RUTGERS
New Jersey Agricultural Experiment Station

This is a section from the

2016

Mid-Atlantic

Commercial Vegetable Production Recommendations

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

The full manual, containing recommendations specific to New Jersey, can be found on the Rutgers NJAES website in the Publications section njaes.rutgers.edu

The label is a legally-binding contract between the user and the manufacturer.
The user must follow all rates and restrictions as per label directions.
The use of any pesticide inconsistent with the label directions is a violation of Federal law.

Cooperating Agencies: Rutgers, The State University of New Jersey, U.S. Department of Agriculture, and County Boards of Chosen Freeholders. Rutgers Cooperative Extension, a unit of the Rutgers New Jersey Agricultural Experiment Station, is an equal opportunity program provider and employer.

avoid untreated sclerotia in lower soil layers from infesting the upper soil layer:

Contans--2.0 to 4.0 lb 5.3WG/A

At the beginning of flowering or prior to onset of disease apply:

Endura--8.0 to 11.0 oz 70W/A (7 to 10 day interval, no more than 2 applications per growing season).
Priaxor--6.0 to 8.0 fl oz 4.17SC /A (suppression only)

Fusarium Wilt

Use resistant varieties if available. Plant as early possible minimize crop growth when soil temperatures are ideal for Fusarium wilt development (68 to 72°F).

Viruses

Use resistant varieties when possible and manage aphid populations .

Bacterial Blight

The pathogen can be seedborne so source high quality seed. Avoid walking or moving equipment through fields when vines are wet. This will further spread the disease.

Ascochyta Blight

Ascochyta blight is favored by long periods of leaf wetness and heavy growth of vines that creates a moist chamber effect under the pea vine canopy. Plant fungicide treated seed. Deeply incorporate crop debris immediately after harvest before the fungus can be dispersed by wind or rain. Scout on a regular basis because pathogen can develop and spread rapidly. In fields with a history of blight apply one of the following fungicides preventatively:

azoxystrobin --6.0 to 15.5 fl oz 2.08F/A or OLF
Headline--6.0 to 9.0 fl oz 2.1EC/A
Endura--8.0 to 11.0 oz 70W/A
Priaxor--4.0 to 8.0 fl oz 4.17SC /A (also effective for powdery mildew)

Powdery Mildew

Powdery mildew is favored by warm, dry days and cool nights that lead to dew formation. Disease severity is usually highest in late summer therefore fall plantings are most susceptible. If available, plant resistant or less susceptible cultivars. At first appearance of disease, apply:

sulfur--3.0 to 10.0 lb/A
Endura--8.0 to 11.0 oz 70W/A
Priaxor--4.0 to 8.0 fl oz 4.17SC/A (also effective for Ascochyta blight)

PEPPERS

Recommended Pepper Varieties

Variety[1]	Color[2]	Disease Resistance[3]							
		BLSR	CMV	PVY	PHY	TEV	TM	TMV	TSWV
Bell Type									
Redstart	G/R								
Red Knight	G/R	1-3		R					
Aristotle	G/R	1-3			T		R		
Turnpike	G/R	0-5, 7-9			T				
Early Sunsation	G/Y	1-3							
Karisma	G/R	1-3	T	R				R	
Paladin	G/R				R/T		R		
Revolution	G/R	1-3, 5	T		T				
PS0994-1819	G/R	1-5			T				
Tomcat	G/R	1-5, 7-9				R		R	
Intruder	G/R	1-3			T	R		R	
Delerio	G/O							R	R
Mecate	G/Y	1-3						R	
Declaration	G/R	1-3, 5			T				T
Archimedes	G/R	0-3 ,7, 8			T		R		
Cherry Type									
Cherry Bomb (hot)	G/R							R	
Grandi	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								

Recommended Pepper Varieties *(continued)*

Variety[1]	Color[2]	Disease Resistance[3]							
		BLSR	CMV	PVY	PHY	TEV	TM	TMV	TSWV
Hot Types									
Cheyenne (Cayenne)	G/R								
Mesilla (Cayenne)	G/R			R		R		R	
Nainari (Cayenne)	G/R								
Barajas (Jalapeno)	G/R	1-3							
Campeon (Jalapeno)	G/R	0-3, 7, 8		R					
Compadre (Jalapeno)	G/R								
El Jefe (Jalapeno)	G/R	0-3, 7, 8		R		T			
Grande (Jalapeno)(processing)	G/R			R		R			
New Park (Jalapeno)	G/R	1-3							
Rayo (Jalapeno) (processing)	G/R	1-3							
Numex Joe E. Parker (Anaheim)	G/R								
Banana and Hungarian Types for Fresh or Processing									
Bounty	Y/R								
Boris	Y/R								R
Budapest (hot)	Y/R								
Ethem	Y/R								
Inferno (hot)	Y/R								
Pagaent	Y/R	1-3							
Sopron	Y/R	1-3							
Superette	Y/R								
Sweet Arrow	Y/R								
Sweet Savannah	Y/R								

[1]Varieties listed by maturity within each type, earliest first. All varieties listed are hybrid.
[2]Fruit color: G/R=Green to Red, G/O=Green to Orange, G/Y=Green to Yellow, LY=Light Yellow, LG=Light Green and LG/R=Light Green to Red., Y/R Yellow to Red.
[3]Disease resistance from source seed companies: BLSR=Bacterial Leaf Spot Resistance resistant (races listed); CMV=Cucumber Mosaic Virus (T=tolerant); PHY=*Phytophthora capsici* (T=tolerant and R=resistant); PVY=Potato Virus Y (R=resistant); TEV = Tobacco Etch Virus (T=tolerant and R=resistant); TMV=Tobacco Mosaic Virus (T=tolerance and R=resistant); TM=Tobamovirus Virus (R=resistant); TSWV=Tomato Spotted Wilt Virus (T=tolerance and R=resistant).

Recommended Nutrients Based on Soil Tests

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

		Soil Phosphorus Level				Soil Potassium Level				
Peppers	Pounds N per Acre	Low	Med	High (Opt.)	Very High	Low	Med	High (Opt.)	Very High	Nutrient Timing and Method
		Pounds P_2O_5 per Acre				Pounds K_2O per Acre				
	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 1.0 pound of boron (B) per acre with broadcast fertilizer. See Table B-9 for more specific boron recommendations.
[1]If crop is mulched with plastic but not drip/trickle fertilized, broadcast 150 pounds of nitrogen (N) per acre with phosphorus and potassium fertilizer.
[2]In Virginia, crop replacement values of 50 lbs. P_2O_5 and 50 lbs. K_2O per acre are recommended on soils testing Very High.

Suggested Pepper Fertigation Schedule

This table provides examples of fertigation schedules based on two common scenarios - sandy coastal plain soils and heavier upland soils. It should be modified according to specific soil tests and base fertility.

Fertigation recommendations for 75 lbs N and 125 lbs 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 (lbs/a)[3]			50			100		
			N	N	N	K_2O	K_2O	K_2O
Stage and Description	Weeks	Days	lbs/day	lbs/week	lbs/stage	lbs/day	lbs/week	lbs/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 lbs N and 75 lbs K_20[1,2]

For soils with organic matter content greater than 2% or fine texture and high or optimum K

			Nitrogen			Potash		
Preplant (lbs/a)[3]			50			50		
			N	N	N	K_2O	K_2O	K_2O
Stage and Description	Weeks	Days	lbs/day	lbs/week	lbs/stage	lbs/day	lbs/week	lbs/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]Rates above are based on 7260 linear bed feet per acre (6-ft bed spacing). If beds are closer or wider, fertilizer rates should be adjusted proportionally. Drive rows should not be used in acreage calculations. See Fertigation in section C-Irrigation Management for more information.
[2]Base overall application rate on soil test recommendations.
[3]Applied under plastic mulch to effective bed area using modified broadcast method.
[4]For extended harvest after 10 weeks 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. The following are critical tissue test values for peppers.

Critical pepper tissue test values.

