RUTGERS
New Jersey Agricultural Experiment Station

This is a section from the

2022/2023
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 2023, a Critical Update** with important updates to the 2022/2023 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 Commissioners. 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 labeling distributed with the product at the point of sale for legally enforceable rates and use restrictions and precautions. Although labels are available on the Internet from electronic label services such as CDMS (*http://www.cdms.net/*), Greenbook (*https://www.greenbook.net*), or Agrian (*https://www.agrian.com/labelcenter/results.cfm)* the information contained in these electronic labels may not be identical to the labeling distributed with the product. **Please be advised that these electronic label services provide use disclaimers, and in some cases legally binding *User Agreements* assigning all liability to user of service. (**See section D 3.1. Labels and Labeling for more detail.)

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

1. Pesticides are listed by **group number or code based on chemical structure and mechanism of action**, as classified by the Herbicide Resistance Action Committee (**HRAC**, *https://hracglobal.com/*) for herbicides, the Insecticide Resistance Action Committee (**IRAC**, *https://irac-online.org/*) for insecticides, and the Fungicide Resistance Action Committee (**FRAC, *https***://www.frac.info/[3]) for fungicides.
   In this guide, if the group number or code is in bold font, there are resistance concerns for the product.

2. **Restricted use pesticides** are marked with a * in the Tables. These products may only be used by certified and/or licensed pesticide applicators, and when stated on the label, those making applications under their direct supervision. Some labels may restrict use solely to certified and/or licensed applicators. (See section D 3.2.1 Restricted Use Classification Statement for more detail).

3. **In addition to the pesticide products listed in the Commodity Recommendations below, other formulations or brands with the same active ingredient(s) may be commercially available. ALWAYS CHECK THE INDIVIDUAL PRODUCT LABELING:**
   a) to ensure a pesticide is labeled for the same intended use,
   b) to ensure the pesticide is labeled for the desired crop,
   c) for differences in application rates and % active ingredient(s), and
   d) additional restrictions.

4. All pesticide recommendations contained in this document are prescribed for spray applications to a **broadcast area of 1 acre** (43,560 square feet). **Adjust the rate accordingly for banded applications** (See section E 1.3. Calibrating Granular Applicators) **or for chemigation** (check labels for amounts per 1,000 feet).

5. Check the label for and do not exceed 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.

7. In accordance with the USDA National Organic Program, the Organic Materials Research Institute (OMRI) maintains a directory of all products that OMRI has determined are allowed for use in organic production, processing, and handling. These products are catalogued online in the **OMRI Products List** (see *https://www.omri.org/omri-lists*).

Cucumbers

For earlier cucumber production and higher, more concentrated yields, use gynoecious varieties. A gynoecious plant produces a high percentage of female flowers and fruit. To produce pollen, 1 to 15% of pollinator must be planted and seed companies add this seed to the gynoecious variety. Both pickling and slicing gynoecious varieties are available. Parthenocarpic cucumbers that produce fruit without pollination are also available for protected culture and field production.

Recommended Varieties

Type	Variety[1]	Days	F1[2]	Type[3]	Use[4]	Reported Disease Resistance[5]								
						Scab (Ccu)	PM (Px)	AN (Co)	DM[6] (Pcu)	ALS (Psl)	CMV	WMV	ZMV	PRSV
Standard Slicing Varieties	Bristol	54	Yes	Gyn	F	X	X	X		X	X	X	X	X
	Dasher II	58	Yes	Gyn	F	X	X	X		X	X			
	Dominator	55	Yes	Gyn	F	X	X	X		X	X			
	General Lee	66	Yes	Gyn	F	X	X				X			
	Intimidator	53	Yes	Gyn	F	X	X	X		X	X			
	Mongoose	55	Yes	Gyn	F	X	X	X		X	X	X	X	X
	Speedway	56	Yes	Gyn	F	X	X	X		X	X			
	Stonewall	53	Yes	Gyn	F	X	X	X		X	X			
	SV4719CS	56	Yes	Gyn	F	X	X	X	X	X			X	
	Thunder	58	Yes	Gyn	F	X	X	X		X	X		X	
Slicers Long Types	Suyo Long	61	No	Mon	F		X							
	Tasty Green	52	Yes	Mon	F		X							
Pickles	Bernstein	52	Yes	Parth	MHP	X	X							
	Bowie	51	Yes	Parth	MP	X	X							
	Citadel	52	Yes	Gyn	HMP	X	X	X	X	X	X			
	Eureka	57	Yes	Mon	HF	X	X	X		X	X	X		X
	Expedition	50	Yes	Gyn	MP	X	X	X		X	X			
	Jackson Supr.	52	Yes	Gyn	HMFP	X	X	X		X	X			
	Lennon	51	Yes	Parth	MPH	X	X							
	Liszt	51	Yes	Parth	MP	X	X							
	Logan	51	Yes	Gyn	MP	X	X	X		X	X			
	Max Pack	57	Yes	Mon	FH	X	X	X		X	X	X	X	X
	Peacemaker	52	Yes	Gyn	MHP	X	X	X	X	X	X			
	Puccini	50	Yes	Parth	HMFP	X	X	X		X	X			
	Rubenstein	51	Yes	Parth	MP	X	X							
	SV7140CN	50	Yes	Gyn	MP	X	X	X		X	X			
	SVCN6404	52	Yes	Gyn	MHP	X	X	X	X	X	X			
	Vlaspik	51	Yes	Gyn	MP	X	X	X		X	X			
	V5016	49	Yes	Parth	MHP	X	X							
	V5025	49	Yes	Parth	MHP	X	X							
	V5031	49	Yes	Parth	MHP	X	X							
Protected Culture / High Tunnels	Corinto	48	Yes	Parth	F	X					X			
	Cucapa	48	Yes	Parth	F		X				X			
	Excelsior	50	Yes	Parth	F	X	X				X			
	Lisboa	60	Yes	Parth	F	X								
	Picolino	45	Yes	Parth	F		X				X			
	Rocky	46	Yes	Parth	F	X	X							
	Socrates	52	Yes	Parth	F	X	X							

[1]**Listed alphabetically within type**.
[2]Hybrid.
[3]Gyn=Gynoecious or mostly female flowers; 5-15% of a monoecious pollinizer variety added; Mon=Monoecious type with female and male flowers; Parth=Parthenocarpic type that sets fruit without pollination.
[4]F=Fresh Market, P=Processing (pickling), H=Hand harvest multiple times, M=Machine harvest once.
[5]X=high or intermediate level of resistance to Scab, PM=Powdery Mildew, AN=Anthracnose, DM=Downy Mildew, ALS=Angular Leaf Spot, CMV=Cucumber Mosaic Virus, WMV=Watermelon Mosaic Virus, ZMV=Zucchini Yellows Mosaic Virus, PRSV=Papaya Ring Spot Virus.
[6]Only varieties with some resistance to Downy Mildew are noted with an X.

Recommended Nutrients Based on Soil Tests

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

		Soil Phosphorus Level				Soil Potassium Level				
		Low	Med	High (Opt)	Very High	Low	Med	High (Opt)	Very High	
Cucumbers[1]	**N (lb/A)**	**P_2O_5 (lb/A)**				**K_2O (lb/A)**				**Nutrient Timing and Method**
	80-150	150	100	50	0[2]	200	150	100	0[2]	Total nutrient recommended
	25-50	125	75	25	0[2]	175	125	75	0[2]	Broadcast and disk-in
	25	25	25	25	0	25	25	25	0	Band place with planter
	25-75	0	0	0	0	0	0	0	0	Sidedress when vines begin to run

For plasticulture, fertilization rates are based on a standard row spacing of 6 ft.

