Delaware Cooperative Extension

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This is a section from the

2024/2025
Mid-Atlantic Commercial Vegetable Production Recommendations

The recommendations are **NOT** for home gardener use.

The full recommendations are available online at:
https://www.udel.edu/academics/colleges/canr/cooperative-extension/sustainable-production/commercial-crops/vegetable-crops/midatlantic-vegetable-recommendations/

Printed copies of the recommendations are available for purchase at the New Castle, Kent and Sussex County Extension Offices in Delaware.

This publication will be revised biennially. In January 2025, a Critical Update with important updates for this publication will be communicated through the above website.

These recommendations were prepared and reviewed by individuals from Cornell University, University of Delaware, Delaware State University, University of Maryland, Penn State, Rutgers University, Virginia Tech, and West Virginia University with the purpose of providing up to date information for commercial vegetable growers in the Mid-Atlantic states of **Delaware, Maryland, New Jersey, Pennsylvania, Virginia,** and **West Virginia**.

Disclaimer

- The label is a legally-binding contract between the pesticide 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.

F. Commodity Recommendations

Pesticide Use Disclaimer

THE LABEL IS THE LAW

A pesticide applicator is legally bound by the labeling found on and with the pesticide container in their possession. Before using a pesticide, check and always follow 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 Proagrica's CDMS (*https://www.cdms.net/*), Greenbook (*https://www.greenbook.net*), or Agworld DBX powered by 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/*) 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 LABELING ON THE PRODUCT CONTAINER ITSELF:**
   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 physical product 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*).

Spinach

Recommended Varieties

Type	Variety[1]
Fall (Summer Planted)	Kolibri* (Semi-savoy; DM resistance races 1-9, 12-15, tolerance 10-11)
	Kookaburra* (Savoy; DM resistance races 1-13)
	Persius* (Smooth, DM resistance races 1, 3, 5, 8, 9, 11, 12, 14, 16)
	SV 2146 VB* (Semi-savoy, DM resistance races 1-14, 16, 19)
	Regiment (Semi-savoy; DM resistance races 1-7, 11)
	Space (Smooth, DM resistance races 1-3, 5, 6, 8, 9, 11, 12, 14, 16, 19)
Summer (Spring Planted)	Corvair* (DM resistance races 1-11)
	Kookaburra* (Semi-savoy; DM resistance races 1-13)
	Marabu* (Smooth; DM resistance races 1-10, 15)
	SV2146VB* (Semi-savoy, DM resistance races 1-14, 16, 19)
	SV2157VB* (Savoy; DM resistance races 1-13)
"Baby" Leaf Type	C2-606* (Smooth: slow bolting: DM resistance races 1-9, 11-16, 18, 19)
	Finwhale RZ* (Smooth: DM resistance races 1-15, 17)
	Marabu* (Smooth; DM resistance races 1-10,15)
	Seaside* (Smooth; DM resistance races 1-11)
	Sunangel RZ* (Semi-savoy; DM resistance races 1-9, 11-19

[1]**Listed alphabetically within type**. *F1 hybrid variety. Downy Mildew (DM) resistance/tolerances (according to vendors) and specialty characters in parentheses. Processors generally specify preferred varieties for contracted plantings.

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.

Spinach[1]		Soil Phosphorus Level				Soil Potassium Level				
		Low	Med	High (Opt)	Very High	Low	Med	High (Opt)	Very High	
	N (lb/A)	P_2O_5 (lb/A)				K_2O (lb/A)				Nutrient Timing and Method
Spring or Fall	100-230	200	150	100	0[2]	200	150	100	0[2]	Total nutrient recommended
	50-75	200	150	100	0[2]	200	150	100	0[2]	Broadcast and disk-in
	25-40	0	0	0	0	0	0	0	0	Sidedress or topdress
	40-60	0	0	0	0	0	0	0	0	Topdress after each cutting
Overwinter	100-190	200	150	100	0[2]	200	150	100	0[2]	Total nutrient recommended
	20-30	200	150	100	0[2]	200	150	100	0[2]	Broadcast and disk-in at fall planting
	50-80	0	0	0	0	0	0	0	0	Topdress in late February when crop begins to grow
	30-40	0	0	0	0	0	0	0	0	Topdress in March
	40-60	0	0	0	0	0	0	0	0	Topdress for second cutting

[1]Apply 20-30 lb/A of sulfur (S) for most soils. [2]In VA, crop replacement values of 50 lb/A of P_2O_5 and 50 lb/A of K_2O are recommended on soils testing Very High.

Seed Treatment

Use treated seed. See Disease Control below for more information.

