

Black Rot, Blackleg, Alternaria

Use hot water seed treatment. See the preceding "Seed Treatment" section.

Clubroot

Radishes are susceptible to clubroot, whereas turnips are resistant. Use of irrigation water containing spores of the fungus is the principal way that disease is spread to new fields. If clubroot occurs, take time to clean and disinfect any equipment to be used in other fields to prevent spread. Adjust soil pH with hydrated lime to as close to 7.0 as possible. Improve drainage in the field as much as possible and grow on raised beds.

Downy Mildew

Apply the following when weather conditions favor disease development and/or disease is first noticed:

copper, fixed-- at labeled rates every 7 to 10 days

Leaf Spots

Apply preventatively or when initial symptoms first appear:

Alternate one of the following FRAC code 11 fungicides:

Quadris--6.0-15.5 oz 2.08SC/A, or

Cabrio--8.0-12.0 oz 20WG/A

With:

copper, fixed--at labeled rates every 7 to 10 days.

Scab

This disease is more severe under dry soil conditions, high soil pH, and low level of magnesium. Heavy irrigation in the first 2 weeks after emergence and the application of sulfur to reduce soil pH will assist in disease control.

White Rust

When weather conditions favor disease development or at the first sign of disease in field:

Alternate one of the following FRAC code 11 fungicides:

Quadris--6.0 to 15.5 fl oz 2.08SC/A, or

Cabrio--8.0-16.0 oz 20 WG/A

With

Ridomil Gold Copper--2.0 lb 65WP/A every 7 days.

SPINACH

Varieties							
Varieties ¹	DE	MD	NJ	PA	VA	WV	
Fall Processing							
Seven R* (MMR)							Spinach varieties for fall processing are recommended in DE, MD, NJ, PA, VA & WV
Hybrid No. 7*							
Melody* (MMR)							
Tyee* (DMR)							
Fidalgo* (WRT) (trial)							
Vancouver* (WRT) (not for overwinter)							
Fall Market							
Packer* (MR)	D	M	N	P	V	WV	
Olympia* (DMR)			M		P		
Melody* (MMR)	D	M	N	P	V	WV	

(table continued next page)

Varieties (continued)

Varieties ¹	DE	MD	NJ	PA	VA	WV
Fall Market						
Bolero* (flat-leaved for bunching)			N			
Camano (DMR)			N	P		
Tyee* (DMR)				P		WV
Samish* (DMR,WRT)				P		
Spring Processing						
Seven R* (MMR) (early seeding)	D		N			
Hybrid No. 7*	D	M			V	
Melody* (MMR)	D	M	N	P	V	WV
Tyee* (DMR)	D			P		WV
Spinner* (DMR)					P	
Spring Market						
Vienna* (MMR)	D	M	N			WV
Marathon* (MMR)	D	M		P		WV
Kent* (MMR)				P		
Olympia* (DMR)				P		WV
Tyee* (DMR)	D			P		WV
Spinner* (DMR)				P		WV
Overwinter Market						
Vienna* (MMR)	D	M	N	P		WV
Swiss Chard						WV
Bright Lights						WV
Argentata						WV

¹ Varieties listed by maturity within each group, earliest first.

* Indicates hybrid varieties.

Letters in parentheses indicate disease resistance possessed by varieties. See the "Abbreviations": section in front portion of this publication.

Recommended Nutrients Based on Soil Tests

Before using the table below, refer to important notes in Plant Nutrient Recommendations in Section B, Soil And Nutrient Information. These notes provide additional suggestions to adjust rate, timing and placement of nutrients depending on soil type cation exchange capacity and existing fertility levels.