[1]Sulfur (S) at a rate of 25-30 lb/A is recommended for most soils.

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

Fertigation Schedule Examples

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 125 lb N and 125 lb K_2O[1,2] For soils with organic matter content less than 2% or coarse texture and low to medium or deficient K								
			Nitrogen			**Potash**		
Pre-plant (lb/A)[3]			**25**			**50**		
			N	**N**	**N**	**K_2O**	**K_2O**	**K_2O**
Stage and Description	Weeks	Days	lb/day	lb/week	lb/stage	lb/day	lb/week	lb/stage
1 Early vegetative	1	1-7	0.5	3.5	3.5	0.4	2.8	2.8
2 Late vegetative	2-3	8-14	0.9	6.3	12.6	0.7	4.9	9.8
3 Fruiting and harvest	4-7	15-42	1.4	9.8	39.2	0.9	6.3	25.2
4 Later harvest[4]	8-10	43-70	0.9	6.3	18.9	0.6	4.2	12.6
Fertigation recommendations for 75 lb N and 50 lb K_20[1,2] For soils with organic matter content greater than 2% or fine texture and high or optimum K								
			Nitrogen			**Potash**		
Pre-plant (lb/A)[3]			**50**			**50**		
			N	**N**	**N**	**K_2O**	**K_2O**	**K_2O**
Stage and Description	Weeks	Days	lb/day	lb/week	lb/stage	lb/day	lb/week	lb/stage
1 Early vegetative	1	1-7	1	7	7	1	7	7
2 Late vegetative	2-3	8-14	1.5	10.5	21	1.6	11.2	22.4
3 Fruiting and harvest	4-7	15-42	2.2	15.4	61.6	2.2	15.4	61.6
4 Later harvest[4]	8-10	43-70	1.7	11.9	35.7	1.6	11.2	33.6

[1]Rates are based on 7,260 linear bed ft/A (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 section C 3. Fertigation). [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. Critical cucumber tissue test values for most recently matured leaves at first bloom are: N 3.5-6 %, P 0.3-0.6 %, K 1.6-3.0 %, Ca 2-4 %, Mg 0.5-0.7% and S 0.3-0.8%. For additional nutrients and other growth stages consult with a tissue testing laboratory or this weblink at the University of Florida: *https://edis.ifas.ufl.edu/publication/ep081.*

Seed Treatment

Seed should be treated; check with your seed company and see Disease Control below.

Planting Dates

Direct seeding starts late-April in warmer, southern areas and after May 10 in PA and other cool areas. Successive plantings can be made through early August. Container-grown plug plants are started 3 weeks ahead of transplanting. On plastic mulch, planting starts when daily mean temperatures have reached 60°F (16°C). First

transplanting dates vary from April 10 in southern regions to June 1 in northern areas. Early plantings should be protected from winds with row covers or rye windbreaks.

Spacing

Slicers: Space rows 3-4 ft apart with plants 9-12 inches apart. Seeding rate: apart with plants 9-12 inches apart for direct seeding bare ground. For plasticulture, space beds 6-8 feet apart and seed or transplant 1- 2 rows per bed, 9-12 inches apart in the row.

Machine Harvest Pickles: Research and field data have shown that 55,000-65,000 plants/A is the optimum population for yield and quality. Parthenocarpic pickles are being used more widely in the region. These are planted to achieve 22,000 to 30,000 plants/A.

Hand Harvest Pickles: Space rows 3-4 ft apart with plants 6-8 inches apart. Seeding rate: 1.5-2 lb/A.

Mulching and Fumigation

Plastic mulch laid on moist soil before field planting conserves moisture and increases soil temperature and early and total yield. Various widths of plastic are available; choose one that works with your production system and equipment. Fumigation will be necessary when there is a history of soil-borne diseases in the field; several fumigants can be used on cucumber depending on what the predominant pests are (see section E 1.5. Soil Fumigation). Fumigation also aids in the control of weeds. Fumigant and mulch should be applied to well-prepared planting beds; check the fumigant label for the plant-back period that must be adhered to for crop safety. Plastic should be laid immediately over the fumigated soil. Fumigation alone may not provide satisfactory weed control under plastic. Black plastic can be used without a herbicide to provide control of most weeds.

Fertilizer must be applied during bed preparation. At least 50% of the N should be in the nitrate (NO_3^-) form. Drip (trickle) irrigation is recommended for plastic mulch systems and tape is laid at the same time as mulch. Foil and highly reflective mulches can be used to repel aphids that transmit viruses in fall-planted (after July 1) cucurbits. Direct seeding through the mulch is recommended for maximum virus protection; transplants should not be used with foil mulches. Also, an herbicide is not necessary.

Cucumbers also have been successfully grown in no-till systems on cover crop mulch.

Irrigation

Cucumbers require irrigation for best yield and quality. During flowering and fruiting water use can be over 0.25 inches/day and water deficit during this period will have the greatest negative impact on yield and fruit quality. A balance must be struck, however, between maintaining adequate moisture for fruiting while minimizing wetness in the canopy and on the soil surface which promotes fruit rots and Downy Mildew.

Trellising

Fresh market slicer cucumbers and pickles may be produced on trellises which may result in 2-3 times greater average yield than in non-trellised fields. Trellising is the preferred system in high tunnels. Trellising incurs a higher cost than growing cucumbers on the ground, but it has the following benefits:

1. Improved fruit quality, particularly with respect to color and shape (no yellow “ground spot”).
2. More effective control of many diseases and insects.
3. Less damage to vines resulting in a longer harvest season.
4. More consistent and thorough harvesting resulting in fewer jumbos and culls.
5. Easier harvesting than ground grown cucumbers.

Erect the trellis so that it is 6 ft high with a top (No. 8) and bottom (No. 12) wire and plastic twine or netting tied between the two wires at each plant. Posts or poles should be no more than 15 ft apart and the top wire should be very taut. An additional brace between posts may be required when the fruit load becomes heavy. In high tunnels, wires are stretched at the height desired and plastic twine is used to train plants. Training the main stem is required until it reaches and extends over the top wire. Pruning lateral runners near the base of the plant will result in higher yields. The first 4-6 lateral runners that appear should be removed. Other runners above this point should be allowed to run. Single stem systems are often used in high tunnels.

Pollination

Honey bees, squash bees, bumble bees and other wild bees are important for proper cucumber pollination and fruit set. In high tunnels bumble bees are particularly effective. Populations of pollinating insects may be adversely

affected by insecticides applied to flowers or weeds in bloom. Apply insecticides only in the evening hours or wait until bloom is completed before application (see also section A 12. Pollination). Follow all label requirements for pollinator protection. Bee Toxicity ratings are available in the insecticide tables that follow.

Parthenocarpic Cucumbers

Parthenocarpic cucumbers do not require pollination to set fruit. They will be nearly seedless or have unformed seeds. They should be isolated from seeded cucumber types to increase productivity and maintain the seedless nature. Parthenocarpic types should be considered when bee activity is limited such as in high tunnels, under row covers, or in very early plantings.