Timing	Value	N	P	K	Ca	Mg	S	Fe	Mn	Zn	B	Cu
		%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm
Most recently matured leaves prior to blossom	**Deficient**	<4.0	0.3	5	0.9	0.35	0.3	<30	30	25	20	5
	Adequate range	4	0.3	5	0.9	0.35	0.3	30	30	25	20	5
		5	0.5	6	1.5	0.6	0.6	150	100	80	50	10
	High	>5.0	0.5	6	1.5	0.6	0.6	>150	100	80	50	10
	Toxic (>)	-	-	-	-	-	-	-	-	-	350	-
Most recently matured leaves at first flower	**Deficient**	<3.0	0.3	2.5	0.9	0.3	0.3	<30	30	25	20	5
	Adequate range	3	0.3	2.5	0.9	0.3	0.3	30	30	25	20	5
		5	0.5	5	1.5	0.5	0.6	150	100	80	50	10
	High	>5.0	0.5	5	1.5	0.5	0.6	>150	100	80	50	10
	Toxic (>)	-	-	-	-	-	-	-	1000	-	350	-
Most recently matured leaves at early fruit set	**Deficient**	<2.9	0.3	2.5	1	0.3	0.3	<30	30	25	20	5
	Adequate range	2.9	0.3	2.5	1	0.3	0.3	30	30	25	20	5
		4	0.4	4	1.5	0.4	0.4	150	100	80	50	10
	High	>4.0	0.4	4	1.5	0.4	0.4	>150	100	80	50	10
	Toxic (>)	-	-	-	-	-	-	-	-	-	350	-

Seed Treatment

Check with your seed company to determine if seed is hot water-treated. Purchase hot water treated seed if possible or request hot water seed treatment. See the Disease Section for more information to prevent disease.

Transplant Production

Sow seed in the greenhouse 6 to 8 weeks before field planting. Seven ounces of seed are necessary to produce plants (10,000) for one acre. Optimum temperatures for germination Temperature is 85°F (29.5°C). 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 cop that grows best at temperatures of 70° to 75°F (21.1° to 23.9°C). Peppers are sensitive to temperature extremes. Poor fruit set and blossom drop can be expected when night temperatures drop below 60°F (15.6°C) or day temperatures rise above 85°F (29.4°C). Transplant into the field May 1 to May 30 for summer harvest. In Virginia and warm areas, transplant July 25 to August 1 for fall harvest. Space rows 4 to 5 feet apart. Set plants 12 to 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 pound of actual boron per acre 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 through the growing season, 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 to 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 to 15 inches apart with plants staggered 12 to 18 inches apart in each of the double rows. Use 5-foot wide plastic for double rows and 4-foot 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- to 2½-foot long by 1¼ x 1½-inch Honduran pine stakes (half-length tomato stakes). Drive stakes 6 to 8 inches into the soil every 4 to 5 feet in the plant row. Tie plants with polyethylene string that is used for staked tomatoes. Tie the first string 7 to 9 inches above the soil when plants are 10 to 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 feet. Then run the string back on the opposite side of the plant row using the same procedure. Allow 3- to 4-foot untied breaks every 100 feet 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 when making a decision about staking peppers. The higher price offered for red peppers increases the potential for profit when staking for the red compared to the green market.

Harvest and Post Harvest Considerations

Harvest green fruit once they have reached full size and the walls are firm. Harvest every 7 to 14 days to achieve maximum yields. Harvest red, yellow, or orange peppers after they turn color. Colored pepper production requires two to four 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, sun scald, and heat damage. Peppers can be brushed or washed after harvest. If peppers are washed in a dump tank, wash water temperature should be 0°-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. 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 85 - 90%. 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 to 3 weeks if handled properly. Dried hot peppers are stored at 32° to 38°F.

Weed Control

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

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

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

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

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

For Weed Control Under Plastic Mulch

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

1. Complete soil tillage, and form raised beds, if desired, prior to applying herbicide(s). Do not apply residual herbicides before forming beds, or herbicide rate and depth of incorporation may be increased, raising the risk of crop injury. When beds are formed and plastic mulch laid in a single pass, the herbicide should be applied after the bed is formed, as a part of the same operation.

2. Apply herbicide(s) recommended for use under plastic mulch in a band as wide as the mulch. Condensation that forms on the underside of the mulch will activate the herbicide. Use the trickle irrigation to provide moisture if the soil is too dry for condensation to form on the underside of the mulch.

3. Complete by laying the plastic mulch and trickle irrigation tubing, if used, immediately after the herbicide application. Delay punching the planting holes until seeding or transplanting.

Note. All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft^2).

Transplants

Fomesafen--0.25 to 0.375 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Reflex 2E to control weeds in transplanted peppers in New Jersey and Virginia only. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, "farmassist.com". Go to the website "farmassist.com" and register (or sign in if previously registered), then under "products" on the toolbar, click on indemnified labels and follow the instructions.** Apply 16 to 24 fl oz/A in Virginia and 16 to 20 fl oz/A in New Jersey after the final bed is formed and the drip tape is laid and immediately prior to laying plastic mulch. Soil must not be disturbed by any mechanical process after application. Unless restricted by other products (e.g. soil sterilants or fumigants), crops may be transplanted immediately following the Reflex application. Pepper transplants must have a minimum of 5 true leaves when planted into soil treated with Reflex. Transplants with fewer than 5 true leaves have a greater risk of injury. Peppers varieties may vary in their response to Reflex; therefore, treat small acreages first to determine crop tolerance, especially when applying to a new variety.

New Jersey: A maximum of 1.25 pint of Reflex **(or a maximum of 0.313 lb ai/A of fomesafen from any product containing fomesafen);** Virginia: A maximum of 1.5 pint of Reflex **(or a maximum of 0.375 lb ai/A of fomesafen from any product containing fomesafen)** may be applied per acre in ALTERNATE years. Be sure to consider rotational crops when deciding to apply fomesafen. If crop is replanted do not re-apply Reflex. Rotational restrictions are dependent on whether fomesafen was applied under the plastic, bare ground, or over plastic mulch, refer to 24(c) label for specifics. Do not harvest within 60 days of application. New Jersey label specifically mentions Bell, Chile, Cooking, and Sweet peppers; Virginia label does not specify pepper type.

S-metolachlor--0.63 to 0.95 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Dual Magnum 7.62E to control weeds in peppers in Delaware, New Jersey, Pennsylvania, and Virginia. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, "farmassist.com". Go to the website "farm assist.com" and register (or sign in if previously registered), then under "products" on the toolbar, click on indemnified labels and follow the instructions.** Apply 0.67 to 1.00 pints per acre Dual Magnum 7.62E to control annual grasses, yellow nutsedge, galinsoga, and certain other broadleaf weeds. Use as a surface-applied pretransplant spray before laying the plastic mulch, or as a directed basal spray after establishment. DO NOT preplant incorporate Dual Magnum. Make only one application during the growing season. DO NOT apply within 65 days of harvest. **Other generic versions of metolachlor and s-metolachlor may be available, and may or may not be labeled for use in the crop. Labeled for use in transplanted bell peppers only in DE, NJ, and PA! Labeled for use in bell, chili, Cubanelle, and tabasco peppers in Delaware, Maryland, and New Jersey.**

Seeded and Transplants

Clomazone--0.25 to 0.50 lb/A. Apply 0.66 to 1.33 pints per acre Command 3ME pretransplant before laying plastic mulch. Use the lower rate on fields with coarse-textured soils low in organic matter, when weed pressure is light, or to minimize herbicide carryover that could affect subsequent crops or a winter crop. Use higher rates on fields with fine-textured soils and those with high organic matter, or to improve control of certain weeds, including

common cocklebur. Command is an excellent broad-spectrum herbicide that will control annual grasses and most broadleaf weeds, except pigweed sp., carpetweed, morningglory sp., and yellow nutsedge. Combine with Devrinol or Dual Magnum (transplants only) to improve the control of carpetweed and pigweed sp. Labeled for use on all varieties including bell, hot, pimento, and sweet (except banana).

