soils. Activate with ½ inch of rainfall or sprinkler irrigation within 48 hr of application to control most annual grasses and certain broadleaf weeds. -Maximum Prowl H2O application per season is 3 pt/A.						
3	Treflan 4E	1 to 2 pt/A	**trifluralin**	0.5 to 1.0 lb/A	--	12
-**Labeled for transplanted peppers only**; not labeled for seeded peppers. -Apply preplant incorporated. Incorporate 23 inches of the soil within 8 hr of application. -Slight stunting may occur if weather is cool and damp at time of transplanting. -Maximum application per season: not specified.						
8	Prefar 4E	5.0 to 6.0 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 day before making transplant holes to allow condensation to incorporate the herbicide. Plasticulture: row middles application is labeled. -**Bareground**: apply preemergence or preplant incorporated. -**Do not** incorporate more than 2 inches deep (1 inch is optimum). -If applied preemergence, irrigate irrigate within 36 h of application with ½ inch of water; if not incorporated with irrigation or rainfall within 36 h, weed control maybe reduced. -Provides control/suppression of some annual grass weeds and some broadleaves including pigweeds, purslane, and lambsquarters.						
13	Command 3ME	0.66 to 1.33 pt/A	**clomazone**	0.25 to 0.50 lb/A	--	12
-**Plasticulture**: under plastic: apply in a band under the plastic, immediately before laying the mulch. Plasticulture: row middles application is labeled. -**Bareground**: apply preemergence for seeded peppers **or** before transplanting (**do not** apply over emerged plants). -Use the lower rate on coarse-textured soils low in organic matter, when weed pressure is light, or to minimize herbicide carryover that could affect subsequent crops. Use higher rates on fine-textured soils or soils with high organic matter, or to improve control of certain weeds, including common cocklebur (refer to label for specific weeds and rates).						

1. Soil Applied, Command - continued on next page

1. Soil Applied, Command - continued

-**Do not** use on banana peppers.
-Broad-spectrum herbicide that will control annual grasses and many broadleaf weeds, except pigweed sp., carpetweed, morningglory sp., and yellow nutsedge; combine with Devrinol or Dual Magnum (transplants only) to improve the control.
-**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.
-Maximum Command applications per season: 1.

14	Reflex 2SL	16 to 20 fl oz/A NJ 16 to 24 fl oz/A VA	**fomesafen**	0.25 to 0.375 lb/A	60	24

-**Special Local Needs Label 24(c) has been approved for VA only (expires 12/31/2020).** -The use of Reflex 2SL is legal ONLY if a waiver of liability has been completed (see *www.syngenta-us.com/labels/indemnified-label-login*).
-**Plasticulture**: under plastic is labeled; apply in a band under the plastic, immediately before laying the mulch; use on transplants only (not for seeded peppers). Crops may be transplanted immediately following application. Row middles application is labeled.
-**Bareground**: apply as broadcast, preemergence treatment on transplants only (not for seeded peppers). **Do not** incorporate.
-Label does not specify pepper type.
-To avoid injury, transplants must have a minimum of 5 true leaves when planted in soil treated with Reflex.
-Reflex provides both residual and postemergence control of susceptible weeds. Effective postemergence control requires an adjuvant.
-Varieties may vary in their response to Reflex; treat small acreages first to determine crop tolerance.
-Consider rotational crops when applying fomesafen. If crop is replanted **do not** re-apply. Rotational restrictions depend on whether fomesafen was applied bareground, or under or over plastic mulch, see 24(c) label for specifics.
-Maximum Reflex application: 24 fl oz/A IN ALTERNATE YEARS.

15	Devrinol 2-XT 2EC Devrinol DF-XT 50DF	2 to 4 qt/A 2 to 4 lb/A	**napropamide**	1.0-2.0 lb/A	--	24

-**Plasticulture**: under plastic is labeled for seeded or transplanted peppers; apply in a band under the plastic, immediately before laying mulch. Use lower rate on coarse textured or sandy soil. Condensation that forms on the underside of the mulch will activate the herbicide. Plasticulture: row middles application is labeled.
-**Bareground**: apply as broadcast, preemergence treatment for seeded and transplanted peppers. Rainfall or irrigation within 24 hr after application improves performance (½ inch sprinkler irrigation).
-Annual grasses and certain annual broadleaf weeds will be suppressed or controlled.
-May reduce stand and yield of fall planted small grain crop. Moldboard plowing will reduce the risk of injury.
-Maximum Devrinol application per season: 4 qt/A (2-XT) or 4 lb/A (DF-XT).