Season Extension

Low Tunnel Cucumber Production Cucumbers for early production may be successfully grown in high tunnels, in low tunnels with perforated clear plastic row covers, or using floating row covers. Use plastic mulch and trickle irrigation as discussed above. The following field system - similar to that used for early sweet corn - is also successful: A modified bedshaper is used to form a ridge on each side of the plant row, leaving a suitable area for planting. A 36-inch wide piece of embossed clear plastic is then used to cover the plant row, leaving a 5-6 inch high space between the planted row and the plastic cover. It is estimated that temperatures may be increased 10-20°F depending on time of planting and sunlight availability and intensity.

High Tunnel Cucumber Production Cucumbers are a potentially profitable crop for spring and fall production within a high tunnel. Cucumbers mature in approximately half the length of time required for tomato ripening. Cucumbers are also amenable to vertical trellising which increases production and quality. High tunnel cucumber varieties are often parthenocarpic (requiring no pollenizers) although gynoecious varieties can also be used (with pollenizers). Cucumbers can be established by direct seeding or transplanting. Space plants 12-18 inches apart in-row on 42-48 inch bed centers. High tunnel varieties can remain unpruned, though pruning can reduce pest infestation and improve marketable yield. If pruning is done, the lower laterals (suckers) should be pruned on the bottom 2 ft leaving 1 or 2 stems per plant to trellis. More information on relative planting and harvesting dates is available in section A 9 High Tunnels in the General Production Recommendations chapter.

Greenhouse Production Varieties are usually parthenocarpic varieties bred specifically for the lower light conditions of fall, winter, and early spring. European “English” or “Dutch” types and Asian types are available. Hydroponic nutrient solution systems are commonly used, and cucumbers are trellised with single or double stems trained onto twine; see also section A 10. Greenhouse Production.

Harvest and Storage

Cucumbers should be harvested when they have reached full size for the variety but while seeds are still soft. For slicers and manually harvested pickles, multiple harvests at 2-3 day intervals will be necessary. Machine-harvested pickles are harvested once when less than 5% have become oversized, as this produces the highest bushel yields. Size requirements of processors will also dictate schedules for machine and hand harvesting pickles.

Cucumbers can be held for 10-14 days at 50-54°F with a relative humidity of 85-90%. At 50°F and above, cucumbers ripen rapidly, with the green color changing to yellow, starting after about 10 days. The color change is accelerated if cucumbers are stored in the same room as apples, tomatoes, or other ethylene-producing crops. Cucumbers for fresh market are usually waxed to reduce moisture loss. Cucumbers are subject to chilling injury if held below 50°F for longer than about 2 days

Weed Control

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

Recommended Herbicides

1. Identify the weeds in each field and select recommended herbicides. More information is available in the “Herbicide Effectiveness on Common Weeds in Vegetables” (Table E-3) in chapter E Pest Management.
2. Minimize herbicide resistance development. Identify the herbicide mode of action group number and follow recommended good management practices; **bolded group numbers in tables below are herbicides at higher risk for selecting resistant weed populations.** Include non-chemical weed control whenever possible.

Labeled Application Sites for Cucumbers

Herbicide (*=Restricted Use)	HRAC group number	Plastic mulch production					Bareground production		
		Soil-Applied		Postemergence					
		Under Plastic	Row Middles	Over Plastic	Row Middles	Post-Harvest	Soil-applied	POST	Post-harvest
Sandea	2	YES	YES	YES	YES		YES	YES	
Treflan	3		YES						
Curbit	3		YES				YES		
Prefar	8	YES	YES				YES		
Command	13		YES				YES		
Strategy	3+13		YES				YES		
Select	1			YES	YES			YES	
SelectMax	1			YES	YES			YES	
Poast	1			YES	YES			YES	
Gramoxone*[1]	22					YES		YES	

[1] Special Local Needs Label 24(c), be sure it is registered for the specific state and for the intended use.

1. Soil-Applied

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
2	Sandea 75DF	0.5 to 1 oz/A	**halosulfuron**	0.023 to 0.047 lb/A	14	12
-**Plasticulture**: can be applied in a band under the plastic, immediately before laying the mulch; delay seeding or transplanting for 7 days after application. Row middles: apply before or after weed emergence; apply as a shielded application to avoid contact with the crop. If weeds have emerged, use a non-ionic surfactant at 0.25% v/v or include a non-selective herbicide. -**Bareground**: apply broadcast after seeding but before crop emergence or no sooner than 7 days before transplanting. -Suppresses or controls yellow nutsedge and certain broadleaf weeds. -Sandea is an ALS inhibiting herbicide and resistant weed populations are common in the region. **Do not** use Group 2 herbicides repeatedly in the same field. -**Do not** apply Sandea to crops treated with a soil applied organophosphate insecticide, or use a foliar applied organophosphate insecticide within 21 days before or 7 days after a Sandea application. -Maximum Sandea applications per year is 2 and **do not** exceed 2 oz/A during the crop season.						
3	Curbit 3EC	1 to 3 pt/A	**ethalfluralin**	0.38 to 1.13 lb/A	--	24
-**Plasticulture** row middles only: apply as a banded spray after crop emergence or transplanting. **Do not** soil incorporate. -**Bareground**: apply broadcast after direct-seeding but prior to crop emergence; **do not** use on transplanted cucumbers. -Controls annual grasses and certain annual broadleaf weeds, including carpetweed and pigweed sp. -Use lower rate for coarse-textured soils or soils with low organic matter. -Where overhead irrigation is available, activate Curbit with 0.5 inch of irrigation within 2 days after application; if no irrigation or rainfall occurs within 5 days of application, activity of Curbit can be reduced. -Available as a pre-mix herbicide Strategy. Strategy at 3 pt/A= Curbit at 26 fl oz (0.6 lb ai) and Command at 8 fl oz (0.188 lb ai) -Maximum applications per season: not specified						
3	Treflan 4EC	1 to 2 pt/A	**trifluralin**	0.5 to 1 lb/A	30	12
-**Plasticulture** row middles only: apply as a directed spray after emergence when plants have reached the 3 to 4 true leaf stage of growth. -**Not labeled for bareground production**. Primarily controls annual grasses with a few broadleaf weeds. -**Do not** use (or reduce the rate) when cold, wet soil conditions are expected, or crop injury may result. -Maximum applications per season: not specified.						
3 + 13	Strategy 2.1SC	1.5 to 6 pt/A	**ethalfluralin *plus* clomazone**	0.39 to 1.58 lb/A	45	24
-**Plasticulture**: row middles application. **Bareground**: apply broadcast just before planting or after planting but before crop emergence. -Strategy is a prepackage mixture of Curbit 3EC and Command 3ME. Refer to individual products for comments. -Clomazone spray or vapor drift may injure susceptible crops and other vegetation, refer to Command 3ME for comments. -**Do not** apply prior to planting crop. **Do not** soil incorporate. Maximum applications per season: not specified.						
8	Prefar 4E	5 to 6 qt/A	**bensulide**	5 to 6 lb/A	45	12
-**Plasticulture**: under plastic: apply in a band under the plastic, immediately before laying the mulch. Allow 7 day before making transplant holes to allow condensation to incorporate the herbicide. Plasticulture: row middles application is labeled. -**Bareground**: apply preemergence or pre-plant incorporated. -Preemergence applications should be followed by irrigation within 36 h (apply enough water to wet the soil at least 2 to 4 inches deep). Pre-plant incorporated applications should be incorporated 1 to 2 inches deep (deeper than 2 inches will result in reduced weed control). -Provides control/suppression of some annual grass weeds and some broadleaves including pigweeds, purslane, and lambsquarters. -**Do not** apply more than 6 lb ai/A per season.						