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

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

Napropamide--1.0 to 2.0 lb/A. Apply 2.0 to 4.0 quarts per acre Devrinol 2-XT preemergence in a band under the plastic, immediately before laying the mulch. Condensation that forms on the underside of the mulch will activate the herbicide. Annual grasses and certain annual broadleaf weeds will be suppressed or controlled under the mulch and around the plant hole. Use lower rate on coarse-textured or sandy soil. Devrinol may reduce stand and yield of fall grains. Moldboard plowing will reduce the risk of injury to a small grain follow crop.

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

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

1. Complete soil preparation, apply herbicide(s) under the mulch (see above), and lay plastic and trickle irrigation (optional) before herbicide application between the rows.
2. Spray preemergence herbicide(s), registered and recommended for use on the crop in bands onto the soil and the shoulders of the plastic mulch before planting and weeds germinate, **OR** apply after planting as a shielded spray combined with a postemergence herbicide to control emerged weeds**. DO NOT broadcast spray over the plastic mulch at any time!**
3. Incorporate preemergence herbicide into the soil with ½ to 1 inch of rainfall or overhead irrigation within 48 hours of application.
4. Apply Gramoxone in bands to the soil strips between the plastic mulch before the crop emerges or is transplanted, **AND/OR** as a shielded spray postemergence to control emerged weeds. Use in combination with residual herbicides that are registered for use.

Note. All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft^2).

Preplant (surface applied)

Transplants

Fomesafen--0.25 to 0.375 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Reflex 2E to control weeds in transplanted peppers in New Jersey and Virginia only. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, "farmassist.com". Go to the website "farmassist.com" and register (or sign in if previously registered), then under "products" on the toolbar, click on indemnified labels and follow the instructions.** Apply 16 to 24 fl oz/A in Virginia and 16 to 20 fl oz/A in New Jersey as a shielded banded spray directed toward the soil between the rows of plastic mulch pre-transplant.

New Jersey: A maximum of 1.25 pint of Reflex **(or a maximum of 0.313 lb ai/A of fomesafen from any product containing fomesafen);** Virginia: A maximum of 1.5 pint of Reflex **(or a maximum of 0.375 lb ai/A of fomesafen from any product containing fomesafen)** may be applied per acre in ALTERNATE years. Be sure to consider rotational crops when deciding to apply fomesafen. If crop is replanted do not re-apply Reflex. Rotational restrictions are dependent on whether fomesafen was applied under the plastic, bare ground, or over plastic mulch, refer to 24(c) label for specifics. Do not harvest within 60 days of application. New Jersey label specifically mentions Bell, Chile, Cooking, and Sweet peppers; Virginia label does not specify pepper type.

Pendimethalin--0.48 to 1.42 lb/A. Apply 1.0 to 3.0 pints per acre Prowl H_2O as a banded directed shielded spray and activate with one-half inch of rainfall or sprinkler irrigation within 48 hours of application to control most annual grasses and certain broadleaf weeds. Use the lower rate on coarse-textured or sandy soils. **DO NOT apply "over the top" of the crop, or severe injury may occur. Observe a 70 day PHI (PreHarvest Interval). Labeled for use on bell pepper, chili pepper, cooking pepper, pimiento, and sweet pepper.**

S-metolachlor--0.63 to 0.95 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Dual Magnum 7.62E to control weeds in peppers in Delaware, New Jersey, Pennsylvania, and Virginia. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, "farmassist.com". Go to the website "farmassist.com" and register (or sign in if previously registered), then under "products" on the toolbar, click on indemnified labels and follow the instructions.** Apply 0.67 to 1.00 pints per acre Dual Magnum 7.62E to control annual grasses, yellow nutsedge, galinsoga, and certain other broadleaf weeds. Use as a surface-applied banded directed shielded spray, preemergence to the weeds. Posttransplant banded directed shielded sprays should be applied to weed-free soil. Dual Magnum will not control emerged weeds. Control emerged weeds with Gramoxone added to the shielded and directed banded herbicide spray. Make only one application during the growing season. DO NOT apply within 65 days of harvest**. Other generic versions of metolachlor and s-metolachlor may be available, and may or may not be labeled for use in the crop. Labeled for use in**

transplanted bell peppers only in DE, NJ, and PA! Labeled for use in bell, chili, Cubanelle, and tabasco peppers in Delaware, Maryland, and New Jersey.

Seeded and Transplants

Clomazone--0.25 to 0.75 lb/A. Apply 0.66 to 2.00 pints per acre Command 3ME pretransplant as a banded directed shielded spray. Use the lower rate on fields with coarse-textured soils low in organic matter, when weed pressure is light, or to minimize herbicide carryover that could affect subsequent crops or a winter crop. Use higher rates on fields with fine-textured soils and those with high organic matter, or to improve control of certain weeds, including common cocklebur. Command is an excellent broad-spectrum herbicide that will control annual grasses and most broadleaf weeds, except pigweed sp., carpetweed, morningglory sp., and yellow nutsedge. Combine with Devrinol or Treflan (transplants only) to improve the control of carpetweed and pigweed sp. Labeled for use on all varieties including bell, hot, pimento, and sweet (except banana). See WARNING below.

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

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

Napropamide--1.0 to 2.0 lb/A. Apply 2.0 to 4.0 quarts per acre Devrinol 2-XT as a banded directed shielded spray and activate with one-half inch of rainfall or sprinkler irrigation within 48 hours of application to control most annual grasses and certain broadleaf weeds. Use the lower rate on coarse-textured or sandy soils. May reduce stand of and yield of fall grains. Mold board plowing will reduce the risk of injury.

Postemergence

DCPA--6.0 to 10.5 lb/A. Apply 8.0 to 14.0 pints per acre Dacthal 6F 4 to 6 weeks after transplanting for preemergence weed control. Emerged weeds will not be controlled. Dacthal will not injure crop foliage. Spray broadcast when crop is grown without plastic mulch or band between the rows when plastic mulch is used. Controls late season annual grasses, common purslane, and other broadleaf weeds.

Halosulfuron--0.023 to 0.047 lb/A. Apply 0.5 to 1.0 dry ounce Sandea 75WG as a banded directed shielded spray to the soil strips of peppers grown on plastic mulch ONLY to suppress or control yellow nutsedge and broadleaf weeds including common cocklebur, redroot pigweed, smooth pigweed, ragweed species, and galinsoga. Sandea applied postemergence will not control common lambsquarters or eastern black nightshade. Add nonionic surfactant to be 0.25 percent of the spray solution (1 quart per 100 gallons of spray solution). DO NOT use oil concentrate. Susceptible broadleaf weeds usually exhibit injury symptoms within 1 to 2 weeks of treatment. Typical symptoms begin as yellowing in the growing point that spreads to the entire plant and is followed by death of the weed. Injury symptoms are similar when yellow nutsedge is treated but may require 2 to 3 weeks to become evident and up to a month for the weed to die. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. DO NOT apply Sandea to crops treated with a soil applied organophosphate (OP) insecticide, or use a foliar applied organophosphate (OP) insecticide within 21 days before or 7 days after a Sandea application**. DO NOT exceed total of 0.094 pounds per acre, equal to 2.0 dry ounces of Sandea per crop-cycle. DO NOT exceed a total of 0.094 pound per acre, equal to 2 dry ounces of Sandea applied in one year.**

Pendimethalin--0.48 to 1.42 lb/A. Apply 1.0 to 3.0 pints per acre Prowl H_2O as a banded directed shielded spray and activate with one-half inch of rainfall or sprinkler irrigation within 48 hours of application to control most annual grasses and certain broadleaf weeds preemergence. Tank-mix with paraquat to control emerged weeds. Use the lower rate on coarse-textured or sandy soils. **Do NOT apply "over the top" of the crop, or severe injury may occur. Observe a 70 day PHI (PreHarvest Interval). Labeled for use on bell pepper, chili pepper, cooking pepper, pimiento, and sweet pepper.**

Paraquat--0.6 lb/A. Apply 2.4 pints per acre Gramoxone SL 2.0 or OLF as a banded, directed, and shielded spray between the rows ONLY, to control emerged grass and broadleaf weed seedlings. Do not allow spray to contact plants as injury or residues may result. Use shields to prevent spray contact with crop plants. Do not exceed a spray pressure of 30 psi. Add wetting agent as per label.