15	Dual Magnum 7.62EC	0.5 to 1.33 pt/A	**s-metolachlor**	0.48 to 1.27 lb/A	60	24

-**Special Local Needs Label 24(c) has been approved for NJ and VA (expires VA 12/31/2021; NJ 1/30/2022).**
-Labeled for use in transplanted bell and non-bell peppers (except tabasco peppers).
-**Special Local Needs Label 24(c) has been approved for PA for bell peppers only (expires 4/28/2023) and maximum rate of 1 pt/A.**
-The use of Dual Magnum is legal ONLY if a waiver of liability has been completed (see *www.syngenta-us.com/labels/indemnified-label-login*).
-**Plasticulture**: under plastic is labeled for seeded or transplanted peppers; apply in a band under the plastic, immediately before laying mulch. Use lower rate on coarse textured or sandy soil. Condensation that forms on the underside of the mulch will activate the herbicide. Plasticulture: row middles application is labeled.
-**Bareground**: apply as broadcast, preemergence treatment for transplanted bell and non-bell peppers, do no use on seeded peppers; **do not** incorporate. **For NJ only** can be applied as post-directed spray to soil surface after the plants have recovered from transplant shock. Dual will not control emerged weeds.
-Maximum Dual Magnum applications per season: 1.

2. Postemergence

Group	Product Name	Product Rate	Active Ingredient (*=Restricted Use)	Active Ingredient Rate	PHI (d)	REI (h)
1	Select 2EC Select Max 0.97EC	6 to 8 fl oz/A 9 to 16 fl oz/A	**clethodim**	0.07 to 0.12 lb/A	20	24
	Poast 1.5EC	1 to 2.5 pt/A	**sethoxydim**	0.2 to 0.5 lb/A	7	12

-**Select 2EC**: use crop oil concentrate (COC) at 1% v/v (1 gal/100 gal of spray solution). **Select Max**: use nonionic surfactant (NIS) at 0.25% v/v (1 qt/100 gal of spray solution). **Poast**: use COC at 1.0% v/v
-**The use of COC 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 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.
-Yellow nutsedge, wild onion, wild garlic, and broadleaf weeds will not be controlled.
-Controls many annual and certain perennial grasses, including annual bluegrass, but Poast is preferred for goosegrass control. For best results, treat annual grasses when they are actively growing. Control may be reduced if grasses are large or under hot or dry weather conditions. -Repeated applications may be necessary to control certain perennial grasses. If repeat applications are necessary, allow 14 days between applications. -Rainfastness is 1 h.

2. Postemergence, Select, Poast - continued on next page

2. Postemergence, Select, Poast - continued

-**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 of Select 2EC in a single application and **do not** exceed 2 pt/A for the season; **do not** apply more than 16 fl oz of Select Max in a single application and **do not** exceed 4 pt/A for the season. -**Do not** apply more than 1.5 pt/A Poast 1.5EC in single application and **do not** exceed 4.5 pt/A for the season.						
22	Gramoxone 2SL	2.0 pt/A	**paraquat***	0.5 lb/A	30	24
-Gramoxone can be applied before or after transplanting to control emerged broadleaf weeds and grass seedlings. -Include a nonionic surfactant at 0.25% v/v. **Do not** allow spray to contact crop foliage as injury may result. Use flaps that drag along the edge of plastic mulch and use 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 (*http://usparaquattraining.com*); certified applicators must repeat training every three years.						

3. Postharvest

Group	Product Name	Product Rate	Active Ingredient (*=Restricted Use)	Active Ingredient Rate	PHI (d)	REI (h)
22	Gramoxone 2SL	2.25 to 3 pt/A	**paraquat***	0.56 to 0.75 lb/A	--	24
-**A Special Local Needs Label 24(c) has been approved in VA (expires 12/31/2022) and a Supplemental Label in DE for the use of Gramoxone SL 2.0 for postharvest application to desiccate the crop.** -Apply after the last harvest for bareground or plasticulture. 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 (*http://usparaquattraining.com*); certified applicators must repeat training every three years.						

4. 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	Active Ingredient (*=Restricted Use)
2	League	**imazosulfuron**
14	Aim	**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

Aphids

Green peach aphid is the most common aphid on peppers. Females can produce numerous pale yellow or pink-colored young (nymphs); large numbers can build up on the undersides of leaves, often following pyrethroid insecticide applications. Aphids are sucking insects that excrete a sugary, sticky substance (honeydew) that coats fruit and causes growth of black sooty mold fungus. Both honeydew and mold can hurt marketability. Natural predators and parasitoids (braconid wasps) can keep aphid populations below damaging levels, but broadspectrum insecticides, like pyrethroids, destroy natural enemies. Use selective insecticides whenever possible. Begin sampling plants in July for the presence of aphids and natural enemies. Spray only when aphid densities appear to be increasing in the absence of predators. Treat if aphids exceed 5 per leaf. When plants are small, silver reflective plastic mulch can significantly reduce the number of aphids landing on the crop.

Apply one of the following formulations:
Note: Spray coverage to the underside of the leaf is important; add a spreader-sticker to foliar sprays.

