RUTGERS UNIVERSITY
Cooperative Extension
New Jersey Agricultural Experiment Station

This is a section from the

2026/2027
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 at: *https://njaes.rutgers.edu/pubs/publication.php?pid=e001*.

This manual will be revised biennially. **In January 2027, a Critical Update** with important updates to the 2026/2027 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.

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2026/2027
Mid-Atlantic Commercial Vegetable Production Recommendations

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

POISON Help®

1-800-222-1222

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/or the National Poison Control Center (1-800-222-1222).
  Your call will be routed to your State Poison Control Center.
- Have the pesticide label with you!
- Be prepared to give the EPA registration number to the responding center/agency

Horseradish

Horseradish is a hardy perennial from the Mustard family that is grown for its fleshy white roots in annual production systems. Roots that are left in the ground for two or more growing seasons become stringy and woody. If roots are not harvested or killed, horseradish can become a weed.

There are three types of horseradish: "**Common**" types have broad crinkled leaves and high quality, large, smooth roots, but they are susceptible to virus and White Rust. "**Bohemian**" types have medium-sized narrow smooth leaves and somewhat lower quality roots. They are susceptible to virus but have some White Rust tolerance. "**Big Top Western**" types have smooth, large upright leaves and large, good quality roots; however, the roots are rough or corky on the surface. "Big Top Western" types have resistance to virus and White Rust. Use locally selected horseradish strains that are adapted to the area.

Recommended Nutrients Based on Soil Tests

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

		Soil Phosphorus Level				Soil Potassium Level				
		Low	Med	High (Opt)	Very High	Low	Med	High (Opt)	Very High	
Horse-radish [1,2]	**N (lb/A)**	**P_2O_5 (lb/A)**				**K_2O (lb/A)**				**Nutrient Timing and Method**
	150-200	200	150	100	0	200	150	100	0	Total nutrient recommended
	50	200	150	100	0	200	150	100	0	Broadcast and disk-in
	50-100	0	0	0	0	0	0	0	0	Sidedress 3-5 weeks after planting
	50	0	0	0	0	0	0	0	0	Sidedress 4-6 weeks after planting if needed

[1]Apply 1.0 to 2.0 lb/A of boron (B) with broadcast fertilizer; see also Table B-7. in Chapter B Soil and Nutrient Management.
[2]Apply 25-30 lb/A of sulfur (S) for most soils.

Planting and Spacing

Sets are selected roots from the previous crop. They should be 10-12 inches long and ¼ to 5/8 inch in diameter. Do not allow roots to dry out before planting. To ensure proper orientation at planting, make a square cut at the end of the roots nearest the main root. Make a slanting cut at the other end and plant the slanting cut end downward.

Plant in late April to early May. Place sets at an angle in a furrow so the top will be 1 inch deep and the bottom 2 inches deep. Alternatively, use a dribble to make a slanted planting hole, or leave several inches above the soil surface and cover sets by forming ridges in the row. Sets should point in the same direction that the cultivator will go, *e.g.*, for two-row cultivator, two rows in one direction and the next two rows in the opposite direction. Space rows 34--36 inches apart with 18 inches between sets in the row.

Harvest and Storage

Dig roots as needed. In an annual system, the set will become the main root which is the largest and most valuable for the market. For maximum growth, harvest once tops have died due to frost. Alternatively, tops can be cut off as close to the soil surface as possible. Then wait several days before harvesting. Roots overwinter, but winter soil conditions may prevent harvesting. Store horseradish in the dark with temperatures between 32-40°F (0-4°C) and 98% relative humidity. Roots exposed to light become green. Roots can be stored for 8-9 months. If storage and temperature conditions cannot be met, consider harvesting the following spring by digging the roots as soon as new growth starts to appear. Select the top performing lateral roots for the next crop.

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.