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

reduced control of grasses may result. Observe a minimum preharvest interval of 20 days.

Sethoxydim--0.2 to 0.3 lb/A. Apply 1.0 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) postemergence as a banded directed shielded spray to control annual grasses and certain perennial grasses. **The use of oil concentrate may increase the risk of crop injury when hot or humid conditions prevail**. To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 20 days and apply no more than 4.5 pints per acre in one season.

For Transplanting Into Soil Without Plastic Mulch (Broadcast Applications)

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

1. Complete soil tillage, apply preplant incorporated herbicide(s), and incorporate. Use a finishing disk or field cultivator that sweeps at least 100% of the soil surface twice, at right angles, operated at a minimum of 7 miles per hour (mph), OR a PTO driven implement once, operated at less than 2 miles per hour (mph).
2. Seed and apply preemergence herbicide(s) immediately after completing soil tillage, and mechanical incorporation of preplant herbicides. Irrigate if rainfall does not occur, to move the herbicide into the soil and improve availability to germinating weed seeds within 2 days of when the field was last tilled, or plan to control escaped weeds by other methods.

Note: All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft^2).

Preplant Incorporated

Transplants

Trifluralin--0.5 to 1.0 lb/A. Apply 1.0 to 2.0 pints per acre Treflan 4E. Incorporate into 2 to 3 inches of soil within 8 hours after application. Slight stunting may result if weather is cool and damp.

Seeded and Transplants

Napropamide--1.0 to 2.0 lb/A. Apply 2.0 to 4.0 quarts per acre Devrinol 2-XT before planting and incorporate 1 to 2 inches deep with power-driven rotary cultivators to control most annual grasses and certain broadleaf weeds. Use lower rate on coarse-textured or sandy soil. Devrinol may reduce stand and yield of fall grains. Moldboard plowing will reduce the risk of injury to a small grain follow crop.

Trifluralin--0.5 to 1.0 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Trilin in Maryland.** Apply 1.0 to 2.0 pints per acre Trilin prior to transplanting. Incorporate to a depth of 3 inches. Use the lower rate on coarse-textured soils low in organic matter, and the higher rate on fine-textured soils with high organic matter. Avoid planting during periods of cold, wet weather to reduce the risk of temporary stunting.

Preplant (soil surface applied)

Transplants

Fomesafen--0.25 to 0.375 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Reflex 2E to control weeds in transplanted peppers in New Jersey and Virginia only. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, "farmassist.com". Go to the website "farmassist.com" and register (or sign in if previously registered), then under "products" on the toolbar, click on indemnified labels and follow the instructions.** ***Transplanted peppers ONLY.*** Apply 16 to 24 fl oz/A in Virginia and 16 to 20 fl oz/A in New Jersey up to 7 days prior to transplanting. Effectiveness may be reduced if untreated soil is exposed during transplanting or other field operations. Transplants with fewer than 5 true leaves have increased risk of injury. Overhead irrigation or rainfall prior to transplanting will activate the herbicide and reduce the risk of injury. Avoid field operations that may concentrate Reflex treated soil around the transplant root ball. During transplanting be sure the soil in the transplant hole settles flush or above surrounding soil surface. Pepper varieties may vary in their response to Reflex; therefore, treat small acreages first to determine crop tolerance, especially when applying to a new variety.

New Jersey: A maximum of 1.25 pint of Reflex **(or a maximum of 0.313 lb ai/A of fomesafen from any product containing fomesafen);** Virginia: A maximum of 1.5 pint of Reflex **(or a maximum of 0.375 lb ai/A of fomesafen from any product containing fomesafen)** may be applied per acre in ALTERNATE years. Be sure to consider rotational crops when deciding to apply fomesafen. If crop is replanted do not re-apply Reflex. Rotational restrictions are dependent on whether fomesafen was applied under the plastic, bare ground, or over plastic mulch, refer to 24(c) label for specifics. Do not harvest within 60 days of application. New Jersey label specifically mentions Bell, Chile, Cooking, and Sweet peppers; Virginia label does not specify pepper type.

S-metolachlor--0.63 to 0.95 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Dual Magnum 7.62E to control weeds in peppers in Delaware, New Jersey, Pennsylvania, and Virginia. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, "farmassist.com". Go to the website "farmassist.com" and register (or sign in if previously registered), then under "products" on the toolbar, click on indemnified labels and follow the instructions.** Apply 0.67 to 1.00 pints per acre Dual Magnum 7.62E to control annual grasses, yellow nutsedge, galinsoga, and certain other broadleaf weeds. Use as a surface-applied pretransplant spray, or as a directed basal spray after establishment. DO NOT preplant incorporate Dual Magnum. Posttransplant directed sprays should be applied to weed-free soil. Dual Magnum will not control emerged weeds. Cultivate and/or hoe to control emerged

weeds before treatment. Make only one application during the growing season. DO NOT apply within 65 days of harvest. **Other generic versions of metolachlor and s-metolachlor may be available, and may or may not be labeled for use in the crop. Labeled for use in transplanted bell peppers only in DE, NJ, and PA! Labeled for use in bell, chili, Cubanelle, and tabasco peppers in Delaware, Maryland, and New Jersey.**

Seeded and Transplants

Clomazone--0.25 to 0.75 lb/A. Apply 0.66 to 2.0 pints per acre Command 3ME pretransplant. Use the lower rate on fields with coarse-textured soils low in organic matter, when weed pressure is light, or to minimize herbicide carryover that could affect subsequent crops or a winter crop. Use higher rates on fields with fine-textured soils and those with high organic matter, or to improve control of certain weeds, including common cocklebur. Command is an excellent broad-spectrum herbicide that will control annual grasses and most broadleaf weeds, except pigweed sp., carpetweed, morningglory sp., and yellow nutsedge. Combine with Devrinol or Treflan (transplants only) to improve the control of carpetweed and pigweed sp. Labeled for use on all varieties including bell, hot, pimento, and sweet (except banana).

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

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

Napropamide--1.0 to 2.0 lb/A. Apply 2.0 to 4.0 quarts per acre Devrinol 2-XT prior to transplanting or seeding. Incorporate with one-half inch of sprinkler irrigation within 48 hours of application to control most annual grasses and certain broadleaf weeds. Use the lower rate on coarse-textured or sandy soils. May reduce stand of and yield of fall grains. Mold board plowing will reduce the risk of injury.

Postemergence

DCPA--6.0 to 10.5 lb/A. Apply 8.0 to 14.0 pints per acre Dacthal 6F 4 to 6 weeks after transplanting for preemergence weed control. Emerged weeds will not be controlled. Dacthal will not injure crop foliage. Controls late season annual grasses, common purslane, and other broadleaf weeds.

Clethodim--0.094 to 0.125 lb/A. Apply 6.0 to 8.0 fluid ounces per acre Select 2EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) or 12.0 to 16.0 fluid ounces of Select Max 0.97EC with nonionic surfactant to be 0.25% of the spray solution (1 quart per 100 gallons of spray solution) postemergence to control many annual and certain perennial grasses, including annual bluegrass. Select will not consistently control goosegrass. The use of oil concentrate with Select 2EC may increase the risk of crop injury when hot or humid conditions prevail. To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 20 days.

Sethoxydim--0.2 to 0.3 lb/A. Apply 1.0 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) postemergence to control annual grasses and certain perennial grasses. The use of oil concentrate may increase the risk of crop injury when hot or humid conditions prevail. To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 20 days and apply no more than 4.5 pints per acre in one season.

Postharvest
With or Without Plastic Mulch

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

Note. All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft^2).

Insect Control

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

NOTE: Copies of specific insecticide product labels can be downloaded by visiting the websites www.CDMS.net or www.greenbook.net. Also, specific labels can be obtained via web search engines.