Group	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
1A	Lannate LV	1.5 to 3.0 pt/A	methomyl*	3	48	H
1A	Vydate L	2.0 to 4.0 pt/A	oxamyl* - **foliar**	7	48	H
1B	Dimethoate 400	0.5 to 0.66 pt/A	dimethoate*	0	48	H
1B	Malathion 57 EC	1.25 to 1.5 pt/A	malathion	3	12	H

Aphids - continued on next page

Aphids - continued

Group	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
1B	Orthene 97	0.5 to 1.0 lb/A (bell)	acephate	7	24	H
1B	Orthene 97	0.5 lb/A (non-bell)	acephate	7	24	H
4A	Neonicotinoid insecticides registered for use on Peppers: see table at the end of Insect Control.					
4C	Closer SC	1.5 to 2.0 fl oz/A	sulfoxaflor	1	12	H
4C	Transform WG	0.75 to 1.0 oz/A	sulfoxaflor	1	24	H
4D	Sivanto Prime or 200SL	21 to 28 fl oz/A	flupyradifurone - **soil**	45	4	M
4D	Sivanto Prime or 200SL	7.0 to 12.0 fl oz/A	flupyradifurone - **foliar**	1	4	M
9B	Fulfill 50WDG	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
23	Movento	4.0 to 5.0 fl oz/A	spirotetramat	1	24	L
28	Exirel	13.5 to 20.5 fl oz/A	cyantraniliprole	1	12	H
28 + 6	Minecto Pro	10.0 fl oz/A	cyantraniliprole + abamectin*	7	12	H
29	Beleaf 50SG	2.8 to 4.3 oz/A	flonicamid	0	12	L
n/a	Grandevo CG (OMRI)	2 to 3 lb/A	*Chromobacterium subtsugae*	0	4	M

Caterpillar "Worm" Pests (including: Corn Earworms (CEW), European Corn Borers (ECB), Beet Armyworms (BAW), Cabbage Loopers (CL), Hornworms, and other Armyworms)

Peppers may be attacked by various lepidopteran pest species. For decades, ECB was the most important of these in the mid-Atlantic Region requiring intense (weekly) control measures throughout the fruiting period of peppers. However, since the mid-2000s, ECB populations and damage to peppers have declined significantly. Today, a mix of any of the species listed above can occur in peppers and sometimes require control. Local pheromone or blacklight traps are effective for monitoring key moth pest populations. Consult your Extension Agent or IPM alerts for information about trap catches. Also, visually inspecting plants and fruit or beat sheeting can help determine the presence or absence of lepidopteran pests. There is no reliable economic threshold. Note that not all lepidopteran pest species are listed on all of the insecticide labels below, but, unless noted, these products have activity on all caterpillars. **Pyrethroid (Group 3A) resistance is common in BAW and also has been reported in populations of CEW.** So caution should be used when using that class of insecticide. Also, multiple applications of pyrethroids may lead to aphid outbreaks on peppers. Rotating insecticide classes within a season is strongly recommended.

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV	1.5 to 3.0 pt/A	methomyl*	3	48	H
1B	Orthene 97 (not for CEW)	0.5 to 1.0 lb/A (bell)	acephate	7	24	H
1B	Orthene 97 (not for CEW)	0.5 lb/A (non-bell)	acephate	7	24	H
3A	Pyrethroid insecticides registered for use on Peppers: see table at the end of Insect Control. **Not recommended for BAW.**					
5	Entrust SC (OMRI)	3.0 to 8.0 fl oz/A	spinosad	1	4	M
5	Radiant SC	5.0 to 10.0 fl oz/A	spinetoram	1	4	M
6	Proclaim 5SG	2.4 to 4.8 oz/A	emamectin benzoate*	7	12	H
11A	XenTari (OMRI)	0.5 to 2.0 lb/A	*Bacillus thuringiensis aizawai*	0	4	N
11A	Dipel DF, others (OMRI)	1.0 to 2.0 lb/A	*Bacillus thuringiensis kurstaki*	0	4	N
15	Rimon 0.83EC	9.0 to 12.0 fl oz/A	novaluron	1	12	M
18	Confirm 2F	6.0 to 16.0 fl oz/A	tebufenozide	7	4	M
18	Intrepid 2F	4.0 to 16.0 fl oz/A	methoxyfenozide	1	4	L
22	Avaunt 30WDG, Avaunt eVo	3.5 oz/A	indoxacarb	3	12	H
28	Coragen 1.67SC	3.5 to 7.5 fl oz/A	chlorantraniliprole - **soil**	1	4	L
28	Coragen 1.67SC	3.5 to 7.5 fl oz/A	chlorantraniliprole - **foliar**	1	4	L
28	Exirel	7.0 to 13.5 fl oz/A	cyantraniliprole	1	12	H
28	Verimark	5.0 to 10.0 fl oz /A	cyantraniliprole	1	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28 + 4A	Durivo	10.0 to 13.0 fl oz/A	thiamethoxam + chlorantraniliprole	30	12	H
28 + 4A	Voliam Flexi	4.0 to 7.0 oz/A	thiamethoxam + chlorantraniliprole	1	12	H
28 + 6	Minecto Pro	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin*	7	12	H
32	Spear Lep	1.0 to 2.0 pt/A	GS-omega/kappa-Hxtx-Hv1a	0	4	L

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

Cutworms are not a major pest of peppers but are occasionally encountered. They can feed on the lower smaller leaves but typically create the most damage by clipping small transplants off at the soil level. Cutworms feed at night and hide in the top layer of the soil near the plant roots during the day. Scout seedlings for presence of clipped seedlings.