F. Horseradish

1. Preemergence

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
14	Goal 2XL GoalTender 4F	2 pt/A 1 pt/A	**oxyfluorfen**	0.5 lb/A	--	48
-Apply immediately after planting but before emergence of new leaves. -Emerged leaves that receive direct herbicide application will be injured. It may be desirable to cultivate immediately prior to application to remove emerged weeds. Delay cultivation after Goal application, when possible, to reduce deactivation of Goal by incorporation. -**Do not** use Goal herbicide on horseradish plantings which are weak or under stress due to temperature, disease, fertilizer, nematodes, insects, pesticides, drought, or excessive moisture. -**Do not** apply more than 2 pt/A of Goal 2XL per crop or no more than 1 pt/A per crop of GoalTender.						
14	Spartan 4L, Zeus 4L or Spartan Charge 3.5EC	2.25 to 8 fl oz/A 2.9 to 10.2 fl oz/A	**sulfentrazone**	0.07 to 0.25 lb/A	--	12
-Labeled for preplant, preemergence or preplant incorporated. Do not incorporate to a depth greater than 2 inches. -Preemergence applications should be made at least 5 days prior to crop emergence. -Do not apply more than 8 fl oz/A per 12-month period for Spartan 4L or Zeus and do not exceed 10.2 fl oz/A for Spartan Charge. -Prepackaged mixtures with sulfentrazone include Authority Elite 7SE or BroadAxe 7SE: Authority Elite or BroadAxe at 25 fl oz/A = 21 fl oz/A Dual Magnum 7.62E + 5.3 fl oz/A of Spartan Charge.						
15	Dual Magnum 7.62E generic metolachlor 8EC	1 to 1.33 pt/A 1 to 2 pt/A	**s-metolachlor** **metolachlor**	0.95 to 1.27 lb/A 0.95 to 1.91 lb/A	--	24
-Apply after planting, but before crop emergence; Dual will not control emerged weeds. Primarily controls annual grasses, certain broadleaf weeds, and nutsedge. -**Do not** make more than one application per crop; **do not** apply more than 1.33 pt/A per crop. -Prepackaged mixtures with s-metolachlor include Authority Elite 7SE or BroadAxe 7SE: Authority Elite or BroadAxe at 25 fl oz/A = 21 fl oz/A Dual Magnum 7.62E + 5.3 fl oz/A of Spartan Charge.						

2. Postemergence

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
1	Shadow 3EC Select 2EC Select Max 0.97EC	4 to 5.33 fl oz/A 6 to 8 fl oz/A 9 to 16 fl oz/A	**clethodim**	0.07 to 0.125 lb/A	30	24
	Poast 1.5EC	1 to 2.5 pt/A	**sethoxydim**	0.2 to 0.3 lb/A	60	12
-**Select 2EC**: use crop oil concentrate (COC) at 1% v/v (1 gal/100 gal of spray solution). **Select Max 0.97EC**: use nonionic surfactant (NIS) at 0.25% v/v (1 qt/100 gal of spray solution). **Shadow 3EC**: use crop oil concentrate (COC) at 1% v/v (1 gal/100 gal of spray solution) for large or stressed grasses; use nonionic surfactant (NIS) at 0.25% v/v (1 qt/100 gal of spray solution) when crop safety is a concern. **Poast 1.5EC**: use COC at 1.0% v/v. -**General comments:** -The use of COC may increase the risk of crop injury when hot or humid conditions prevail. To reduce the risk of crop injury, switch to NIS when grasses are small and soil moisture is adequate. -Use lower labeled rates for annual grass control and higher labeled rates for perennial grass control. For best results, treat annual grasses when they are actively growing and before tillers are present. -Yellow nutsedge, wild onion, wild garlic, and broadleaf weeds will **not** be controlled with these herbicides. -These herbicides control many annual and certain perennial grasses. Clethodim is best on annual bluegrass; while Poast is preferred for goosegrass control. -Repeated applications may be necessary to control certain perennial grasses. If repeat applications are necessary, allow 14 days between applications. -Rainfastness is 1 h. -**Do not** tank mix with or apply within 2 to 3 days of any other pesticide, unless labeled, as this may increase the risk of crop injury or reduce the control of grasses. -**Do not** apply more than 8 fl oz/A of Select 2EC in a single application and **do not** exceed 2 pt/A for the season; **do not** apply more than 16 fl oz/A of Select Max in a single application and **do not** exceed 4 pt/A for the season. -**Do not** apply more than 5.33 fl oz/A of Shadow 3EC in a single application and **do not** exceed 21.33 fl oz/A for the season. -**Do not** apply more than 2.5 pt/A Poast in a single application and **do not** exceed 5 pt/A for the season.						
15	Outlook 6E	12 to 21 fl oz/A	**dimethenamid**	0.56 to 0.98 lb/A	40	12
-Apply postemergence from the 2-leaf to the 8-leaf stage. Outlook will not control emerged weeds. -Do not exceed the maximum labeled for the soil type.						