Beet Armyworm

Apply one of the following formulations:

chlorantraniliprole--**(soil/drip/foliar)** 3.5 to 5.0 fl oz/A Coragen 1.67SC (or other labeled mixtures containing

chlorantraniliprole like Durivo and Voliam flexi, and Voliam Xpress)
cyantraniliprole--**soil** 5.0 to 10.0 fl. oz/A Verimark, **foliar** 7.0 to 13.5 fl. oz/A Exirel
emamectin benzoate--2.4 to 4.8 oz/A Proclaim 5 SG
flubendiamide--1.5 fl oz/A Belt SC (or other labelled mixtures containing flubendiamide like Vetica)
indoxacarb--3.5 oz/A Avaunt 30WDG
methomyl – 1.5 to 3.0 pts/A Lannate LV
methoxyfenozide **(early season**)--4.0 to 8.0 fl oz/A Intrepid 2F; (**late season)--**8.0 to 16.0 fl oz/A Intrepid 2F
spinetoram--5.0 to 10.0 fl oz/A Radiant SC
spinosad--4.0 to 8.0 fl oz/A Entrust SC **OMRI-listed**

Cabbage Looper

Apply one of the following formulations:
acephate **(bell-pepper only)**--0.5 to 1.0 lb/A Orthene 97S (or OLF)
Bacillus thuringiensis--1.0 to 2.0 lb/A Dipel (or OLF) **OMRI-listed**
bifenthrin--2.1 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)
beta-cyfluthrin--2.1 to 2.8 fl oz/A Baythroid XL
chlorantraniliprole--**soil/drip/foliar** 3.5 to 5.0 fl oz/A Coragen 1.67SC (or other labelled mixtures containing chlorantraniliprole like Durivo and Voliam flexi)
cyantraniliprole--**soil** 6.75 to 10 fl. oz/A Verimark; **foliar** 10.0 to 17.0 fl. oz/A Exirel
cyfluthrin--2.1 to 2.8 fl oz/A Tombstone (or OLF)
emamectin benzoate--2.4 to 4.8 oz/A Proclaim 5 SG
esfenvalerate--5.8 to 9.6 fl oz/A Asana XL
flubendiamide--1.5 fl oz/A Belt SC (or other labelled mixtures containing flubendiamide like Vetica)
imidacloprid+beta-cyfluthrin--3.8 to 4.1 fl oz/A Leverage 360
indoxacarb--2.5 to 3.5 oz/A Avaunt 30WDG
lambda-cyhalothrin--0.96 to 1.60 fl oz/A Warrior II **or** 1.92 to 3.20 fl oz/A Lambda-Cy (LambdaT, or OLF) (or other labelled mixtures containing lambda cyhalothrin like Endigo ZC)
lambda-cyhalothrin+chlorantraniliprole--5.0 to 8.0 fl oz/A Voliam Xpress
methomyl--1.5 to 3.0 pts/A Lannate LV
methoxyfenozide (**early season**)--4.0 to 8.0 fl oz/A Intrepid 2F; (**late season**)--8.0 to 16.0 fl oz/A Intrepid 2F permethrin **(sweet, bell-type only)--**4.0 to 8.0 oz/A Perm-Up 3.2 EC (or OLF)
spinetoram--5.0 to 10.0 fl oz/A Radiant SC
spinosad--3.0 to 6.0 fl oz/A Entrust SC **OMRI-listed**
tebufenozide--6.0 to 8.0 fl oz/A (early season), 8.0 to 16.0 fl oz/A (late season) Confirm 2F
zeta-cypermethrin--3.2 to 4.0 fl oz/A Mustang Maxx (or OLF)
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

Cutworms

(Also see Section E in "Soil Pests--Their Detection and Control".)

Preplant
bifenthrin--3.4 to 6.8 fl oz/A Capture LFR

Postplanting Treatment
Apply one of the following formulations:
bifenthrin--2.1 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)
lambda-cyhalothrin--0.96 to 1.60 fl oz/A Warrior II **or** 1.92 to 3.20 fl oz/A Lambda-Cy (LambdaT, or OLF)
lambda-cyhalothrin +chlorantraniliprole--5.0 to 8.0 fl oz/A Voliam Xpress
zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)

European Corn Borer (ECB)

Note. Begin treatments when fruit are ¼ to ½ inch in diameter or larger and ECB moths are being caught in either local pheromone or blacklight traps. Consult your county Extension agent or integrated pest management reports for additional information about trap catches, phenology predictions, and proper timing of sprays for ECB. Apply one of the following formulations:

acephate **(bell pepper only)**--0.75 to 1.00 lb/A Orthene 97S (or OLF)
beta-cyfluthrin--1.6 to 2.8 fl oz/A Baythroid XL (or other labelled mixtures containing beta cyfluthrin like Leverage 360)
bifenthrin--2.1 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)
bifenthrin + imidacloprid--5.1 to 9.85 fl oz/A Brigadier (or OLF)
chlorantraniliprole--**(soil/drip/foliar)** 3.5 to 5.0 fl oz/A Coragen 1.67SC (or other labelled mixtures containing chlorantraniliprole like Durivo and Voliam flexi)
cyantraniliprole--**soil** 10 fl. oz/A (ECB) Verimark; **foliar** 7.0 to 13.5 fl. oz/A Exirel
cyfluthrin--1.6 to 2.8 fl oz/A Tombstone (or OLF)
esfenvalerate--5.8 to 9.6 fl oz/A Asana XL
flubendiamide--1.5 fl oz/A Belt SC (or other labelled mixtures containing flubendiamide like Vetica)
indoxacarb--3.5 oz/A Avaunt 30WDG (or OLF)
lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II **or** 2.56 to 3.84 fl oz/A Lambda-Cy (LambdaT, or OLF) (or other labelled mixtures containing lambda-cyhalothrin like Endigo ZC)
lambda-cyhalothrin +chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress
methomyl—3.0 pts/A Lannate LV
methoxyfenozide (**early season)--**4.0 to 8.0 fl oz/A Intrepid 2F; (**late season**)--8.0 to 16.0 fl oz/A Intrepid 2F
novaluron--9.0 to 12.0 fl oz/A Rimon 0.83EC
permethrin **(sweet, bell-type only)--**8.0 oz/A Perm-Up 3.2 EC or OLF)
spinetoram--5.0 to 10.0 fl oz/A Radiant SC
spinosad--3.0 to 6.0 fl oz/A Entrust SC **OMRI-listed**
tebufenozide--6.0 to 8.0 fl oz/A (early season), 8.0 to 16.0 fl oz/A (late season) Confirm 2F
zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

Fall Armyworm

Apply one of the following formulations:
Bacillus thuringiensis--1.0 to 2.0 lbs/A Dipel (or OLF)
bifenthrin--2.1 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF) (or other labelled mixtures containing bifenthrin like Brigadier)
chlorantraniliprole--**(soil/drip/foliar)** 3.5 to 5.0 fl oz/A

Coragen 1.67SC (or other labelled mixtures containing chlorantraniliprole like Durivo and Voliam flexi)
cyantraniliprole--**soil** 5.0 to 10.0 fl. oz/A Verimark, **foliar** 7.0 to 13.5 fl. oz/A Exirel
emamectin benzoate--2.4 to 4.8 oz/A Proclaim 5SG
flubendiamide--1.5 fl oz/A Belt SC (or other labelled mixtures containing flubendiamide like Vetica)
lambda-cyhalothrin +chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress
methomyl—1.5 to 3.0 pts/A Lannate LV
methoxyfenozide (**early season)--**4.0 to 8.0 fl oz/A Intrepid 2F; (**late season**)--8.0 to 16.0 fl oz/A Intrepid 2F
spinetoram--5.0 to 10.0 fl oz/A Radiant SC
spinosad--4.0 to 8.0 fl oz/A Entrust SC **OMRI-listed**
zeta-cypermethrin--3.2 to 4.0 fl oz/A Mustang Maxx (or OLF)
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