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
Pre-Planting						
3A	Pyrethroid insecticides registered for use on Peppers: see table at the end of Insect Control.					

Flea Beetles

Flea beetles can occasionaly damage young pepper seedlings. Tobacco and eggplant flea beetle damage consists of foliage feeding resembling tiny shotgun holes, primarily on young transplants. Control of flea beetles is suggested before plants reach 25% defoliation.

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
3A	Pyrethroid insecticides registered for use on Peppers: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Peppers: see table at the end of Insect Control.					
21A	Torac	17.0 to 21.0 fl oz/A	tolfenpyrad	1	12	H
28	Verimark	6.75 to 13.5 fl oz /A	cyantraniliprole	1	4	H

Leafminers

Leafminers exhibit several generations per year but they are considered minor pests of peppers. Adult flies penetrate the leaf surface to deposit a single egg. Larvae emerge and form galleries or tunnels during their feeding process. These tunnels can be observed as white, serpentine mines on the leaves. Excessive damage on small transplants can lead to leaf drop and plant death.

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Vydate L	2.0 to 4.0 pt/A	oxamyl* - **foliar**	7	48	H
3A	Pyrethroid insecticides registered for use on Peppers: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Peppers: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	6.0 to 10.0 fl oz/A	spinosad	1	4	M
5	Radiant SC	6.0 to 10.0 fl oz/A	spinetoram	1	4	M
6	Agri-Mek SC	1.75 to 3.5 fl oz/A	abamectin*	7	12	H
6	Proclaim 5SG	3.2 to 4.8 oz/A	emamectin benzoate*	7	12	H
15	Rimon 0.83EC	12.0 fl oz/A	novaluron	1	12	M
17	Trigard 75WSP	2.66 oz/A	cyromazine	0	12	H
28	Coragen 1.67SC	5.0 to 7.5 fl oz/A	chlorantraniliprole - **soil**	1	4	L
28	Coragen 1.67SC	5.0 to 7.5 fl oz/A	chlorantraniliprole - **foliar**	1	4	L
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	AP	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28 + 6	Minecto Pro	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin*	7	12	H

Mites

Two-spotted spider mites (TSSM) are the most common mites found on peppers, although broad mites are also a sporadic pest. TSSM are tiny (1/60-1/80 inch), yellowish in color with 2 dark spots on each side of their body. Their damage is most often the first indicator of their presence on pepper plants. They feed by removing fluids from plant tissue leading to lighter colored or white areas described as stippling. Extensive feeding can lead to reduced photosynthesis, reduced vigor, and potential death of plants. TSSM most often occur on the undersides of leaves. They reproduce very quickly, and once a heavy population is reached, webbing can be observed on plants. Mites are flared by hot, dry conditions, particularly in July and August, and by the use of broad-spectrum insecticides like organophosphates, carbamates or pyrethroids killing predators, or by frequent applications of fungicides.

Mites - continued on next page

Mites - continued

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
6	Agri-Mek SC	1.75 to 3.5 fl oz/A	abamectin*	7	12	H
6 + 3A	Gladiator	19.0 fl oz/A	abamectin* + zeta-cypermethrin*	7	12	H
6 + 28	Minecto Pro	5.5 to 10.0 fl oz/A	abamectin* + cyantraniliprole	7	12	H
10A	Onager 1EC	12 to 24 fl oz/A	hexythiazox	1	12	N
10B	Zeal Miticide	2.0 to 3.0 oz/A	etoxazole	7	12	L
20B	Kanemite 15SC	31 fl oz/A	acequinocyl	1	12	L
21A	Magister SC	24.0 to 31.0 fl oz/A	fenazaquin	3	12	H
21A	Portal XLO	2.0 pt/A	fenpyroximate	1	12	L
21A	Torac (broad mite only)	14.0 to 21.0 fl oz/A	tolfenpyrad	1	12	H
23	Oberon 2SC	7.0 to 8.5 fl oz/A	spiromesifen	1	12	M
23	Movento (broad mite only)	4.0 to 5.0 fl oz/A	spirotetramat	1	24	L
20D	Acramite 50WS	0.75 to 1.0 lb/A	bifenazate	3	12	M

Pepper Maggots (PM)

Horsenettle and ground cherries are primary hosts of the pepper maggot. Adult flies are active all summer and deposit eggs in the tissue of young pepper fruit by piercing it with their ovipositor. PM strongly prefer cherry peppers and other round fruit. Maggots feed on the developing seeds and internal tissue of the fruit then exit the fruit leaving a large hole that is highly susceptible to pathogens and rot. Sanitation and rotation is important as adult flies are attracted to rotting fruit. Yellow sticky traps baited with a 30% liquid ammonia and installed in trees surrounding fields can indicate the presence of adult flies. Planting cherry peppers can alert growers of PM's presence. Sprays should be initiated one week following detection of the first flies; 2-3 sprays may be necessary.