Seeding

Dates: *Spring*: March 12 to April 20 (harvest May 20 to June 7). *Fall*: August 10-31 (harvest September 25 to October 10). *Overwinter*: October 1-15 (harvest in the spring). **Rates:** *Not clipped*: 10-14 lb/A. *Clipped*: 18-25 lb/A. **Spacing:** *Processing*: rows on 12-inch centers. *Market:* rows on 12-inch centers. Planted on 6- and 8-row beds.

Pre-harvest

FOR FALL HARVEST ONLY. Apply 6.0 to 8.0 g/A (active ingredient) gibberellic acid to improve harvesting efficiency of semi-upright varieties and to increase yield under cool growing conditions. For best response, apply when daytime temperatures are 40-70°F (4-21°C) and when early morning dew is present on the crop. Apply by ground equipment in 20-50 gal of water/A, 12-18 days before each harvest. Wait until some regrowth has occurred before applying gibberellic acid to promote growth of a second or third cutting.

Harvest and Post-Harvest Considerations

For processing spinach, harvest plants before they are too large (or begin to bolt in spring plantings), usually when 16-17 inches tall. A second cut is made often in summer planted for fall harvest after suitable regrowth. The first cut is made 6-7 inches above the ground to eliminate as much stem, petiole, and older leaves as possible for the whole leaf pack. Prior to the second cutting, small disks can be used to cut away yellow or old leaves and to remove some soil away from the crown to facilitate harvest. Depending on temperature and plant density, 3-4 weeks between the first and second cutting are needed to obtain adequate regrowth.

For fresh market spinach, plants should be dry prior to harvest to prevent petiole breakage. When harvesting by hand, cut leaves above the crown or soil line and bunch. Exclude yellow leaves and leaves that are dirty with soil. Bunched spinach must be handled very carefully to avoid breakage of plants or bunches during bunching, washing, and packaging. Spinach for bag mixes is usually hand harvested, but mechanical harvesters for this purpose are now available. Walk-behind harvesters are also available for smaller acreage growers.

Store spinach at 32°F (0°C) and 95-100% relative humidity. Spinach is very perishable and can be stored for only 10-14 days. Crushed ice should be used for rapid cooling and for removing the heat of respiration. Top ice, hydro-cooling and vacuum cooling are other satisfactory cooling methods.

Most spinach for fresh market is prepackaged in perforated plastic bags to reduce moisture loss and physical injury. Controlled atmospheres with 10-40% carbon dioxide and 10% oxygen retard yellowing and extend shelf life. Special guidance for handling cut spinach, particularly for the bagged salad market, has been developed due to elevated food safety concerns.

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.

1. Soil-Applied

Group	Product Name (*=Restricted Use)	Product Rate	Active Ingredient	Active Ingredient Rate	PHI (d)	REI (h)
8	Ro-Neet 6E	4 pt/A	**cycloate**	3 lb/A	--	48
-Preplant incorporated treatments; apply before seeding and incorporate into soil 2-3 inches, and incorporation should occur within a few hours of application. Delay planting 7-10 days may help reduce potential injury. -Labeled for only specific states including DE, MD, NJ, PA, and VA (WV not included on label) -Ro-Neet provides residual control for a short period of time (about 3 weeks). Only 1 application is allowed per crop cycle						
15	Dual Magnum 7.62E	0.33 to 0.67 pt/A	**s-metolachlor**	0.32 to 0.63 lb/A	50	24
-Special Local Needs Label 24(c) for the use of Dual Magnum 7.62E to control weeds in spinach in DE, NJ, and PA (expires DE 12/31/2028; NJ 1/28/2027; PA 12/31/2027). The use of Dual Magnum 7.62E is legal ONLY if a waiver of liability has been completed (see: *https://www.syngenta-us.com/labels/indemnified-label-login*). -Apply as a preemergence treatment, **do not** incorporate. -Primarily controls annual grasses and certain broadleaf weeds. Dual will not control emerged weeds. -Note that the Dual rate labeled for spinach is lower than other crops; Dual will only provide a few weeks of control for select species at this low rate. Ratings in Table E-3 are based on higher use rates. -Apply to spinach accurately with a well calibrated sprayer. The margin of crop safety for Dual Magnum on spinach is narrow; rates higher than recommended for the soil type may result in crop injury. -Only 1 application per same season is allowed.						