1. Soil-Applied - continued next page

F. Cucumbers

1. Soil-Applied - continued

13	Command 3ME	0.4 to 1 pt/A	**clomazone**	0.15 to 0.375 lb/A	30	12

-**Plasticulture**: row middles application only.
-**Bareground**: apply broadcast just before planting or after planting but before crop emergence.
-Use the lower rate when used on coarse-textured soils low in organic matter, when weed pressure is light, or to minimize herbicide carryover that could affect subsequent crops.
-Controls annual grasses and many broadleaf weeds including common lambsquarters, velvetleaf, spurred anoda, and jimsonweed. Carpetweed, morningglory sp., pigweed sp., and yellow nutsedge will not be controlled. Higher rates will improve control (or expand number of species controlled) such as common cocklebur, common ragweed, or jimsonweed (refer to label for specific weeds and rates).
-**WARNINGS**: Command spray *or* vapor drift may injure sensitive crops and other vegetation up to several hundred yards from the point of application. **Do not** apply adjacent to sensitive crops (see label) or vegetation, or under unfavorable wind or weather conditions. Command may limit subsequent cropping options, see the label.
-Available as a pre-mix herbicide Strategy: Strategy at 3 pt/A= Command at 8 fl oz (0.188 lb ai) and Curbit at 26 fl oz (0.6 lb ai)
-Maximum number of Command applications per year: 1.

2. Postemergence

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
1	Select 2EC Select Max 0.97EC	6 to 8 fl oz/A 9 to 16 fl oz/A	**clethodim**	0.094 to 0.13 lb/A	14	24
	Poast 1.5EC	1 to 1.5 pt/A	**sethoxydim**	0.19 to 0.28 lb/A	3	12

-**Select 2EC**: use crop oil concentrate (COC) at 1% v/v (1 gal/100 gal of spray solution). **Select Max**: use nonionic surfactant (NIS) at 0.25% v/v (1 qt/100 gal of spray solution). **Poast**: Apply with COC at 1.0% v/v.
-**The use of COC may increase the risk of crop injury when hot or humid conditions prevail.** To reduce the risk of crop injury, omit additives or switch to NIS when grasses are small and soil moisture is adequate.
-Use lower labeled rates for annual grass control and higher labeled rates for perennial grass control.
-Yellow nutsedge, wild onion, wild garlic, and broadleaf weeds will not be controlled.
-Controls many annual and certain perennial grasses, including annual bluegrass, but Poast is preferred for goosegrass control. For best results, treat annual grasses when they are actively growing and before tillers are present. Control may be reduced if grasses are large or under hot or dry weather conditions.
-Repeated applications may be necessary to control certain perennial grasses. If repeat applications are necessary, allow 14 days between applications.
-**Do not** tank mix with or apply within 2 to 3 days of any other pesticide, unless labeled, as this may increase the risk of crop injury or reduce the control of grasses.
-**Do not** apply more than 8 fl oz of Select 2EC in a single application and **do not** exceed 32 fl oz/A for the season; **do not** apply more than 16 fl oz of Select Max in a single application and **do not** exceed 64 fl oz/A for the season.
-**Do not** apply more than 1.5 pt/A Poast in a single application and **do not** exceed 3 pt/A for the season.
-Rainfastness is 1 h.

2	Sandea 75DF	0.5 to 1 oz/A	**halosulfuron**	0.023 to 0.047 lb/A	14	12

-**Plasticulture**: broadcast (over the top) or directed to row middles; broadcast for bareground.
-**Bareground**: apply Sandea after the crop has at least 3 to 5 true leaves but before first female flowers appear and no sooner than 14 days after transplanting. If weeds have emerged, use a non-ionic surfactant at 0.25% v/v.
-Suppresses or controls yellow nutsedge and certain broadleaf; control of weeds taller than 3 inches may not be adequate. Sandea will not control common lambsquarters or eastern black nightshade if applied postemergence; for row middle application, tank mix with a non-selective herbicide to increase spectrum of control.
-Sandea provides both residual and postemergence control of susceptible weed species. Effective postemergence control requires an adjuvant. Sandea is an ALS inhibiting herbicide and resistant weed populations are common in the region. **Do not** use Group 2 herbicides repeatedly in the same field.
-**Do not** apply Sandea to crops treated with a soil applied organophosphate insecticide, or use a foliar applied organophosphate insecticide within 21 days before or 7 days after a Sandea application.
-Rainfastness is 4 h. Sandea applications per year is 2 and **do not** exceed 2 oz/A during the crop season

22	Gramoxone SL 2.0* Gramoxone SL 3.0*	1.95 pt/A 1.3 pt/A	**paraquat**	0.49 lb/A	14	24

-**A Supplemental Label has been approved for the use of Gramoxone 2SL or 3SL for postemergence weed control in DE, MD, NJ, PA, and VA.** Row middles as a shielded application. Apply as a directed spray in a minimum of 20 gal spray mix/A to control emerged weeds between the rows after crop establishment. Include a nonionic surfactant at 0.25% v/v.
-Use shields or hoods to prevent spray contact with the crop and low spray pressure (maximum of 30 psi) to reduce small droplets that are prone to drift. See the label for additional information and warnings.
-Rainfastness is 30 min. A maximum of 3 applications per year are allowed.
-***Restricted-use pesticide***. Only certified applicators, who successfully complete the paraquat-specific training, can mix, load or apply paraquat. Application of paraquat "under the direct supervision" of a certified applicator is no longer allowed. Required training link (*http://usparaquattraining.com*); certified applicators must repeat training every three years.

3. Postharvest

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
22	Gramoxone SL 2.0* Gramoxone SL 3.0*	2.25 to 3 pt/A 1.5 to 2 pt/A	**paraquat**	0.56 to 0.75 lb/A	--	24

- **A Special Local Needs Label 24(c) has been approved for Gramoxone SL 2.0 in VA (expires 12/31/2022) and a Supplemental Label in DE for the use of both Gramoxone formulations for postharvest application to desiccate the crop.**
- Apply after the last harvest for bareground or plasticulture. Always include an adjuvant.
- Spray coverage is essential for optimum effectiveness. See the label for additional information and warnings.
- Rainfastness 30 min. A maximum of 2 applications for crop desiccation are allowed.
- ***Restricted-use pesticide***. Only certified applicators, who successfully complete the paraquat-specific training, can mix, load or apply paraquat. Application of paraquat "under the direct supervision" of a certified applicator is no longer allowed. Required training link (*http://usparaquattraining.com*); certified applicators must repeat training every three years.

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

Group	Product Name (*=Restricted Use)	Active Ingredient
14	Aim	**carfentrazone**

Insect Control

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

Seed and At-Plant Treatments for Seedcorn Maggot

Farmore DI-400 as a commercially applied seed treatment which contains thiamethoxam (Group 4A).
Athena* (bifenthrin + avermectin B1, Group 3A + 6) at planting at 8.5 to 17 fl oz/A.
Verimark (cyantraniprole, Group 28) applied no earlier than 72 hours prior to planting, at 10-13.5 oz/A using in-furrow spray, transplant tray drench, transplant water treatment, hill drench, or surface band.
Note: The use of neonicotinoid insecticides (Group 4A) at planting may help reduce seedcorn maggot populations.
See also Maggots in section E 3.1. Soil Pests - Detection and Control.