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
1B	Dimethoate 400	0.50 to 0.66 pt/A	dimethoate*	0	48	H
1B	Malathion 57 EC	2.5 pt/A	malathion	3	12	H
3A	Pyrethroid insecticides registered for use on Peppers: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Peppers: see table at the end of Insect Control.					

N**ote:** Use of acephate in bell peppers will reduce pepper maggot infestations.

Pepper Weevils (PW)

Adults are small beetles with a long snout. PW do not overwinter in our area, but is a sporadic pest occasionally imported on transplants or fruit from the South. PW require a constant pepper host throughout the year and can therefore not survive north of South Carolina. **The materials listed here are effective for adult weevil control but are ineffective in controlling the larvae.**

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Vydate L	2.0 to 4.0 pt/A	oxamyl* - **foliar**	7	48	H
3A	Pyrethroid insecticides registered for use on Peppers: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Peppers: see table at the end of Insect Control.					
15	Rimon 0.83EC	9.0 to 12.0 fl oz/A	novaluron	1	12	M
21A	Torac	17.0 to 21.0 fl oz/A	tolfenpyrad	1	12	H
28	Harvanta 50SL	16.4 fl oz/A	cyclaniliprole	1	4	H

Stink Bugs

Brown, green, and the invasive brown marmorated stink bugs (BMSB) may attack pepper fruit. Stink bugs have a characteristic shield shape, a triangle on their thorax, are approximately 0.5 inch long and can emit a foul odor when disturbed. BMSB have white stripes on their antennae; nymphs have a dark colored or dark and white body, depending on the instar or stage of development, and have characteristic black and white striped legs. Stink bug eggs are in masses, barrel shaped and cream to greenish colored. Both nymphs and adults feed on fruit, and leave a conspicuous white "halo" or discoloration on the surface. Feeding injury from BMSB can be significantly more severe than that from other species. Growers should scout for stink bugs, and initiate weekly sprays if observed.

Stink bugs - continued on next page

Stink Bugs - continued

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV	1.5 to 3.0 pt/A	methomyl*	3	48	H
3A	Pyrethroid insecticides registered for use on Peppers: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Peppers: see table at the end of Insect Control.					

Thrips

Several species can be present; tobacco, flower, and Western flower thrips are the most common. Thrips fly in from surrounding crops or weeds and feed on the foliage, flowers and fruit. Larvae and adults cause damage by removing fluids from tissues. Adults can also damage fruit by leaving oviposition marks forming a small indent. Resulting damage from feeding leaves silvery or gray areas on fruit. Leaf distortion can also occur. More importantly, several species of thrips are vectors of Tomato Spotted Wilt Virus (TSWV), an important and untreatable disease (once acquired) of tomato, tobacco, and pepper crops. Thrips control is critical for reducing TSWV. Scout for thrips and begin treatments when observed. Do not produce transplants with bedding plants in the same greenhouse.

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Vydate L	2.0 to 4.0 pt/A	oxamyl* - **foliar**	7	48	H
3A[1]	Pyrethroid insecticides registered for use on Peppers: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Peppers: see table at the end of Insect Control.					
21A	Torac	21.0 fl oz/A	tolfenpyrad	1	12	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
n/a	Requiem EC	2.0 to 3.0 qt/A	*Chenopodium* extract	0	4	L

[1]Resistance concerns with western flower thrips

Group 3A Pyrethroid Insecticides Registered for Use on Peppers

Note, resistance concerns with this class of insecticide with western flower thrips, BAW, and CEW.

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	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
Asana XL	5.8 to 9.6 fl oz/A	esfenvalerate*	7	12	H
Baythroid XL	1.6 to 2.8 fl oz/A	beta-cyfluthrin*	7	12	H
Brigade 2EC, others	2.1 to 6.4 fl oz/A	bifenthrin*	7	12	H
Capture LFR	3.4 to 6.8 fl oz/A	bifenthrin*	7	12	H
Danitol 2.4EC	10.67 fl oz/A	fenpropathrin*	3	24	H
Declare	0.77 to 1.54 fl oz/A	gamma-cyhalothrin*	5	24	H
Hero EC	4.0 to 13.0 fl oz/A	zeta-cypermethrin* + bifenthrin*	7	12	H
Lambda-Cy 1EC, others	1.92 to 3.84 fl oz/A	lambda-cyhalothrin*	5	24	H
Mustang Maxx	2.24 to 4.0 fl oz/A	zeta-cypermethrin*	1	12	H
Permethrin 3.2EC, others	4.0 to 8.0 fl oz/A	permethrin*	3	12	H
Tombstone, others	1.6 to 2.8 fl oz/A	cyfluthrin*	7	12	H
Warrior II	0.96 to 1.92 fl oz/A	lambda-cyhalothrin*	5	24	H
Combo products containing a pyrethroid					
Besiege	5.0 to 9.0 fl oz/A	lambda-cyhalothrin* + chlorantraniliprole (Group 28)	5	24	H
Brigadier	5.1 to 9.85 fl oz/A	bifenthrin* + imidacloprid (Group 4A) - **foliar**	7	12	H
Endigo ZC	4.0 to 4.5 fl oz/A	lambda-cyhalothrin* + thiamethoxam (Group 4A)	5	24	H
Gladiator	19.0 fl oz/A	zeta-cypermethrin* + abamectin* (Group 6)	7	12	H
Leverage 360	3.8 to 4.1 fl oz/A	beta-cyfluthrin* + imidacloprid (Group 4A)	7	12	H