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	14	24
	Poast 1.5EC	1 to 1.5 pt/A	**sethoxydim**	0.2 to 0.3 lb/A	15	12

2. Postemergence Shadow, Select, Select Max, Poast - continued next page

2. Postemergence Shadow, Select, Select Max, Poast - continued

-**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). **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**: use COC at 1.0% v/v. -**The use of COC may increase the risk of crop injury when hot or humid conditions prevail**. To reduce the risk of crop injury, omit additives or switch to NIS when grasses are small and soil moisture is adequate. -Use lower labeled rates for annual grass control and higher labeled rates for perennial grass control. -Yellow nutsedge, wild onion, wild garlic, and broadleaf weeds will **not** be controlled. -Controls many annual and certain perennial grasses, including annual bluegrass, but Poast is preferred for goosegrass control. For best results, treat annual grasses when they are actively growing 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. -Rainfastness is 1 h. -**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 1.5 pt/A Poast in a single application and **do not** exceed 3.5 pt/A for the season.						
4	Stinger 3SL / Spur 3SL	4 to 8 fl oz/A	**clopyralid**	0.094 to 0.188 lb/A	21	12
-Apply to spinach in the 2 to 5-leaf stage -Stinger will control common cocklebur, groundsel, jimsonweed, prickly lettuce, pineappleweed, common ragweed, and legumes. -Some leaf curling may occur; as well as noticeably more upright leaf development, but does not affect yield or maturity -Use 2 4.0 fl oz/A to control annual weeds less than 2 inches tall; increase the rate to 4.0 to 8.0 fl oz/A to control larger annual weeds. -Spray additives are not needed or required by the label and are not recommended. -Observe crop rotation restrictions or injury may occur from herbicide carryover. -Rainfastness is 6 h. Maximum use rate is 8 fl oz/A per season.						
5	Spin-Aid 1.3EC*	3 to 6 pt/A	**phenmedipham**	0.5 to 1 lb/A	21	12
-**Labeled for processing spinach only.** -Apply to spinach at the 4-true leaf stage or larger; spinach plants less than 4 to 6 true leaf may be injured from Spin-Aid -**Do not** apply if temperatures are over 75 F in order to reduce risk of crop injury. -**Do not** spray if dew is present on leaves. -For best results spray when weeds are at the 2 true leaf stage. The use of an 8002 flat fan nozzle or a comparable nozzle is suggested. -Rainfastness is 6 h. Split applications of Spin-Aid is allowed, but total rate of Spin-Aid rate is 6 pt/A per season.						

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
-**Supplemental Label in DE for the use of both Gramoxone formulations for postharvest application to desiccate the crop.** -Apply after the last harvest. 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 (*https://campus.extension.org/enrol/index.php?id=2201*); certified applicators must repeat training every three years.						

Insect Control

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

Aphids Green peach aphid is the most common aphid on spinach. Populations can remain on spinach throughout the winter and their presence can be a contamination concern for leafy crops. Females fly to plants and produce numerous pale yellow or pink-colored young (nymphs). Large numbers of aphids can build up on the undersides of leaves, often following pyrethroid insecticide applications. Aphids are sucking insects and excrete a sugary, sticky substance (honeydew). Preserve natural enemies by using selective insecticides whenever possible. Spray coverage to the underside of the leaf is important; add a spreader-sticker to foliar sprays. Foxglove aphids may be more difficult to control with group 4A insecticides.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
4A	Neonicotinoid insecticides registered for use on Spinach: see table at the end of Insect Control.					

Aphids - continued next page

Aphids - continued

4D	Sivanto Prime or 200SL	21 to 28 fl oz/A	flupyradifurone - **soil**	21	4	M
4D	Sivanto Prime or 200SL	7 to 14 fl oz/A	flupyradifurone - **foliar**	1	4	M
9B	Fulfill 50WDG	2.75 oz/A	pymetrozine	7	12	L
9B	PQZ	2.4 to 3.2 fl oz/A	pyrifluquinazon	1	12	L
9D	Versys	1.5 fl oz/A	afidopyropen	0	12	L
21A[1]	Torac	17.0 to 21.0 fl oz/A	tolfenpyrad	1	12	H
23	Movento	4.0 to 5.0 fl oz/A	spirotetramat	3	24	L
23 + 7C	Senstar	8.0 to 10.0 fl oz/A	spirotetramat + pyriproxyfen	14	24	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	n/a	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H
29	Beleaf 50SG	2.0 to 2.8 oz/A	flonicamid	0	12	L

[1]Aerial application with spray plane not allowed.

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*	1.5 pt/A	methomyl	7	48	H
1B	Diazinon AG500*	2.0 to 4.0 qt/A	diazinon	AP	72	H
3A	Baythroid XL*	0.8 to 1.6 fl oz/A	beta-cyfluthrin	0	12	H
3A	Mustang Maxx*	2.24 to 4.00 fl oz/A	zeta-cypermethrin	1	12	H
3A	Tombstone*	0.8 to 1.6 fl oz/A	cyfluthrin	0	12	H

Leafminers

Serpentine leafminers can cause direct damage to spinach leaves affecting marketability.