Flea Beetle

Apply one of the following formulations:
beta-cyfluthrin--2.8 fl oz/A Baythroid XL
bifenthrin--2.1 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)
bifenthrin + imidacloprid--5.1 to 9.85 fl oz/A Brigadier (or OLF)
clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC, **foliar** 3.0 to 4.0 fl oz/A Belay 2.13SC
cyantraniliprole--**soil** (at-planting) 6.75 to 13.5 fl. oz/A Verimark
cyfluthrin--2.8 fl oz/A Tombstone (or OLF)
dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL; or 5.0 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG
esfenvalerate--5.8 to 9.6 fl oz/A Asana XL
imidacloprid--**soil** 7.0 to 14.0 fl oz/A Admire Pro (or OLF)
imidacloprid + beta-cyfluthrin--4.1 fl oz/A Leverage 360
lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II **or** 2.56 to 3.84 fl oz/A Lambda-Cy (LambdaT, or OLF)
lambda-cyhalothrin +chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress
permethrin **(sweet, bell-type only)--**4.0 to 8.0 oz/A Perm-Up 3.2EC (or OLF)
thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SG; **foliar** 2.0 to 3.0 oz/A Actara 25WDG
thiamethoxam + chlorantraniliprole--**soil, drip** 10.0 to 13.0 fl oz/A Durivo; **foliar** 4.0 to 7.0 oz/A Voliam Flexi)
zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

Green Peach Aphid

Note. For best green peach aphid control during periods of drought, apply insecticide 2 to 3 days after irrigation. Thorough spray coverage beneath leaves is important when foliar sprays are used. Apply one of the following formulations:

acephate B**ell pepper**--0.5 to 1.0 lb/A Orthene 97S (or OLF); Non-bell pepper: 0.5 lb/A Orthene 97S (or OLF)
acetamiprid--2.0 to 4.0 oz/A Assail 30SG (or OLF)
Chenopodium extract--2.0 to 3.0 qts/A Requiem
clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC, **foliar** 3.0 to 4.0 fl oz/A Belay 2.13SC
flonicamid--2.0 to 2.8 oz/A Beleaf 50SG
flupyradifurone--7.0 to 12.0 fl. oz/A Sivanto 200SL
imidacloprid-- **soil** 7.0 to 14.0 fl oz/A Admire Pro (or OLF), **foliar** 1.3 to 2.2 fl oz/A Admire PRO (or OLF) (or other labeled mixtures containing imidaclorpid like Leverage 360)
methomyl--1.5 to 3.0 pts/A Lannate LV
oxamyl--**foliar** 2.0 to 4.0 pt/A Vydate L
pymetrozine--2.75 oz/A Fulfill 50WDG
spirotetramat--4.0 to 5.0 fl oz/A Movento
thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SG; **foliar** 2.0 to 3.0 oz/A Actara 25WDG
(or other labeled mixtures containing thiamethoxam like Durivo, Voliam flexi, or Endigo ZC)

Leafminers

Apply one of the following formulations:
abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7SC (or OLF)
chlorantraniliprole--**(soil/drip/foliar)** 5.0 to 7.5 fl oz/A Coragen 1.67SC (larvae only)
cyantraniliprole--**soil** 6.75 to 10.0 fl. oz (drip or injection), 6.75 to 13.5 fl. oz (at-planting) Verimark, **foliar** 13.5 to 20.5 fl. oz/A Exirel
cyromazine--2.66 oz/A Trigard 75WSP
dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL; or 5.0 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG
emamectin benzoate--3.2 to 4.8 oz/A Proclaim 5SG
lambda-cyhalothrin + chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress
oxamyl--**foliar** 2.0 to 4.0 pt/A Vydate L
permethrin **(sweet, bell-type only)--**4.0 to 8.0 fl oz/A Perm-up 3.2, Permethrin 3.2 (or OLF)
spinetoram--6.0 to 10.0 fl oz/A Radiant SC
spinosad--6.0 to 10.0 fl oz/A Entrust SC **OMRI-listed**

Mites

Apply one of the following formulations:
abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7SC (or OLF)
bifenazate--0.75 to 1.00 lb/A Acramite 50WS
etoxazole--2.0 to 3.0 oz/A Zeal Miticide[1]
fenpyroximate--2.0 pts/A Portal
spiromesifen--7.0 to 8.5 fl oz/A Oberon 2S

Pepper Maggot

Pepper maggot flies are active from June 1 to mid-August. Apply one of the following formulations:

bifenthrin + imidacloprid--5.1 to 9.85 fl oz/A Brigadier (or OLF) (adults only)
dimethoate--0.50 to 0.66 pt/A Dimethoate 400 4EC (or OLF)
malathion--2.5 fl oz/A Malathion 57EC
zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF) (adults only)
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC (adults only)

Note: Use of acephate for corn borer control in bell peppers will reduce pepper maggot infestations.

Pepper Weevil (PW)

PW is a pest occasionally imported on older transplants or transplants with flowers or fruit. Apply one of the following formulations:

acetamiprid--2.5 to 4.0 oz/A Assail 30SG (or OLF)
bifenthrin--2.1 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)
bifenthrin + imidacloprid--5.1 to 9.85 fl oz/A Brigadier (or OLF)

clothianidin--**foliar** 3.0 to 4.0 fl oz/A Belay 2.13SC
dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL; or 5.0 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG
imidacloprid--**foliar only** 2.2 fl oz/A Admire PRO (or OLF)
lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II **or** 2.56 to 3.84 fl oz/A Lambda-Cy (LambdaT, or OLF) (adults only)
lambda-cyhalothrin + chlorantraniliprole – 6.0 to 9.0 fl oz/A Voliam Xpress (adults only)
novaluron--9.0 to 12.0 fl oz/A Rimon 0.83Ec
oxamyl--**foliar** 2.0 to 4.0 pts/A Vydate L
permethrin **(sweet, bell pepper only)--**4.0 to 8.0 oz/A Perm-Up 3.2 EC (or OLF)
thiamethoxam--**foliar only** 3.0 to 5.5 oz/A Actara 25WDG
thiamethoxam + chlorantraniliprole--4.0 to 7.0 oz/A Voliam Flexi
zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

Stink bugs

Apply one of the following formulations:
beta-cyfluthrin--1.6 to 2.8 fl oz/A Baythroid XL
bifenthrin--2.1 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)
bifenthrin + imidacloprid--5.1 to 9.85 fl oz/A Brigadier (or OLF)
clothianidin--**foliar** 3.0 to 4.0 fl oz/A Belay 2.13SC
cyfluthrin--1.6 to 2.8 fl oz/A Tombstone (or OLF)
dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL; or 5.0 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG
fenpropathrin **green stinkbug only**--10.67 fl oz/A Danitol 2.4 EC
imidacloprid +beta-cyfluthrin--3.8 to 4.1 fl oz/A Leverage 360
lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II **or** 2.56 to 3.84 fl oz/A Lambda-Cy (LambdaT, or OLF) (or other labeled mixtures containing lambda-cyhalothrin like Voliam Xpress)
lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo ZC
methomyl–Lannate LV (see label for rates and current registration status)
thiamethoxam--**foliar** 3.0 to 5.5 oz/A Actara 25WDG (or other labeled mixtures containing thiamethoxam like Durivo and Voliam flexi)
zeta-cypermethrin--3.2 to 4.0 fl oz/A Mustang Maxx (or OLF)
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

Thrips

Diseased plants should be rogued out. After spraying for thrips, place diseased plants in a plastic bag and remove from the field. Several species of thrips spread Tomato Spotted Wilt Virus. Scout for thrips and begin treatments when observed. Do not produce vegetable transplants with bedding plants in the same greenhouse. Apply one of the following formulations:

acetamiprid--4.0 oz/A Assail 30SG (or OLF)
beta-cyfluthrin--2.1 to 2.8 fl oz/A Baythroid XL
bifenthrin--2.1 to 6.4 fl oz/A Bifenture 2EC(Sniper, or OLF)
cyfluthrin--2.1 to 2.8 fl oz/A Tombstone (or OLF)
dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL; or 5.0 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG
imidacloprid--**soil only** 7.0 to 14.0 fl oz/A Admire Pro (or OLF) (foliage feeding thrips only)
imidacloprid +beta-cyfluthrin--3.8 to 4.1 fl oz/A Leverage 360 (foliage feeding thrips only)
oxamyl--2.0 to 4.0 pts/A Vydate L
spinetoram--6.0 to 10.0 fl oz/A Radiant SC
spinosad--4.0 to 8.0 fl oz/A Entrust SC **OMRI-listed**
thiamethoxam--**soil only** 1.66 to 3.67 oz/A Platinum 75SG
zeta-cypermethrin+bifenthrin--10.3 fl oz/A Hero EC