Aphids **Note**: Aphids transmit multiple viruses.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl **- melon aphid only**	1-3	48	H
4A	Neonicotinoid insecticides registered for use on Cucumbers: see table at the end of Insect Control.					
4D	Sivanto Prime or 200SL	21.0 to 28.0 fl oz/A	flupyradifurone - **soil**	21	4	M
4D	Sivanto Prime or 200SL	7.0 to 14.0 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
28	Exirel	13.5 to 20.5 fl oz/A	cyantraniliprole	1	12	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28	Verimark	Soil, at planting: 10 to 13.5 fl oz/A Drip chemigation: 10 fl oz/A	cyantraniliprole	1	4	H
28 + 6	Minecto Pro*	10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H
29	Beleaf 50SG	Foliar: 2.0 to 2.8 oz/A Drip: 2.8 to 4.28 oz/A	flonicamid	0	12	L

Armyworms and Cabbage Loopers

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl	1-3	48	H

Armyworms and Cabbage Loopers - continued next page

Armyworms and Cabbage Loopers - continued

3A	Pyrethroid insecticides registered for use on Cucumbers: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	4.0 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*	3.0 t0 4.8 oz/A	emamectin benzoate	7	12	H
11A	Dipel DF, others (OMRI)	0.5 to 2.0 lb/A	*Bacillus thuringiensis kurstaki*	0	4	N
11A	XenTari (OMRI) (armyworms)	0.5 to 2.0 lb/A	*Bacillus thuringiensis aizawai*	0	4	N
11A	XenTari (OMRI) (cabbage loopers)	0.5 to 1.0 lb/A	*Bacillus thuringiensis aizawai*	0	4	N
18	Intrepid 2F	4.0 to 10.0 fl oz/A	methoxyfenozide	3	4	L
22	Avaunt 30WDG, Avaunt eVo	2.5 to 6.0 oz/A	indoxacarb	3	12	H
28	Coragen 1.67SC	3.5 to 7.5 fl oz/A	chlorantraniliprole - **soil and foliar**	1	4	L
28	Exirel (armyworms)	7.0 to 13.5 fl oz/A	cyantraniliprole	1	12	H
28	Exirel (cabbage loopers)	10.0 to 17.0 fl oz/A	cyantraniliprole	1	12	H
28	Verimark	6.75 to 13.5 fl oz/A	cyantraniliprole	1	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28 + 4A	Voliam Flexi	4.0 to 7.0 oz/A	chlorantraniliprole + thiamethoxam	1	12	H
28 + 6	Minecto Pro*	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H

Cucumber Beetles

Cucumber beetles can transmit bacterial wilt; however, losses from this disease vary greatly between fields and varieties. Pickling cucumbers grown in high-density rows for once-over harvesting can compensate for at least 10% stand losses. On farms with a history of bacterial wilt control adult beetles before they feed extensively on the cotyledons and first true leaves. If foliar insecticides are used, begin spraying shortly after plant emergence and repeat weekly if new beetles continue to invade fields. Treatments may be required until vines begin to run (usually about 3 weeks after plant emergence). Seeds pretreated with a neonicotinoid seed treatment such as Farmore DI-400 should provide up to 14 days of control of cucumber beetle, otherwise, apply one of the following formulations:

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl	1-3	48	H
1A	Sevin XLR Plus	1.0 qt/A	carbaryl	3	12	H
3A	Pyrethroid insecticides registered for use on Cucumbers: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Cucumbers: see table at the end of Insect Control.					
28	Exirel	20.5 fl oz/A	cyantraniliprole	1	12	H
28	Verimark	Soil, at planting: 13.5 fl oz/A Drip chemigation: 10 fl oz/A	cyantraniliprole	1	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H

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

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

Leafminers

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
3A	Pyrethroid insecticides registered for use on Cucumbers: see table at the end of Insect Control.					
4A	Neonicotinoid insecticides registered for use on Cucumbers: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	6.0 to 8.0 fl oz/A	spinosad	1	4	M
5	Radiant SC	6.0 to 10.0 fl oz/A	spinetroram	1	4	M
6	Agri-Mek SC*	1.75 to 3.5 fl oz/A	abamectin	7	12	H
6 + 3A	Athena*	13.5 to 17 fl oz/A	bifenthrin + avermectin B1	7	12	H
17	Trigard 75WSP	2.66 oz/A	cyromazine	0	12	H

Leafminers - continued next page

Leafminers - continued

28	Coragen 1.67SC	3.5 to 7.5 fl oz/A	chlorantranil**i**prole - 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	1	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
28 + 6	Minecto Pro*	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H

Melonworms and Pickleworms

Apply one of the following formulations. When using foliar materials, make one treatment prior to fruit set, and then treat weekly. Check the label for additional instructions when using soil or drip applications.

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
1A	Lannate LV*	1.5 to 3.0 pt/A	methomyl	1-3	48	H
1A	Sevin XLR Plus	0.5 to 1.0 qt/A	carbaryl	3	12	H
3A	Pyrethroid insecticides registered for use on Cucumbers: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	4.0 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*	3.0 to 4.8 oz/A	emamectin benzoate	7	12	H
18	Intrepid 2F	4.0 to 10.0 fl oz/A	methoxyfenozide	3	4	L
22	Avaunt 30WDG, Avaunt eVo	2.5 to 6.0 oz/A	indoxacarb	3	12	H
28	Coragen 1.67SC	3.5 to 7.5 fl oz/A	chlorantraniliprole - **soil**	1	4	L
28	Coragen 1.67SC	2.0 to 3.5 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

Mites

Mite infestations generally begin around field margins and grassy areas. **Do not mow or maintain field margins and grassy areas after midsummer since this forces mites into the crop**. Local infestations can be spot-treated. Begin treatment when 10-15% of the crown leaves are infested early in the season, or when 50% of the terminal leaves are infested later in the season. **Note**: Continuous use of carbaryl or a pyrethroid may result in mite outbreaks.

Apply one of the following formulations:

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
6	Agri-Mek SC*	1.75 to 3.5 fl oz/A	abamectin	7	12	H
6 + 3A	Athena*	13.5 to 17 fl oz/A	avermectin B1 + bifenthrin	7	12	H
10B	Zeal Miticide	2.0 to 3.0 oz/A	etoxazole	7	12	L
20B	Kanemite 15SC	31.0 fl oz/A	acequinocyl	1	12	L
20D	Acramite 50WS	0.75 to 1.0 lb/A	bifenazate	3	12	M
21A	Magister SC	24.0 to 36.0 fl oz/A	fenazaquin	3	12	H
21A	Portal	2.0 pt/A	fenpyroximate	1	12	L
23	Oberon 2SC	7.0 to 8.5 fl oz/A	spiromesifen	7	12	M
28 + 6	Minecto Pro*	5.5 to 10.0 fl oz/A	cyantraniliprole + abamectin	7	12	H

Thrips

Apply one of the following formulations:

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
3A[1]	Pyrethroid insecticides registered for use on Cucumbers: see table at the end of Insect Control.					
4A[2]	Neonicotinoid insecticides registered for use on Cucumbers: see table at the end of Insect Control.					
5	Entrust SC (OMRI)	6.0 to 8.0 fl oz/A	spinosad	1	4	M
5	Radiant SC	6.0 to 10.0 fl oz/A	spinetroram	1	4	M
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
29	Beleaf 50SG	Foliar: 2.0 to 2.8 oz/A Drip: 2.8 to 4.28 oz/A	flonicamid	0	12	L

