



This is a section from the

2020/2021

Mid-Atlantic

Commercial Vegetable

Production Recommendations

The recommendations are **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: <http://njaes.rutgers.edu/pubs/publication.asp?pid=E001>.

This manual will be revised biennially. In January 2021, a **critical update** with important updates to the 2020/2021 manual will be communicated through local Extension Agents and Vegetable Specialists.

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.

F. Commodity Recommendations

Pesticide Use Disclaimer

THE LABEL IS THE LAW

Before using a pesticide, check the label for up to date rates and restrictions.

Labels can be downloaded from: <http://www.cdms.net/>, <https://www.greenbook.net/> or <http://www.agrian.com/labelcenter/results.cfm>

For more information on Pesticide Safety and the Pesticide Label see chapter D.

Guide to the Recommended Pesticide Tables in the Following Crop Sections:

1. Pesticides are listed by group or code number based on chemical structure and mechanism of action, as classified by the Weed Science Society of America (WSSA) for herbicides, the Insecticide Resistance Action Committee (IRAC) for insecticides, and the Fungicide Resistance Action Committee (FRAC) for fungicides.

If the number is in bold font, the product may have resistance concerns.

2. For restricted use pesticides, the restricted active ingredients are labeled with a *. (See section D 3.2.1 “Restricted Use Classification Statement” for more information).

3. In addition to the pesticides listed below, other formulations or brands with the same active ingredient(s) may be available. ALWAYS CHECK THE LABEL:

- a) to ensure a pesticide is labeled for the same use,**
- b) to ensure the pesticide is labeled for the desired crop, and**
- c) for additional restrictions.**

4. All pesticide recommendations are made for spraying a broadcast area of 1 acre (43,560 square feet). **Adjust the rate for banded applications** (for more information, see section E 1.3 Calibrating Granular Applicators).

5. Check the label for the maximum amount of pesticide per application and the maximum number of applications per year.

6. Bee Toxicity Rating (Bee TR): N=nontoxic; L=minimum impact on bees; M=moderately toxic, can be used if dosage, timing and method of application are correct, but should NOT be applied directly to the crop if bees are present; H=highly toxic, severe losses expected, -- = data not available.

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.

Peppers		Soil Phosphorus Level				Soil Potassium Level				Nutrient Timing and Method
		Low	Med	High (Opt)	Very High	Low	Med	High (Opt)	Very High	
	N (lb/A)	P ₂ O ₅ (lb/A)				K ₂ O (lb/A)				
	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. ¹If crop is mulched with plastic but not drip/trickle fertilized, broadcast 150 lb/A of N with P and K fertilizer. ²In VA, crop replacement values of 50 lb/A of P₂O₅ and 50 lb/A of K₂O 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 ₂ O ^{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 ₂ O	K ₂ O	K ₂ O
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 K ₂ O ^{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 ₂ O	K ₂ O	K ₂ O
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

¹Based 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). ²Base overall application rate on soil tests. ³Applied under plastic mulch to effective bed area using modified broadcast method. ⁴For 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.

F Peppers

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	<i>Chromobacterium subsugae</i>	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	<i>Bacillus thuringiensis aizawai</i>	0	4	N
11A	Dipel DF, others (OMRI)	1.0 to 2.0 lb/A	<i>Bacillus thuringiensis kurstaki</i>	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	Spears 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 occasionally 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	cyflaniliprole	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

F Peppers

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 IEC	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.					

Note: 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	cyfluaniliprole	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	<i>Chenopodium</i> extract	0	4	L

¹Resistance 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

F Peppers

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

¹Can 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) (*= R estricted 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 be 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) (*= R estricted 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

¹Copper based OMRI approved products for suppression of BLS are available; see labels for rates. ²Copper 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

F Peppers

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	--

¹Apply at transplanting and 30 d later. ²May also be applied via transplant water (see label for restrictions). ³Apply Presidio or Ranman via drip between mefenoxam/metalaxyl applications. ⁴If 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.

For Immediate Medical Attention

Call 911

**For a Pesticide Exposure Poisoning
Emergency Call**



For All States

This number will automatically connect you to the poison center nearest to you.

Anyone with a poisoning emergency can call the toll-free telephone number for help. Personnel at the Center will give you first-aid information and direct you to local treatment centers if necessary.

For Pesticide Spills

Small Spills: See the product label for cleanup advice.

Large spills: Call the National Response Center at 1-800-424-8802 or CHEMTREC at 800-424-9300 (24 hours) - Industry assistance with emergency response cleanup procedures for large, dangerous spills.

Be aware of your responsibility to report spills to the proper state agency.