Group 4A Neonicotinoid Insecticides Registered for Use on Peppers

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	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
Admire Pro	7.0 to 14.0 fl oz/A	imidacloprid - **soil**	21	12	H
Admire Pro	1.3 to 2.2 fl oz/A	imidacloprid - **foliar**	0	12	H
Assail 30SG	2.0 to 4.0 oz/A	acetamiprid	7	12	M

Group 4A Neonicotinoid Insecticides Registered for Use on Peppers - continued on next page

Group 4A Neonicotinoid Insecticides Registered for Use on Peppers - continued

Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
Belay 2.13SC	9.0 to 12.0 fl oz/A	clothianidin - **soil**	7	12	H
Belay 2.13SC	3.0 to 4.0 fl oz/A	clothianidin - **foliar**	1	12	H
Actara 25WDG	2.0 to 5.5 oz/A	thiamethoxam	0	12	H
Platinum 75SG	1.66 to 3.67 oz/A	thiamethoxam	30	12	H
Scorpion 35SL	9.0 to 10.5 fl oz/A	dinotefuran - **soil**	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**	21	12	H
Venom 70SG	1.0 to 4.0 oz/A	dinotefuran - **foliar**	1	12	H
Combo products containing a neonicotinoid					
Brigadier	5.1 to 9.85 fl oz/A	imidacloprid + bifenthrin* (Group 3A) - **foliar**	7	12	H
Durivo	10.0 to 13.0 fl oz/A	thiamethoxam + chlorantraniliprole (Group 28)	30	12	H
Voliam Flexi	4.0 to 7.0 oz/A	thiamethoxam + chlorantraniliprole (Group 28)	1	12	H
Endigo ZC	4.0 to 4.5 fl oz/A	thiamethoxam + lambda-cyhalothrin* (Group 3A)	5	24	H
Leverage 360	3.8 to 4.1 fl oz/A	imidacloprid + beta-cyfluthrin* (Group 3A)	7	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 chapter E Pest Management (sections E 1.5 Soil Fumigation and E 1.6 Nematodes Control) for listed fumigants or use nematicides listed below. Consult the label.

Code	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
1A	Vydate L	see label	oxamyl*	7	48	H
--	Nimitz 4EC	3.5 to 5.0 pt/A	fluensulfone	n/a	12	N

Seed Treatment: Reducing Bacterial Leaf Spot

Purchase hot water treated seed if possible or request hot water seed treatment. Heat treatment of seeds is a nonchemical alternative to conventional chlorine treatments that only kill pathogens on the surface of the seed coat. Heat treatment has the additional benefit of killing pathogens within the seed coat and is particularly useful for crops that are prone to seed-borne bacterial infections such as pepper and tomato. Seed heat treatment follows a strict time and temperature protocol and is best done with thermostatically controlled water baths. Two baths are required: one for pre-heating, and a second for the effective (pathogen killing) temperature. For pepper seed, the initial pre-heating is at 100°F (38°C) for 10 minutes, followed by the effective temperature of 125°F (52°C) for 30 minutes. Immediately after removal from the second bath, seeds should be rinsed with cool water to stop the heating process. After that, seeds should be dried on a screen or paper. Pelleted seed is not recommended for heat treatment. Only use heat treatment on seed that will be used during the current production season. Following heat or chlorine treatment, dust the dried seed with Captan 50WP or Thiram 480DP at 1 level tsp/lb of seed (3.0 oz/100 lb). Both for Bacterial leaf spot and Phytophthora, it is important to use resistant varieties on farms or fields with a history of the disease.

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

Use new planting mix. Soilless mixes containing microorganisms that help suppress damping-off fungi should be considered. Transplants that have been in flats for extended periods of time and/or are slow to establish after setting are prone to Rhizoctonia root rot while wet soils favor Pythium root rot.

Code	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
Pythium Root Rot						
28	Previcur Flex 6F[1]	1.2 pt/A	propamocarb HCl	5	12	N
Rhizoctonia Root Rot						
11	azoxystrobin 2.08F	0.40 to 0.80 fl oz/1000 row feet	azoxystrobin	0	4	N

[1]Can be applied via drip or mixed in transplant water with Admire Pro when setting transplants for Pythium control.