[1]Resistance concerns with western flower thrips [2]Resistance concerns with tobacco thrips

Group 3A Pyrethroid Insecticides Registered for Use on Cucumbers					
Apply one of the following formulations (check if the product label lists the insect you intend to spray; the label is the law):					
Product Name (*=Restricted Use)	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
Asana XL*	5.8 to 9.6 fl oz/A	esfenvalerate	3	12	H
Baythroid XL*	0.8 to 2.8 fl oz/A	beta-cyfluthrin	0	12	H
Brigade 2EC*, others	2.6 to 6.4 fl oz/A	bifenthrin	3	12	H
Danitol 2.4EC*	10.67 to 16.0 fl oz/A	fenpropathrin	7	24	H
Declare*	1.02 to 1.54 fl oz/A	gamma-cyhalothrin	1	24	H
Hero EW*	4.0 to 10.3 fl oz/A	zeta-cypermethrin + bifenthrin	3	12	H
Lambda-Cy 1EC*, others	2.56 to 3.84 fl oz/A	lambda-cyhalothrin	1	24	H
Mustang Maxx*	1.28 to 4.0 fl oz/A	zeta-cypermethrin	1	12	H
Permethrin 3.2EC*, others	4.0 to 8.0 fl oz/A	permethrin	0	12	H
Tombstone*, others	0.8 to 2.8 fl oz/A	cyfluthrin	0	12	H
Warrior II*	1.28 to 1.92 fl oz/A	lambda-cyhalothrin	1	24	H
Combo products containing a pyrethroid					
Athena*	7.0 to 17.0 fl oz/A	bifenthrin + avermectin B1 (Group 6)	7	12	H
Besiege*	6.0 to 9.0 fl oz/A	lambda-cyhalothrin + chlorantraniliprole (Group 28)	1	24	H
Endigo ZC*	4.0 to 4.5 fl oz/A	lambda-cyhalothrin + thiamethoxam (Group 4A)	1	24	H
Gladiator*	19.0 fl oz/A	zeta-cypermethrin + abamectin (Group 6)	7	12	H
Savoy EC*	6.0 to 12.9 fl oz/A	bifenthrin + acetamiprid (Group 4A)	7	12	H

Group 4A Neonicotinoid Insecticides Registered for Use on Cucumbers					
Apply one of the following formulations (check if the product label lists the insect you intend to spray; the label is the law):					
Product Name (*=Restricted Use)	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
Actara 25WDG	1.5 to 5.5 oz/A	thiamethoxam	0	12	H
Platinum 75SG	1.66 to 3.67 oz/A	thiamethoxam	30	12	H
Admire Pro	7.0 to 10.5 fl oz/A	imidacloprid - **soil**	21	12	H
Assail 30SG	2.5 to 5.3 oz/A	acetamiprid	0	12	M
Belay 2.13SC	9.0 to 12.0 fl oz/A	clothianidin - **soil/drip**	21	12	H
Belay 2.13SC	3.0 to 4.0 fl oz/A	clothianidin - **foliar** (note: PHI: do not make application after 4th true leaf has unfolded)	see note	12	H
Scorpion 35SL	9.0 to 10.5 fl oz/A	dinotefuran - **soil/drip**	21	12	H
Scorpion 35SL	2.0 to 7.0 fl oz/A	dinotefuran - **foliar**	1	12	H
Venom 70SG	5.0 to 7.5 oz/A	dinotefuran - **soil/drip**	21	12	H
Venom 70SG	1.0 to 4.0 oz/A	dinotefuran - **foliar**	1	12	H
Combo products containing a neonicotinoid					
Durivo	10.0 to 13.0 fl oz/A	thiamethoxam + chlorantraniliprole (Group 28)	30	12	H
Endigo ZC*	4.0 to 4.5 fl oz/A	thiamethoxam + lambda-cyhalothrin (Group 3A)	1	24	H
Savoy EC*	6.0 to 12.9 fl oz/A	acetamiprid + bifenthrin	7	12	H
Voliam Flexi	4.0 to 7.0 oz/A	thiamethoxam + chlorantraniliprole (Group 28)	1	12	H

Disease Control

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

Recommended Fungicides

Nematode Control

See sections E 1.5. Soil Fumigation and E 1.6. Nematode Control, or apply one of the following:

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

Seed Treatment

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

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

Code	**Product Name (*=Restricted Use)**	Product Rate	**Active Ingredient(s)**	PHI (d)	REI (h)	Bee TR
Apply one of the following at-planting (see label for application methods and restrictions):						
Phytophthora and Pythium root rot						
4	Ridomil Gold 4SL[1]	1.0 to 2.0 pt/A	mefenoxam	5	48	N
4	Ultra Flourish 2E[1]	2.0 to 4.0 pt/A	mefenoxam	5	48	N
4	MetaStar 2E AG[1]	4.0 to 8.0 pt/A	metalaxyl	AP	48	N
Phytophthora, Pythium, and Rhizoctonia root rot						
4 + 11	Uniform 3.66SE	0.34 fl oz/1000 ft row. Avoid direct seed contact, which may cause delayed emergence.	mefenoxam + azoxystrobin	AP	0	N
Rhizoctonia root rot						
11	azoxystrobin 2.08F	0.40 to 0.80 fl oz/1000 ft row	azoxystrobin	1	4	N
Pythium root rot only						
28	Previcur Flex 6F	1.2 pt/A in transplant water, drip irrigation, or direct spray at base of plant and soil	propamocarb hydrochloride	2	12	N

[1]To determine the amount of Ridomil Gold, Ultra Flourish or MetaStar needed per acre, use the following calibration formula for changing from broadcast to band application: [Band width (ft) / row spacing (ft)] x broadcast rate (lb/A) = Amount needed lb/A.

Bacterial and Fungal Diseases

Angular Leaf Spot

Resistant varieties should be used when possible (see table Recommended Varieties). At first sign of disease, apply the labeled rates of fixed copper plus mancozeb. Some copper-based products are OMRI listed and can be used in organic production systems to help suppress Angular leaf spot and some fungal diseases. Repeat every 7 days. To minimize the spread of disease, avoid working in field while foliage is wet.

Anthracnose

Resistant varieties should be used when possible (see table Recommended Varieties). Begin fungicide applications when vines begin to run, or earlier if symptoms are detected. Alternate chlorothalonil or mancozeb with other effective fungicides every 7 days. Fungicides with a high risk for resistance development such as FRAC code 11 fungicides that do not come in a mix with another fungicide active ingredient that is effective on Anthracnose, should be tank-mixed with a protectant fungicide. Use at least the minimum labeled rate of each fungicide in the tank-mix. **Do not** apply FRAC code 11 fungicides more than 4 times total per season. **Do not** apply FRAC code 11 fungicides if resistance exists in the area: use fungicides with a different FRAC code instead.