Tomato Fruitworm also called Corn Earworm (CEW), Hornworms (HW)

Apply one of the following formulations:
beta-cyfluthrin--1.6 to 2.8 fl oz/A Baythroid XL (or other labeled mixtures containing beta-cyfluthrin like Leverage 360)
bifenthrin--2.1 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)
chlorantraniliprole--**(soil/drip/foliar)** 3.5 to 5.0 fl oz/A Coragen 1.67SC (or other labeled mixtures containing chlorantraniliprole like Durivo and Voliam flexi)
cyantraniliprole--**soil** 5.0 to 10.0 fl. oz/A Verimark; **foliar** 7.0 to 13.5 fl. oz/A Exirel
cyfluthrin--1.6 to 2.8 fl oz/A Tombstone (or OLF)
emamectin benzoate **(HW only)**--2.4 to 4.8 oz/A Proclaim 5SG
esfenvalerate (**CEW only**)--5.8 to 9.6 fl oz/A Asana XL
flubendiamide--1.5 fl oz/A Belt SC (or other labeled mixtures containing flubendiamide like Vetica)
indoxacarb--2.5 to 3.5 oz/A (HW), 3.5 oz/A (CEW) Avaunt 30WDG
lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II **or** 2.56 to 3.84 fl oz/A Lambda-Cy (LambdaT, or OLF) (or other labeled mixtures containing lambda-cyhalothrin like Endigo ZC)
lambda-cyhalothrin +chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress
novaluron--9.0 to 12.0 fl oz/A Rimon 0.83EC
permethrin **(sweet, bell-type only)--**4.0 to 8.0 fl oz/A Perm-up 3.2, Permethrin 3.2 (or OLF)
spinetoram--5.0 to 10.0 fl oz/A Radiant SC
spinosad--3.0 to 6.0 fl oz/A Entrust SC **OMRI-listed**
tebufenozide--6.0 to 8.0 fl oz/A (early season), 8.0 to 16.0 fl oz/A (late season) Confirm 2F
zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)
zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

Pesticide	Use Category[1]	Hours to Reentry	Days to Harvest[2]
INSECTICIDE			
abamectin	R	12	7
acephate (bell pepper only)	G	24	7
acetamiprid	G	12	7
Bacillus thuringiensis	G	4	0
beta-cyfluthrin	R	12	7
bifenthrin	R	12	7
bifenthrin + imidacloprid	R	12	7
bifenazate	G	12	3
Chenopodium extract	G	4	0
chlorantraniliprole (soil/drip/foliar)	G	4	1
clothianidin(soil/foliar)	G	12	21/1

(table continued next page)

Pesticide	Use Category[1]	Hours to Reentry	Days to Harvest[2]
INSECTICIDE *(cont'd)*			
cyantraniliprole (soil/foliar)	G	4/12	1
cyfluthrin	R	12	7
cyromazine	G	12	0
dimethoate	R	48	see label
dinotefuran(soil/foliar)	G	12	21/1
emamectin benzoate	R	12	7
esfenvalerate	R	12	7
etoxazole	G	12	7
fenpropathrin	R	24	3
fenpyroximate	G	12	1
flonicamid	G	12	0
flubendiamide	G	12	1
flubendiamide+buprofezin	G	12	1
flupyradifuzone	G	4	1
imidacloprid (soil/foliar)	G	12	21/0
imidacloprid+beta-cyfluthrin	R	12	7
indoxacarb	G	12	3
lambda-cyhalothrin	R	24	5
lambda-cyhalothrin+ chlorantraniliprole	R	24	5
lambda-cyhalothrin+ thiamethoxam	R	24	5
malathion	G	12	3
methomyl	R	48	3
methoxyfenozide	G	4	1
novaluron	G	12	1
oxamyl	R	48	7
permethrin (**bell pepper only**)	R	12	3
pymetrozine	G	12	0
spinetoram	G	4	1
spinosad	G	4	1
spriomesifen	G	12	1
spirotetramat	G	24	1
tebufenozide	G	12	7
thiamethoxam (soil/foliar)	G	12	30/0
thiamethoxam+chlorantraniliprole **(soil/foliar)**	G	12	30/1
zeta-cypermethrin	R	12	1
zeta-cypermethrin+bifenthrin	R	12	7
FUNGICIDE (FRAC code)			
Agri-Mycin/Agri-Strep (Group 25)	G	12	AP
Aprovia Top (Groups 3 + 7)	G	12	0
azoxystrobin (Group 11)	G	4	0
Cabrio (Group 11)	G	12	0
chlorothalonil (Group M5)	G	12	3
copper, fixed (Group M1)	G	see label	0
Flint (Group 11)	G	12	3
Forum (Group 40)	G	12	4
Manzate Pro-Stick (Group M3)	G	24	7
MetaStar (Group 4)	G	48	7
Presidio (Group 43)	G	12	2
Priaxor (Groups 7 + 11)	G	17	7
Ranman (Group 21)	G	12	0
Revus (Group 40)	G	12	1
Ridomil Gold (Group 4)	G	12	7
Ridomil Gold Copper (Groups 4 + M1)	G	48	7
Tanos (Groups 11 +27)	G	12	3
Terraclor (Group 14)	G	12	--
Ultra Flourish (Group 4)	G	12	7
Uniform (Groups 4 + 11)	G	0	AP
Zampro (Groups 40 + 45)	G	12	4

(table continued)

See Table D-6.

[1] G = general, R = restricted;

[2] AP=At Plant

Nematode Control

See Chapter E "Nematodes" section of Soil Pests--Their Detection and Control. Use fumigants listed in the "Soil Fumigation" section or use oxamyl (Vydate L) for control. Consult label before use. Nimitz 4EC--3.5 to 5.0 pts/A. Incorporate or drip-apply 7 days before planting.

Disease Control

Seed Treatment

Purchase hot water treated seed if possible or request hot water seed treatment. Heat treatment of seeds is a non-chemical 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 that may be found within the seed coat. Heat treatment is particularly useful for crops, such as pepper and tomato, that are prone to seed-borne bacterial infections. 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. The initial pre-heat cycle is for 10 minutes at 100ºF (37ºC) followed by the effective temperature. Soak pepper seed at 125^{o}F (51^{o}) for 30 minutes. Immediately after removal from the second bath, seeds should be rinsed with cool water to stop the heating process. Afterward, seeds should be dried on screen or paper. Pelleted seed is not recommended for heat treatment. Heat treat only seed that will be used during the current production season.

Following either treatment above, dry the seed, then dust with Captan 50WP or Thiram 480DP at 1 level teaspoon per pound of seed (3 oz/ 100 lb). See Table E-13 for additional seed treatment options.

Damping-Off

Use the disease-free planting mix described in Tables A-2 and A-3. Consideration should be given to using soilless mixes containing microorganisms that suppress damping-off fungi.

azoxystrobin--0.40 to 0.80 fl oz 2.08F/A per 1000 ft/row or OLF at transplanting will help suppress Rhizoctonia root rot

Transplants that have been sitting in flats for extended periods prior to transplanting and/or slow to establish after setting are prone to Rhizoctonia root rot.

A Section 2ee has been granted for the use of Previcur Flex--1.2 pt 4F/A at transplanting and will help suppress Pythium root rot. Can be applied via drip or tank mixed with Admire Pro when setting transplants (see Section 2ee).

See Phytophthora blight control below.