3. 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
5	Lorox	**linuron**
14	Aim (hooded or directed application only)	**carfentrazone**
27	Optogen	bicyclopyrone

Insect Control

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

Aphids

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 pt/A	methomyl	65	48	H
1B	Malathion 57 EC	1.0 to 2.0 pt/A	malathion	7	24	H
4A	Actara 25WDG	1.5 to 3.0 oz/A	thiamethoxam	7	12	H
4A	Admire Pro	4.4 to 10.5 fl oz/A	imidacloprid - **soil**	21	12	H
4A	Admire Pro	1.2 fl oz/A	imidacloprid - **foliar**	7	12	H
4A	Platinum 75SG	1.7 to 4.01 oz/A	thiamethoxam	AP	12	H
4C	Transform WG	0.75 to 1.5 oz/A	sulfoxaflor	7	24	H
4D	Sivanto Prime	7.0 to 14.0 fl oz/A	flupyradifurone	7	4	M
29	Beleaf 50SG	2.0 to 2.8 oz/A	flonicamid	3	12	L

Beet Leafhoppers

Beet leafhoppers can vector brittle root pathogen, and treatment may be justifiable if beet leafhoppers are present by late July.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Sevin XLR Plus	0.5 to 1.0 qt/A	carbaryl	7	12	H
1B	Fyfanon 57 EC	1.0 to 2.0 pt/A	malathion	7	24	H
3A	Fastac CS*	1.8 to 3.8 fl oz/A	alpha-cypermethrin	1	12	H
3A	Mustang Maxx	1.76 to 4.0 fl oz/A	zeta-cypermethrin	1	12	H
4A	Actara 25WDG	1.5 to 3.0 oz/A	thiamethoxam	7	12	H
4A	Admire Pro	4.4 to 10.5 fl oz/A	imidacloprid - **soil**	21	12	H
4A	Admire Pro	1.2 fl oz/A	imidacloprid - **foliar**	7	12	H
4A	Platinum 75SG	1.7 to 4.01 oz/A	thiamethoxam	AP	12	H
4C	Transform WG	0.75 to 1.5 oz/A	sulfoxaflor	7	24	H
4D	Sivanto Prime	7.0 to 14.0 fl oz/A	flupyradifurone	7	4	M

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

Cutworms are moth larvae (caterpillars) that feed on roots and stems. They chew on stems at or near the soil line, severing young plants. Larvae are typically active at night and spend most of this stage belowground. Cutworms are favored by less disturbed soils and debris-covered soil surfaces. Conventional tillage and soil incorporation of crop debris helps reduce populations. Several species are capable of causing injury to young plants. There are usually 2 generations per season. If cutworm damage is anticipated, it is best to treat preventively.

Apply the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Sevin XLR Plus	1 to 2.0 qt/A	carbaryl	7	12	H
3A	Brigade 2EC*	5.1 to 6.4 fl oz/A	bifenthrin	21	12	H
3A	Fastac CS*	1.8 to 3.8 fl oz/A	alpha-cypermethrin	1	12	H
3A	Hero*	2.6 to 6.1 fl oz/A	bifenthrin + zeta-cypermethrin	21	12	H
3A	Mustang Maxx*	1.28 to 4.0 fl oz/A	zeta-cypermethrin	1	12	H
28	Exirel	13.5 to 20.5 fl oz/A	cyantraniliprole	1	12	H

Flea Beetles (FB), Harlequin Bugs

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Sevin XLR Plus	0.5 to 1.0 qt/A	carbaryl - **FB only**	7	12	H