Code	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
Under LIGHT or MODERATE disease pressure ALTERNATE:						
M05	chlorothalonil 6F	1.5 to 2.0 pt/A	chlorothalonil	0	12	N
WITH a TANK MIX the following fungicide PLUS mancozeb 75DF 2.0 to 3.0 lb/A OR chlorothalonil 6F 2.0 to 3.0 pt/A:						
1	Topsin M WSB	0.5 lb/A	thiophanate-methyl	1	24	N
Under HIGH disease pressure, TANK-MIX one of the following fungicides WITH chlorothalonil 6F 2.0 to 3.0 pt/A:						
3 + 11	Quadris Top 1.67SC[1]	12.0 to 14.0 fl oz/A	difenoconazole + azoxystrobin	1	12	--
7 + 11	Merivon 2.09SC[2]	5.5 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
7 + 11	Pristine 38WG[2]	18.5 oz/A	boscalid + pyraclostrobin	0	12	--
11	azoxystrobin 2.08F[1,3]	11.0 to 15.5 fl oz/A	azoxystrobin	1	4	N
11	Cabrio 20EG[2]	12.0 to 16.0 fl oz/A	pyraclostrobin	0	12	N
AND ROTATE with a TANK-MIX of the following fungicide PLUS mancozeb 75DF 2.0 to 3.0 lb/A OR chlorothalonil 6F 2.0 to 3.0 pt/A every 7 days						
1	Topsin M WSB	0.5 lb/A	thiophanate-methyl	1	24	N

[1]**Do not apply near apples**, see label.

[2]Tank mixes of additives, adjuvants, and/or other products may result in crop injury.

[3]Do not tank mix with crop oil concentrates, methylated spray oil, or silicon adjuvants. Do not tank mix with Malathion, Thiodan, Lannate, MPede, or Botran.

Bacterial Wilt

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

Belly Rot (*Rhizoctonia*)

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Apply at the 1 to 3 leaf stage. Make a 2nd application 10-14 d later or just prior to vine tip–over (whichever occurs first):						
11	azoxystrobin 2.08F[1,2]	11.0 to 15.5 fl oz/A	azoxystrobin	1	4	N

[1]Do not tank mix with crop oil concentrates, methylated spray oil, or silicon adjuvants. Do not tank mix with Malathion, Thiodan, Lannate, MPede, or Botran.

[2]**Do not apply near apples**, see label.

Cottony Leak (*Pythium*) - See also Damping-off

At planting, apply mefenoxam (Ridomil Gold 4SL, Ultra Flourish 2E) or metalaxyl (MetaStar 2E AG).

Downy Mildew

The pathogen does not overwinter, but introduction to the region can occur early in the year. Newly developed cultivars with resistance or tolerance should be planted where available (see table Recommended Varieties). Even when using resistant cultivars, a good fungicide program is important. However, fungicide efficacy may vary, as strains of the pathogen may vary between seasons.

Scout fields beginning at plant emergence. Strains of Downy Mildew that infect one cucurbit crop may not affect cucumber. Unnecessary fungicide application can be avoided by not spraying until disease is predicted in the region on cucumber. Begin sprays when vines run or earlier if disease occurrence is predicted for the region (check the Cucurbit Downy Mildew Forecasting website at *https://cdm.ipmpipe.org*). Once the disease has become established in an area, new plantings should receive an application of Ranman, or Previcur Flex at the 1-3 leaf stage. **Preventative applications are much more effective than applications made after disease is detected. In addition, spray programs that include fungicides with several different modes of action (FRAC codes) are more effective than programs with one mode of action.** For example, alternate Ranman (Code 21) *PLUS* Gavel (Codes M03 + 22), with Orondis Ultra (Codes 49 + 40) *PLUS* chlorothalonil (Code M05). Follow all fungicide label precautions in order to reduce the chance of resistance development.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
The following are the most effective products. Sprays should be applied on a 7-day schedule. Under severe disease conditions spray interval may be reduced IF the label allows. ALWAYS tank mix these products with a protectant fungicide (listed below):						
49 + 40	Orondis Ultra 2.33SC	5.5 to 8.0 fl oz/A	oxathiapiprolin + mandipropamid	0	4	--
49+M05	Orondis Opti	1.75 to 2.5 pt/A	oxathiapiprolin + chlorothalonil	0	12	--
21	Ranman 400SC	2.10 to 2.75 fl oz/A (**do not apply with copper**; see label for details)[1]	cyazofamid	0	12	L
28	Previcur Flex 6F	1.2 pt/A	propamocarb hydrochloride	2	12	N
43	Presidio 4SC	4.0 fl oz/A (caution: pathogen is now less sensitive to Presidio)	fluopicolide	2	12	L
M05+22	Zing! 4.9SC	36.0 fl oz/A **contains protectant**	chlorothalonil + zoxamide	0	12	N
M05+27	Ariston 42SC	1.9 to 3.0 pt/A **contains protectant**	chlorothalonil + cymoxanil	3	12	--
M03+22	Gavel 75DF	1.5 to 2.0 lb/A **contains protectant**	mancozeb + zoxamide	5	48	--
11 + 27	Tanos 50DF	8.0 oz/A	famoxadone + cymoxanil	3	12	--
27	Curzate 60DF	3.2 to 5.0 oz/A	cymoxanil	3	12	N
40	Forum 4.17SC	6.0 fl oz/A	dimethomorph	0	12	N
40 + 45	Zampro 525SC	14.0 fl oz/A	dimethomorph + ametoctradin	0	12	--
22	Elumin 4SC	8.0 fl oz/A	ethaboxam	2	12	--
29	Omega 500F	12.0 to 24.0 fl oz/A	fluazinam	7	12	N
***TANK-MIX WITH* protectant fungicides:**						
M03	mancozeb 75DF	2.0 to 3.0 lb/A	mancozeb	5	24	N
M05	chlorothalonil 6F	1.5 to 2.0 pt/A	chlorothalonil	0	12	N

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

Gummy Stem Blight

Gummy Stem Blight occurs primarily in the late summer. Fungicides with a high-risk for resistance development such as Pristine (FRAC code 11) should be tank-mixed with a protectant fungicide to reduce the chances for resistance development. Use at least the minimum labeled rate for each fungicide in the tank mix. **Do not** apply FRAC code 11 fungicides more than 4 times total per season. Apply fungicides from a different FRAC code if resistance to FRAC code 11 fungicides exists in the area. Begin sprays when vines begin to run.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
***ALTERNATE* one of the following formulations:**						
M03	mancozeb 75DF	2.0 to 3.0 lb/A	mancozeb	5	24	N
M05	chlorothalonil 6F	2.0 to 3.0 pt/A	chlorothalonil	0	12	N
WITH A TANK-MIX containing either chlorothalonil or mancozeb PLUS one of the following fungicides:						
3	Proline 480SC	5.7 fl oz/A	prothioconazole	7	12	--
3	Rhyme 2.08SC	5.0 to 7.0 fl oz/A	flutriafol	0	12	--
3 + 9	Inspire Super 2.82EW	16.0 to 20.0 fl oz/A	difenoconazole + cyprodinil	7	12	--
3 + 7	Luna Experience 3.34SC[1]	10.0 to 17.0 fl oz/A	tebuconazole + fluopyram	7	12	--
9 + 12	Switch 62.5WG	11.0 to 14.0 oz/A	cyprodinil + fludioxonil	1	12	L
3 + 7	Aprovia Top 1.62EC	10.5 to 13.5 fl oz/A	difenoconazole + benzovindiflupyr	0	12	--
3 + **11**	Topguard EQ 4.29SC[2,3]	5.0 to 8.0 fl oz/A	flutriafol + azoxystrobin	1	12	--
7 + **11**	Merivon 2.09SC[4]	5.5 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
7 + **11**	Pristine 38WG[4]	12.5 to 18.5 oz/A	boscalid + pyraclostrobin	0	12	--
7 + 12	Miravis Prime	9.2 to 11.4 fl oz/A	pydiflumetofen + fludioxonil	1	12	--
11	azoxystrobin 2.08F[2,3,5]	11.0 to 15.5 fl oz/A	azoxystrobin	1	4	N
11	Cabrio 20EG[4,5]	12.0 to 16.0 oz/A	pyraclostrobin	0	12	N

[1]A mild yellowing on leaf margins is sometimes seen following application of Luna Experience in cucurbits.
[2]Do not tank mix with crop oil concentrates, methylated spray oil, or silicon adjuvants. Do not tank mix with Malathion, Thiodan, Lannate, MPede, or Botran.
[3]**Do not apply near apples**, see label.
[4]Tank mixes of additives, adjuvants, and/or other products may result in crop injury.
[5]azoxystrobin 2.08F and Cabrio 20EG are not recommended in MD, DE and VA due to resistance development.