Bacterial and Fungal Diseases

Anthracnose Fruit Rot

Anthracnose 'hot spots' typically develop in fields with prior history of the disease, especially in fields where peppers or tomatoes have been grown extensively. Heavy winds and rain help spread spores. Excessive fertilization may create dense canopies, which help create microclimates conducive for fruit infection and reduced fungicide control. Scout regularly as fruit begin to develop. Use adequate water when spraying to insure good penetration into canopy. Apply preventative applications starting at bloom, especially in fields with a history of the disease. Removing infected fruit from heavily infested areas of fields have been shown to reduce inoculum levels and help reduce spread of the disease if done early.

Code	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
Beginning at flowering, on a 7 day schedule, apply one of the following:						
M03	mancozeb 75DF	1.6 to 3.2 lb/A	mancozeb	7	24	N
M05	chlorothalonil 6F	1.5 pt/A	chlorothalonil	3	12	N
Tank mix one of the above WITH ONE of the following fungicides and rotate:						
3 + 7	Aprovia Top 1.62EC	10.5 to 13.5 fl oz/A	difenoconazole + benzovindiflupyr	0	12	--
3 + 11	Topguard 4.29SC	4.0 to 8.0 fl oz/A	flutriafol + azoxystrobin	0	12	--
3 + 11	Quadris Top 1.67SC	8.0 to 14.0 fl oz/A	difenoconazole + azoxystrobin	0	12	--
7 + 11	Priaxor 4.17SC	4.0 to 8.0 fl oz/A	fluxapyroxad + pyraclostrobin	7	12	N
11	Cabrio 20EG	8.0 to 12.0 oz/A	pyraclostrobin	0	12	N
11	Quadris 2.08F	6.2 to 15.5 fl oz/A	azoxystrobin	0	4	N
NOTE: DO NOT make more than 2 consecutive applications of any FRAC code 11 fungicide.						

Bacterial Leaf Spot (BLS)

The best method for limiting loss due to BLS is to plant resistant cultivars. Races 1 to 6 and possibly 10 have been identified in areas of the region. A number of new bell pepper cultivars have resistance to some or all races of the pathogen (see table Recommended Varieties). In fields with a history of BLS, only plant cultivars that are resistant. When producing transplants, be sure to use seed treated with hot water (described above) or Clorox. Purchase heat-treated seed or disease-free transplants. Prior to transplanting, apply Agri-Mycin 17 (FRAC code 25, streptomycin) sprays when first true leaves appear and continue every 45 days until transplanting (1.0 lb/100 gal, 1.25 tsp/gal, REI 12 h). Streptomycin cannot applied after transplanting.

Losses may be reduced by maintaining a high level of fertility, which will stimulate additional leaf formation and help replace leaves lost due to BLS. However, sufficient restraint with fertilization must be done to ensure that plants do not become overly vegetative, or fruit set may be severely reduced. Where disease is present or anticipated, do not work in fields when plant surfaces are wet. Disk fields as soon as possible after the growing season is finished. This will hasten breakdown of the crop debris that is harboring the bacteria and minimize overwintering of the bacteria in the field.

Field sprays to help reduce spread: If growing susceptible varieties or varieties showing symptoms of the disease, apply a fixed copper + mancozeb at labeled rates. If necessary, begin preventative fungicide applications shortly after transplanting and repeat every 7 to 10 days, especially if symptoms of BLS are present during transplant production. A Section 2ee for the use of Quintec for the suppression of bacterial leaf spot in pepper has been granted for DE, MD, NJ, PA, and VA (not in WV). Consult label before use.

Code	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
Tank mix the following beginning shortly after transplanting and repeat every 7 days:						
M01	copper (OMRI)[1,2]	1.0 lb ai/A	copper	0	see label	N
M03	mancozeb 75DF	1.5 lb/A	mancozeb	5	12/24	N
The following is a plant defense activator and preventative applications should begin prior to the onset of symptoms.						
P01	Actigard 50WG	0.33 to 0.75 oz/A (see label)	acibenzolar-S-methyl	14	12	N

[1]Copper based OMRI approved products for suppression of BLS are available; see labels for rates. [2]Copper can be tank mixed with mancozeb to help reduce Anthracnose fruit rot.

Bacterial Soft Rot in Harvested Fruit

During periods of humid weather, the stem ends of harvested peppers may turn brown due to bacterial soft rot. If necessary, pack peppers without washing to minimize soft rot. If peppers must be washed, maintain 25 ppm of

chlorine in the water (1 tbs Clorox/8 gal water). Avoid washing peppers with water more than 10°F (6°C) cooler than the fruit temperature to prevent movement of bacteria into the stem end of the fruit.