Flea Beetles (FB), Harlequin Bugs - continued next page

***Flea Beetles (FB), Harlequin Bugs** - continued*

1B	Fyfanon 57 EC	1.0 to 2.0 pt/A	malathion - **FB only**	7	24	H
3A	Brigade 2EC*	5.1 to 6.4 fl oz/A	bifenthrin	21	12	H
3A	Fastac CS*	1.8 to 3.8 fl oz/A	alpha-cypermethrin	1	12	H
3A	Hero*	2.6 to 6.1 fl oz/A	bifenthrin + zeta-cypermethrin	21	12	H
3A	Mustang Maxx*	1.76 to 4.0 fl oz/A	zeta-cypermethrin	1	12	H
3A + 28	Elevest*	7.7 to 9.6 fl oz/A	bifenthrin + chlorantraniliprole **- FB only**	21	12	H
4A	Actara 25WDG	1.5 to 3.0 oz/A	thiamethoxam - **FB only**	7	12	H
4A	Admire Pro	10.5 fl oz/A	imidacloprid - **soil, FB only**	21	12	H
4A	Admire Pro	1.2 fl oz/A	imidacloprid - **foliar, FB only**	7	12	H
4A	Platinum 75SG	1.7 to 4.01 oz/A	thiamethoxam - **FB only**	AP	12	H
5	Blackhawk 36WG	1.7 to 3.3 oz/A	spinosad - **FB only**	3	4	M
5	Entrust SC (OMRI)	3.0 to 6.0 fl oz/A	spinosad - **FB only**	3	4	H
28	Exirel	13.5 to 20.5 fl oz/A	cyantraniliprole - **FB only**	1	12	H

All Group 3A and 4A materials should have efficacy against harlequin bugs.]
[Insecticides with Suppression Only on the label: Radiant SC (FB).

Imported Cabbageworm (IC), Diamondback Moth (DM), Cabbage Looper (CL), and Armyworm spp. (AW)

Early season infestations rarely warrant control because the plant can outgrow injury unless injury to the growing point prevents new leaf emergence. Mid-season defoliation thresholds are greater than 30% defoliation and defoliators are abundant. **Diamondback moths are generally resistant to pyrethroids.**

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Sevin XLR Plus	1.0 to 2.0 qt/A	carbaryl - **AW only**	7	12	H
1B	Malathion 57 EC	1.0 to 2.0 pt/A	malathion - **CL and IC only**	7	24	H
3A[1]	Brigade 2EC*, others	5.1 to 6.4 fl oz/A	bifenthrin	21	12	H
3A[1]	Hero*	2.6 to 6.1 fl oz/A	bifenthrin + zeta-cypermethrin	21	12	H
3A[1]	Fastac CS*	1.8 to 3.8 fl oz/A	alpha-cypermethrin	1	12	H
3A[1]	Mustang Maxx*	3.2 to 4.0 fl oz/A	zeta-cypermethrin	1	12	H
5	Blackhawk 36WG	1.7 to 3.3 oz/A	spinosad	3	4	M
5	Radiant SC	6.0 to 8.0fl oz/A	spinetoram	3	4	H
5	Entrust SC (OMRI)	3.0 to 6.0 fl oz/A	spinosad	3	4	H
11A	DiPel DF, others (OMRI)	0.5 to 2.0 lb/A	*Bacillus thuringiensis kurstaki*	0	4	N
11A	XenTari (OMRI)	0.5 to 1.5 lb/A	*Bacillus thuringiensis aizawai*	0	4	N
18	Intrepid 2F	8.0 to 16.0 fl oz/A	methoxyfenozide	1	4	L
18 + 5	Intrepid Edge	4.5 to 12.0 fl oz/A	methoxyfenozide + spinetoram	3	4	M
28[1]	Coragen 1.67SC Coragen eVo, Vantacor	3.5 to 7.5 fl oz/A 1.2 to 2.5 fl oz/A	chlorantraniliprole **- foliar, AW only**	1	4	L
28[1]	Exirel	10 to 20.5 fl oz/A	chlorantraniliprole - **foliar**	1	12	H
28[1]+3A[1]	Elevest*	5.6 to 9.6 fl oz/A	chlorantraniliprole + bifenthrin	21	12	H

[1]Resistance concerns with beet armyworm.