Phytophthora Crown and Fruit Rot

Different strategies should be used to minimize the occurrence of this disease. Rotate away from susceptible crops (such as cucurbits, peppers, lima and snap beans, eggplants, and tomatoes) for as long as possible, improve field drainage, and apply pre-plant fumigants. When conditions favor disease development apply fungicides following excellent resistance management practices. Fungicides provide suppression only. Fruit are susceptible at all growth stages and must be protected season-long.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Apply one of the following fungicides. Rotate fungicides with different FRAC codes and tank mix with a fixed copper.						
49 + 40	Orondis Ultra 2.33SC	5.5 to 8.0 fl oz/A	oxathiapiprolin + mandipropamid	0	4	--
49+M05	Orondis Opti	1.75 to 2.5 pt/A	oxathiapiprolin + chlorothalonil	0	12	--
40	Revus 2.08F	8.0 fl oz/A	mandipropamid	0	4	--
40 + 45	Zampro 525SC	14.0 fl oz/A	dimethomorph + ametoctradin	0	12	--
22	Elumin 4SC	8.0 fl oz/A	ethaboxam	2	12	--
43	Presidio 4SC[1]	4.0 fl oz/A	fluopicolide	2	12	L
M03+22	Gavel 75DF	1.5 to 2.0 lb/A	mancozeb + zoxamide	5	48	--
M05+22	Zing! 4.9SC	36.0 fl oz/A	chlorothalonil + zoxamide	0	12	N
21	Ranman 400SC	2.75 fl oz/A (**Do not apply with copper**; see label for details)[2]	cyazofamid	0	12	L
40	Forum 4.17SC	6.0 fl oz/A	dimethomorph	0	12	N

[1]Presidio may also be applied through the drip irrigation (see supplemental label). Soil drench followed by drip application has given good results in some trials on crown rot caused by *Phytophthora capsici*.
[2]Ranman should be tank mixed with an organosilicone surfactant when disease is severe, or a non-ionic surfactant or blend of organosilicone and non-ionic surfactant disease is moderate or light.

Powdery Mildew

Excellent resistance is available (see table Recommended Varieties). The fungus that causes cucurbit Powdery Mildew has developed resistance to high-risk fungicides. In the Eastern US, resistance to strobilurin (FRAC code 11), DMI (FRAC code 3), and SDHI (FRAC code 7) fungicides has been reported. Proper fungicide resistance management should be followed to help delay the development of resistance and minimize control failures.

Powdery Mildew generally occurs from mid-July until the end of the season. Observe plants for the presence of Powdery Mildew. If one lesion is found on the underside of 45 old leaves/A, begin the following fungicide program:

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
TANK MIX one of these products with a protectant such as chlorothalonil 6F at 2.0 to 3.0 pt/A:						
50	Vivando 2.5SC[1]	15.4 fl oz/A	metrafenone	0	12	--
3 + 7	Luna Experience 3.34SC[2]	6.0 to 17.0 fl oz/A	tebuconazole + fluopyram	7	12	--
AND ALTERNATE with a TANK MIX of one of the following with a protectant such as chlorothalonil 6F at 2.0 to 3.0 pt/A						
3	Proline 480SC	5.7 fl oz/A	prothioconazole	7	12	--
3	Procure 480SC	4.0 to 8.0 fl oz/A	triflumizole	0	12	N
3	Rally 40WSP	2.5 to 5.0 oz/A	myclobutanil	0	24	N
3	tebuconazole 3.6F	4.0 to 6.0 fl oz/A	tebuconazole	7	12	N
3	Rhyme 2.08SC	5.0 to 7.0 fl oz/A	flutriafol	0	12	--
3 + 9	Inspire Super 2.82EW	16.0 to 20.0 fl oz/A	difenoconazole + cyprodinil	7	12	--
3 + 7	Aprovia Top 1.62EC	10.5 to 13.5 fl oz/A	difenoconazole + benzovindiflupyr	0	12	--
3 + **11**	Topguard EQ 4.29SC[3,4]	5.0 to 8.0 fl oz/A	flutriafol + azoxystrobin	1	12	--
7 + **11**	Pristine 38WG[5]	12.5 to 18.5 oz/A	boscalid + pyraclostrobin	0	12	--
U13	Gatten 5EC	6.0 to 8.0 fl oz/A	flutianil	0	12	--
P05	Regalia (OMRI)	4.0 qt/A	Extract of *Reynoutria sachalinensis*	0	4	--
39	Magister 1.6SC[6]	24.0 to 36.0 fl oz/A	fenazaquin	3	12	H
7 + 12	Miravis Prime	9.2 to 11.4 fl oz/A	pydiflumetofen + fludioxonil	1	12	--
U06	Torino 0.85SC	3.4 fl oz/A	cyflufenamid	0	4	--

[1]Do not mix Vivando with horticultural oils.
[2]A mild yellowing on leaf margins is sometimes seen following application of Luna Experience in cucurbits.
[3]Do not tank mix with crop oil concentrates, methylated spray oil, or silicon adjuvants. Do not tank mix with Malathion, Thiodan, Lannate, MPede, or Botran.
[4]**Do not apply near apples**, see label.
[5]Tank mixes of additives, adjuvants, and/or other products may result in crop injury.
[6]Do not make more than one application per year of Magister.

Scab

Scab typically occurs during cool periods. Excellent resistance is available in some varieties, and they should be used when possible.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Apply one of the following as true leaves form and repeat every 5-7 days:						
M03	mancozeb 75DF	2.0 to 3.0 lb/A	mancozeb	5	24	N
M05	chlorothalonil 6F	2.0 to 3.0 pt/A	chlorothalonil	0	12	N

Viruses

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

If you are having a medical emergency after using pesticides, call 911 immediately.

If you have any of the following symptoms during or shortly after using pesticides: headache, blurred vision, pinpoint pupils, weakness, nausea, cramps, diarrhea, and discomfort in the chest, call a physician and the National Poison Control Center hotline (1-800-222-1222).

Your call will be routed to your State Poison Control Center.
Anyone with a pesticide exposure 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 immediate medical attention call 911. Prompt action and treatment may save a life.

In Case of an Accident

- **Remove the person from exposure.**
- **Get away from the treated or contaminated area immediately.**
- **Remove contaminated clothing.**
- **Wash with soap and clean water.**
- **Call a physician and the Poison Control Center (1-800-222-1222) or agency in your state.**
- **Have the pesticide label with you! Follow the First Aid Precautionary Statements.**
- **Be prepared to give the EPA registration number to the responding center/agency.**