Apply one of the following formulations:						
Group	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
4A	Neonicotinoid insecticides registered for use on Spinach: 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
17	Trigard 75WSP	2.66 oz/A	cyromazine	7	12	H
28	Coragen 1.67SC Coragen eVo	5.0 to 7.5 fl oz/A 1.7 to 2.5 fl oz/A	chlorantraniliprole	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	n/a	4	H
28	Harvanta 50SL	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H

Non-Lepidopteran Chewing Pests Including: Flea Beetles and Grasshoppers

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	14	12	H
3A	Baythroid XL*	2.4 to 3.2 fl oz/A	beta-cyfluthrin	0	12	H
3A	Fastac CS*	2.2 to 3.8 fl oz/A	alpha-cypermethrin	1	12	H
3A	Mustang Maxx*	2.2 to 4.0 fl oz/A	zeta-cypermethrin	1	12	H
3A	Tombstone*	2.4 to 3.2 fl oz/A	cyfluthrin	0	12	H
3A + 4A	Leverage 360*	3.0 fl oz/A	imidacloprid + beta-cyfluthrin	7	12	H
4A	Neonicotinoid insecticides registered for use on Spinach: see table at the end of Insect Control.					
28	Harvanta 50SL (FB only)	10.9 to 16.4 fl oz/A	cyclaniliprole	1	4	H

Spider Mites

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

"Worm Pests" Including: Beet Armyworms (BAW), Cabbage Loopers (CL), Webworm, and Hawaiian Beet Webworm (HBW) Caterpillars can cause direct feeding damage thus there is low tolerance for their presence. **Note:** pyrethroid insecticides (Group 3A, in bold-face type) are not recommended for control of BAW or HBW due to resistance issues.

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 pt/A	methomyl - see label for PHI	label	48	H
3A	Baythroid XL* (CL only)	1.6 to 2.4 fl oz/A	**beta-cyfluthrin - not recommended for BAW or HBW**	0	12	H
3A	Tombstone* (CL only)	1.6 to 2.4 fl oz/A	**cyfluthrin - not recommended for BAW or HBW**	0	12	H
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*	3.2 to 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)	0.5 to 2.0 lb/A	*Bacillus thuringiensis aizawai*	0	4	N
18	Intrepid 2F	4.0 to 10.0 fl oz/A	methoxyfenozide	1	4	L
22	Avaunt 30WDG, Avaunt eVo	3.5 oz/A	indoxacarb	3	12	H
28	Coragen 1.67SC Coragen eVo	3.5 to 7.5 fl oz/A 1.2 to 2.5 fl oz/A	chlorantraniliprole	1	4	L
28	Exirel	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	7	12	H

Group 4A Neonicotinoid Insecticides Registered for Use on Spinach

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**
Admire Pro	1.3 fl oz/A	imidacloprid - **foliar**	7	12	H
Admire Pro	4.4 to 12.5 fl oz/A	imidacloprid - **soil**	21	12	H
Assail 30SG	2.0 to 4.0 oz/A	acetamiprid	7	12	M
Assail 30SC	1.7 to 3.4 fl oz/A	acetamiprid	7	12	M
Belay 2.13SC	9.0 to 12.0 fl oz/A	clothianidin - **soil**	21	12	H
Belay 2.13SC	3.0 to 4.0 fl oz/A	clothianidin - **foliar**	7	12	H
Scorpion 35SL	9.0 to 10.5 fl oz/A	dinotefuran - **soil**	21	12	H
Scorpion 35SL	2.00 to 5.25 fl oz/A	dinotefuran - **foliar**	7	12	H
Venom 70SG	5.0 to 7.5 oz/A	dinotefuran – **soil**	21	12	H
Venom 70SG	1.0 to 3.0 oz/A	dinotefuran - **foliar**	7	12	H
Actara 25WDG	1.5 to 3.0 oz/A	thiamethoxam	7	12	H
Platinum 75SG	1.66 to 3.67 oz/A	thiamethoxam	30	12	H
Combo products containing a neonicotinoid					
Durivo	10.0 to 13.0 fl oz/A	thiamethoxam + chlorantraniliprole (Group 28) - **soil**	30	12	H
Leverage 360*	3.0 fl oz/A	imidacloprid + beta-cyfluthrin (Group 3A)	7	12	H
Voliam Flexi	4.0 to 7.0 oz/A	thiamethoxam + chlorantraniliprole (Group 28)	7	12	H