Imported Crucifer Weevil

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
3A	Pounce 25WP	9.6 oz/A	permethrin - **foliar**	30	12	H
3A	Permethrin 3.2EC*	6.0 fl oz/A	permethrin - **foliar**	30	12	H
3A	Permethrin 3.2EC*	17 fl oz/100 gal	permethrin - **preplant dip**	30	12	H

Swede Midge

Swede midge was confirmed in Pennsylvania in 2020. Horseradish is a host, but it is unclear if swede midge is an economic threat to horseradish. Rotation away from previous cole crop plantings may be important. It is not found on insecticide labels in the sections with horseradish. Consult your local extension office for more information.

Thrips

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 pt/A	methomyl	65	48	H
4A[1]	Admire Pro	4.4 to 10.5 fl oz/A	imidacloprid - **soil**	21	12	H
5	Entrust SC (OMRI)	4.0 to 10.0 fl oz/A	spinosad	3	4	H
5	Radiant SC	6.0 to 8.0 fl oz/A	spinetoram	3	4	H
5	Blackhawk 36WG	1.7 to 3.3 oz/A	spinosad	3	4	M

[1]Resistance concerns with tobacco thrips.

Disease Control

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

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

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Apply one of the following at planting (see label for application methods and restrictions):						
Phytophthora and Pythium root rot						
4	Ridomil Gold 4SL	1.0 to 2.0 pt/A	mefenoxam	AP	48	N
4	Ultra Flourish 2E	2.0 to 4.0 pt/A	mefenoxam	AP	48	N
4	MetaStar 2E AG	4.0 to 8.0 pt/A	metalaxyl	AP	48	N
Pythium and Rhizoctonia root rot						
4 + 11	Uniform 3.72SC	0.34 fl oz/1000 ft row. Avoid direct seed contact, which may cause delayed emergence. See label.	mefenoxam + azoxystrobin	AP	0	N
Rhizoctonia root rot						
11	azoxystrobin 2.08F	0.4 to 0.8 fl oz/1000 ft row	azoxystrobin	AP	4	N

Bacterial and Fungal Diseases

Bacterial Leaf Spot

Rotate away from cruciferous crops for at least 2 years if the field has a known history of disease. Avoid excessive irrigation and maintain proper drainage. Avoid cultivation or other activity when foliage is wet to minimize spread.

Leaf Spots caused by *Alternaria* and *Cercospora* spp.

Use resistant cultivars where available. A 3-year rotation to non-cruciferous crops may be required if the field has a history of disease.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
When conditions favor disease development, apply one of the following on a 7-14 d schedule and rotate between fungicides with different FRAC codes as long as weather conditions favor disease development:						
7	Endura 70WG	4.5 oz/A (Alternaria only)	boscalid	0	12	--
7	Fontelis 1.67SC	16.0 to 30.0 fl oz/A	penthiopyrad	0	12	L
7 + 12	Miravis Prime	6.8 fl oz/A	pydiflumetofen + fludioxonil	7	12	--
11	azoxystrobin 2.08F	6.0 to 15.5-20 fl oz/A (check individual labels)	azoxystrobin	0	4	N
11	Cabrio 20EG	8.0 to 12.0 oz/A	pyraclostrobin	0	12	N

Ramularia Stem and Leaf Spot

In fields with a known history of Ramularia stem and leaf spot apply the following preventatively or when conditions favor disease development.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
M05	chlorothalonil 6F	3.0 pt/A	chlorothalonil	14	12	M

Verticillium Wilt

Rotate away from fields with a known history of Verticillium Wilt. Carefully inspect planting stock for discoloration, streaking and internal flecking. Plant only healthy planting material.

White Rust

Use certified, disease-free seed. A rotation to non-cruciferous crops may be required if the field has a history of disease. Manage weeds and volunteer hosts which may act as reservoirs for the pathogen. Plant "Big Top Western" types which have virus and White Rust resistance.

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
When conditions favor disease development, apply one of the following on a 7 to14-day schedule:						
11	azoxystrobin 2.08F	6.0 to 15.5-20 fl oz/A (check individual labels)	azoxystrobin	0	4	N
11	Cabrio 20EG	8.0 to 16.0 oz/A	pyraclostrobin	0	12	N