Phytophthora Blight

Plant loss can be severe in all pepper types. Phytophthora blight typically develops in low-lying areas after rain and can spread quickly. Planting on a ridge or raised, dome-shaped bed will help provide better soil drainage. Use a minimum 3-year crop rotation with crops other than peppers, cucurbits, lima beans, snap beans, eggplants, or tomatoes. In fields with low-lying or wet areas, plant only Phytophthora-tolerant or -resistant cultivars. In heavily infested fields with a known history of Phytophthora blight, plant only resistant or tolerant cultivars to help reduce plant losses. **If mefenoxam-insensitivity is known, plant only resistant or tolerant cultivars. Do not use mefenoxam or metalaxyl where insensitivity is present.**

Code	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
For control of the CROWN ROT phase of Phytophthora blight, apply one of the following at transplanting and 30 days later.						
4	MetaStar 2E AG	4.0 to 8.0 pt/A[1]	metalaxyl	7	12	N
4	Ridomil Gold 4SL	1.0 pt/A[1]	mefenoxam	--	--	N
4	Ultra Flourish 2E	1.0 qt/A[1]	mefenoxam	--	--	N
21	Ranman 400SC	2.75 fl oz/A[2,3]	cyazofamid	0	12	L
43	Presidio 4SC	3.0 to 4.0 fl oz/A[3]	fluopicolide	2	12	L
49 + **4**	Orondis Gold 1.67SC	See labels[1,2,4]	oxathiapiprolin + mefenoxam	0	4	--
For prevention of the AERIAL STEM AND FRUIT ROT phase of Phytophthora blight, tank mix one of the following with fixed copper and alternate with Ridomil Gold Copper 65WP at 2.5 lb/A (PHI 7 d, REI 48 h).						
21	Ranman 400SC	2.75 fl oz/A	cyazofamid	0	12	L
40	Forum 4.17SC	6.0 fl oz/A	dimethomorph	4	12	N
40	Revus 2.08F	8.0 fl oz/A	mandipropamid	1	12	--
40 + 45	Zampro 525SC	14.0 fl oz/A	dimethomorph + ametoctradin	4	12	--
43	Presidio 4SC	3.0 to 4.0 fl oz/A	fluopicolide	2	12	L
49 + **4**	Orondis Gold 1.67SC	See labels[4]	oxathiapiprolin + mefenoxam	0	4	--

[1]Apply at transplanting and 30 d later. [2]May also be applied via transplant water (see label for restrictions). [3]Apply Presidio or Ranman via drip between mefenoxam/metalaxyl applications.[4]If applying as drip(s), **do not apply** as foliar application, see label for restrictions.

Southern Blight (*Sclerotium rolfsii)*

High soil moisture and temperature favor disease development. Long crop rotations with corn and small grains help reduce disease incidence. Additionally, use the following in the transplant water. Consult label before use.

In Transplant Water						
Code	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
11	azoxystrobin 2.08F	15.5 fl oz/A as a directed spray	azoxystrobin	n/a	4	N
14	Terraclor 75WP	3.0 lb/100 gal of water, apply 0.5 pt/plant	Pentachloronitrobenzene (PCNB)	n/a	12	H

Verticillium Wilt

This soil-borne fungus can infect many crops including eggplant, tomato, pepper, potato, and strawberries and can survive in the soil for many years. A long, proper crop rotation is necessary to reduce losses. DO NOT grow tomato, potato, strawberries, or eggplant in rotation or consecutively in the same field and never plant other solanaceous crops, such as eggplants or tomatoes, between pepper plantings.

Viruses

Cooler than normal temperatures in the early season often result in virus-like mosaic symptoms and distorted appearances in actively growing young transplants. In past instances, entire fields or blocks looked symptomatic. Early season transplants will grow out of problem over time as temperatures rise.

Aphid-transmitted viruses: **Alfalfa Mosaic Virus, Cucumber Mosaic Virus, Potato Virus X, Potato Virus Y, and Tobacco Etch Virus.**

Cucumber Mosaic Virus has caused problems in peppers in the mid-Atlantic region the past few growing seasons. Infected fruit may develop small, irregular brown spots that run parallel on fruit. Young leaves may develop mosaic symptoms. The identification of pepper viruses with laboratory tests can be difficult. Importantly, pepper virus will not be properly controlled with insecticide applications, but symptom expression can be delayed through their use.

Since aphids transmit the virus, growers may wish to use yellow trap pans containing water to determine when mass flights of aphids occur. Repeated applications of a contact aphicide at those times are most beneficial.

Thrips-transmitted viruses: Tomato Spotted Wilt Virus (TSWV) and Impatiens Necrotic Spot Virus (INSV). Resistant varieties should be used, especially in VA. TSWV can be severe on peppers during both greenhouse transplant and field production of the crop. INSV causes similar symptoms as TSWV, however, the virus is not as severe and does not limit production to the same extent. Both viruses are transmitted by a number of thrips species (*e.g.*, Western flower thrips) during the entire thrips life cycle. DO NOT GROW ornamental bedding plants in the same greenhouse as pepper transplants, as thrips are known to transmit the virus from infected ornamental plants. Monitor greenhouses and scout fields regularly for thrips. When thrips are observed in the field, treat with an insecticide and rogue out any plant showing TSWV symptoms.

Mechanically transmitted viruses: Tobacco mosaic virus (TMV).
Use resistant varieties.