Disease Control

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

Recommended Fungicides

Seed Treatment

Code	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
For Rhizoctonia and Fusarium Control:						
12	Maxim 4FS	0.08 to 0.16 fl oz/100 lb seed	fludioxonil	n/a	n/a	L
For Pythium Control:						
4	Apron XL	0.16 to 0.64 fl oz/100 lb seed	mefenoxam	n/a	n/a	N

Damping-off caused *Pythium* and *Rhizoctonia*

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Apply one of the following pre-plant incorporated or as a soil surface spray after planting:						
For Pythium root rot control						
4	Ridomil Gold 4SL	1.0 to 2.0 pt/A	mefenoxam	21	48	N
4	Ultra Flourish 2E	2.0 to 4.0 pt/A	mefenoxam	21	48	N
4	MetaStar 2E AG	4.0 to 8.0 pt/A	metalaxyl	21	48	N
49 + 4	Orondis Gold	4.8 to 9.6 fl oz/A	oxathiapiprolin + mefenoxam	1	4	--
For Pythium and Rhizoctonia root rot control						
4 + 11	Uniform 3.66SE	0.34 fl oz/1000 ft row	mefenoxam + azoxystrobin	--	0	N
Application of mefenoxam or metalaxyl at planting will also help control early-season White Rust infections in spinach.						

Bacterial and Fungal Diseases

Downy Mildew (Blue Mold) and White Rust

Use resistant varieties (see Recommended Varieties Table). Rotate away from spinach for at least 2 years. Do not plant spring crop near overwintered fields. The use of mefenoxam or metalaxyl at planting for damping-off control will provide early season control. Fungicides containing copper may cause phytotoxicity.

Shank application: mefenoxam (0.25 pt/A Ridomil Gold 4SL or 0.5 pt/A Ultra Flourish 2E) or metalaxyl (1.0 pt/A MetaStar 2E AG) may be shanked in 21 days after planting or after first cutting. A second shanked application may be made 21 days later or after the second cutting.

Foliage Application: Beginning 2-3 weeks after emergence (or prior to symptom development), rotate one of the following fungicides on a 7 to 10-day schedule (do not apply if temperature is 90°F/32°C or above):

Code	Product Name (*=Restricted Use)	Product Rate	Active Ingredient(s)	PHI (d)	REI (h)	Bee TR
Beginning 2-3 weeks after emergence (or prior to symptom development), rotate the following fungicides on a 7 to 10-day schedule as long as weather conditions favor disease development:						
Apply one of the following FRAC code 11 fungicides[1]:						
11	Reason 500SC	5.5 to 8.2 fl oz/A	fenamidone	2	12	--
11 + 27	Tanos 50DF	8.0 to 10.0 oz/A	famoxadone + cymoxanil	1	12	--
and rotate with one of the following fungicides:						
21	Ranman 400SC	2.75 fl oz/A	cyazofamid	0	12	L
40	Revus 2.08F	8.0 fl oz/A	mandipropamid	1	4	--
43	Presidio 4SC	4.0 fl oz/A	fluopicolide	2	12	L
45 + 40	Zampro 525SC	14.0 fl oz/A	ametoctradin + dimethomorph	0	12	--
P07	Aliette 80WDG	3.0 lb/A	fosetyl-Al	3	12	N

[1]FRAC code 11 fungicides such as Reason and Tanos should not be applied more than twice before switching to a fungicide with a different mode of action.

Leaf Spots and Anthracnose

These diseases can be prevalent in overwintered spinach and during periods between second and third cuttings. Apply one of the following as soon as symptoms appear in the spring or shortly after cutting and repeat every 7 to 10 days as long as conditions favor disease development.

Recommended Fungicides						
Code	**Product Name (*=Restricted Use)**	**Product Rate**	**Active Ingredient(s)**	**PHI (d)**	**REI (h)**	**Bee TR**
Alternate one of the following fungicides if more than one application is needed:						
7	Fontelis 1.67SC	24.0 fl oz/A	penthiopyrad	3	12	L
11	Cabrio 20EG	12.0 to 16.0 oz/A	pyraclostrobin	0	12	N
Apply the following if only one application is needed:						
7 + 11	Merivon 2.09SC	4.0 to 11.0 fl oz/A	fluxapyroxad + pyraclostrobin	1	12	N
7 + 12	Miravis Prime	9.2 to 13.4 fl oz/A	pydiflumetofen + fludioxonil	0	12	--
9 + 12	Switch 62.5WG	11.0 to 14.0 oz/A	cyprodinil + fludioxonil	0	12	L

Viruses

Cucumber Mosaic Virus

Use resistant varieties. See Recommended Varieties Table above.

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