Bacterial Leaf Spot

The best method for limiting loss due to bacterial leaf spot is to plant BLS resistant cultivars. Races 1,2,3,4,5 and race 6 have been identified in areas of the region. There are a number of bell pepper cultivars that have resistance to races 1 through 5 of the pathogen (see Varieties Table). In fields with a history of bacterial leaf spot, only plant cultivars that have bacterial leaf spot resistance. When producing transplants, be sure to use heat seed treatment or Clorox described under the preceding "Seed Treatment" section. Purchase heat-treated seed or disease-free transplants. In some years, there can be a high risk of developing bacterial leaf spot when using southern-produced transplants. Be sure to purchase only certified transplants. Prior to transplanting, apply streptomycin (Agri-Mycin 17, Agri-Strep) sprays (1.0 lbs per 100 gallons, 1¼ teaspoons per gallon) when first true leaves appear and continue every 4 to 5 days until transplanting. Streptomycin cannot be used on transplants after they are transplanted in field.

Loss from bacterial spot may be reduced by maintaining a high level of fertility. Maintaining high fertility levels will stimulate additional leaf formation to replace those lost from bacterial spot infections. However, sufficient restraint must be used 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 field 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, applying fixed copper at labeled rates. If necessary, begin preventative fungicide applications shortly after transplanting and repeat every 7 to 10 days, especially if symptoms of bacterial leaf spot are present during transplant production and/or on transplants. A Section 2ee for the use of Quintec for the suppression of bacterial leaf spot in pepper has been granted for all states in mid-Atlantic region.

Quintec--6.0 fl oz 2.08F/A

Actigard can be used to reduce bacterial spot severity in hot peppers. Begin applications within one week of transplanting using 0.33 oz/acre.in 30-50 gallons of water. Increase the rate to 0.5 oz/acre in 60-70 gallons of water 3 to 4 weeks after transplanting. Applications of 0.75 oz/acre can be made from 5-8 weeks after transplanting in 70-100 gallons of water per acre. Be sure to avoid using Actigard on drought-stressed plants.

Anthracnose Fruit Rot

Anthracnose fruit rot is increasing in the mid-Atlantic region. 'Hot spots' typically develop in areas of field with prior history of anthracnose, especially in fields where peppers or tomatoes have been extensively grown in the past. Heavy winds and rain help spread spores of pathogen to healthy areas of field. Excessive fertility programs may also help creates dense canopies which reduces fungicide control and create microclimates conducive for fruit infection. Scout on a regular basis as fruit begin to develop. Use adequate water volume when spraying to insure good penetration into canopy. Apply preventative applications starting at bloom before the onset of fruit infections, especially in fields with history of the disease. Removing infected fruit from heavily infested areas of field has been shown to help reduce inoculum loads and reduce spread of the disease if done early and often enough.

***Beginning at flowering apply on a 7 day schedule*:**

Alternate:

chlorothalonil--1.5 pt/A 6F or OLF
Manzate Pro-Stick--1.6 to 3.2 lb 75DF/A

With a tank mix containing chlorothalonil at 1.5 pt/A or Manzate Pro-Stick at 1.6 lb/A and one of the following FRAC code 11 fungicides:

azoxystrobin--6.2 to 15.5 fl oz 2.08F/A or OLF
Cabrio--8.0 to 12.0 oz 20EG/A
Priaxor--4.0 to 8.0 fl oz 4.17SC/A

Or one of the following with a tank mix containing chlorothalonil at 1.5 pt/A or Manzate Pro-Stick at 1.6 lb/A

Quadris Top--8.0 to 14.0 fl oz 2.72SC/A
Aprovia Top--10.5-13.5 fl oz

Do not make more than two consecutive applications of any FRAC code 11 fungicide.

Bacterial Soft Rot

During periods of humid weather, the stem ends of harvested peppers may turn brown due to bacterial soft rot. If necessary, pack peppers dry without washing to minimize soft rot losses. If peppers must be washed, maintain 25 ppm of chlorine (1 tablespoon of Clorox per 8 gallons of water) in the wash water. Avoid washing peppers with water more than $10^{o}F$ ($6^{o}C$) 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 typicially develops in low-lying areas of fields after rain and can spread quickly throughout the entire field. 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 and snap beans, eggplants, or tomatoes. In fields with low-lying or wet areas, plant only Phytophthora-tolerant cultivars such as 'Paladin', 'Aristotle', or 'Revolution'. See Table above. In heavily-infested fields with a known history of Phytophthora blight, plant only resistant/tolerant cultivars to help reduce plant losses. If mefenoxam-insensitivity is known to exist in a field/farm, plant only tolerant cultivars. Do not apply mefenoxam or metalaxyl in fields where insensitivity is known to exist.

For control of the crown rot phase of Phytophthora blight, apply one of the following:

mefenoxam--1.0 pt Ridomil Gold 4SL/A or 1.0 qt Ultra Flourish 2E/A or metalaxyl (MetaStar)--4.0 to 8.0 pt 2E/A at transplanting and 30 days later
Presidio--3.0 to 4.0 fl oz 4SC/A
Ranman--2.75 fl oz 400SC/A (may be applied via transplant water (see label for restrictions)

When using polyethylene mulch, apply Ridomil Gold, Ultra Flourish, Ranman, or Presidio at the above rates and timing by injection through the drip irrigation system. Dilute prior to injecting to prevent damage to injector pump. Only apply Ridomil Gold 4SL at transplanting and 30 days later.

Apply Presidio or Ranman via drip between Ridomil applications.

For prevention of the aerial stem and fruit rot phase of blight:

The following materials are labeled for suppression of the aerial phase of Phytophthora blight on pepper fruit. For best results tank mix one of the following with a copper containing fungicide and rotate on a 7 day schedule with 2.5 lb Ridomil Gold Copper 65WP/A.

Alternate one of the following:

Presidio--3.0 to 4.0 fl oz 4SC/A *plus* fixed copper at labeled rates

Revus--8.0 fl oz 2.08SC/A *plus* fixed copper at labeled rates

Ranman--2.75 fl oz 400SC/A *plus* a non-ionic surfactant

Forum--6.0 fl oz 4.18SC/A *plus* fixed copper at labeled rates

Zampro--14.0 fl oz 525SC/A *plus* fixed copper at labeled rates

With:

Ridomil Gold Copper--2.5 lb 65WP/A.

Blossom End Rot

This physiological disorder is caused by reduced calcium uptake and calcium movement into the fruit when soil moisture is low. To control blossom end rot, maintain proper soil calcium and nutrient balance. Avoid root pruning and damage. The most effective control is to maintain 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.

Sunscald

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

Southern Blight (*Sclerotium*)

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:

Terraclor--3.0 lb 75WP/100 gal of water or OLF and apply 0.5 pint per plant.

azoxystrobin--15.5 fl oz 2.08F/A or OLF as a directed spray may help suppress southern blight.

Verticillium Wilt

The soil-borne fungus can infect a number of crops including eggplant, tomato, pepper, potato, and strawberries and can survive in the soil for many years. Therefore, a long, proper crop rotation is necessary to reduce losses due to verticillium wilt. 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

Early season cold injury can often result in virus-like mosaic and distortion symptoms in actively growing young plants in the spring following cooler than normal temperatures. In past instances, entire fields or blocks look symptomatic. Early-season transplants will grow out of problem over time.

Tobacco mosaic virus (TMV): TMV is transmitted echanically. Use resistant varieties to control TMV.

Aphid-transmitted viruses (PVX, CMV, TEV, PVY, and AMV): CMV 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 developing leaves may develop mosaic symptoms. The positive identification of pepper viruses with laboratory tests can be difficult. Importantly, these viruses of pepper cannot adequately be 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 winged aphids occur. Repeated applications of a contact aphicide at those times are most beneficial.

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

Skin separation or “silvering” of bell pepper fruit

Skin separation or ‘silvering’ in bell pepper fruit reduces aesthetic fruit quality. Research in New Jersey has shown that phytophthora-tolerant bell pepper cultivars (such as ‘Paladin’ and ‘Aristotle’) are more prone to the development of skin separation or ‘silvering’ in fruit compared to phytophthora-susceptible varieties such as ‘Alliance’ or ‘Camelot’.