Crop	Nitrogen (N) Pounds per Acre	Soil Phosphorus Level			Soil Potassium Level		
		Low	Med	Opt.	Low	Med	Opt.
Spinach	100-195 ¹	200 ¹	150 ¹	100 ¹	200 ¹	150 ¹	100 ¹
Spring or Fall	50-75 ²	200 ²	150 ²	100 ²	200 ²	150 ²	100 ²
	25-40 ³	0	0	0	0	0	0
	25-40 ⁴	0	0	0	0	0	0
Spinach	80-120 ⁵	0	0	0	0	0	0
Overwinter	50-80 ⁶						
	30-40 ⁷						

¹ Total amount nutrient recommended

² Broadcast and disk-in

³ Sidedress or topdress

⁴ Topdress after each cutting

⁵ Total Spring application for over-wintered crop

⁶ Topdress late February

⁷ Topdress in March

Seed Treatment

Use seed treated with Maxim 4FS (0.08-0.16 fl oz/100 lb. seed) for Rhizoctonia and Fusarium control and Apron XL LS (0.16-0.64 fl oz./100 lb. seed) for Pythium control.

Seeding

Seeding Dates. *Spring:* March 12 to April 20 (harvest May 20 to June 7). *Fall:* August 10 to August 31 (harvest September 25 to October 10). *Overwinter:* October 1 to 15 (harvest in the spring).

Seeding Rates. *Not clipped:* 10 to 14 pounds per acre. *Clipped:* 18 to 25 pounds per acre.

Spacing, Processing: rows on 12-inch centers. *Market:* rows on 12-inch centers. Planted on 6- and 8-row beds.

Preharvest

FOR FALL HARVEST ONLY. Apply 6-8 grams (active ingredient) gibberellic acid per acre to improve harvesting efficiency of semi-upright varieties and to increase yield of spinach under cool growing conditions. For best response, apply when daytime temperatures are 40° to 70°F (4.4° to 21.1°C) and when early morning dew is present on the crop. Make one application in 20 to 50 gallons of water per acre by ground equipment 12 to 18 days before each harvest. When applying gibberellic acid to promote growth of a second or third cutting, wait until some regrowth has occurred before making application.

Weed Control

Section 18 Emergency Label requests may be submitted to supplement weed control recommendations in spinach.

Identify the weeds in each field and select recommended herbicides that control those weeds. See Tables E-2 and E-3.

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

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

Preplant Incorporated

Cycloate--2.5-3 lb/A. Apply 3 to 4 pints per acre Ro-Neet. Apply before seeding and incorporate into soil 2 to 4 inches with disk. Delay of planting for 7 to 10 days may help reduce potential injury.

Preemergence

S-metolachlor--0.32-0.63 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Dual Magnum 7.62E to control weeds in spinach in Delaware, Maryland, New Jersey, Pennsylvania, and Virginia. The use of this product is legal ONLY if a waiver of liability provided by the local growers association has been signed by the grower, all fees have been paid, and a label has been provided by the association.** Apply 0.33 to 0.67 pints per acre Dual Magnum 7.62E to control annual grasses, galinsoga, and certain other broadleaf weeds. Use as a surface-applied preemergence spray. DO NOT preplant incorporate Dual Magnum. Use the lower rate on fields with coarse-textured soils low in organic matter. Use the higher rates on fields with fine-textured soil and those with high organic matter. Apply Dual Magnum 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. **Other generic versions of metolachlor and s-metolachlor may be available, and may or may not be labeled for use in the crop.**

Postemergence

Clethodim--0.094-0.125 lb/A. Apply 6 to 8 fluid ounces per acre Select 2EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) or 12 to 16 fluid ounces of Select Max 0.97EC with nonionic surfactant to be 0.25% of the spray solution (1 quart per 100 gallons of spray solution) postemergence to control many annual and certain perennial grasses, including annual bluegrass. Select will not consistently control goosegrass. The use of oil concentrate with Select 2EC may increase the risk of crop injury when hot or humid conditions prevail. To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 14 days.

Clopyralid--0.047-0.188 lb/A. Apply 2 to 8 fluid ounces of Stinger 3A per acre in a single application to control certain annual and perennial broadleaf weeds. Stinger controls weeds in the Composite and Legume plant families. Common annuals controlled include galinsoga, ragweed species, common cocklebur, groundsel, pineappleweed, clover, and vetch. Perennials controlled include Canada thistle, goldenrod species, aster species, and mugwort (wild chrysanthemum). Stinger is very effective on small seedling annual and emerging perennial weeds less than 2 to 4 inches tall, but is less effective and takes longer to work when weeds are larger. Use 2 to 4 fluid ounces to control annual weeds less than 2 inches tall. Increase the rate to 4 to 8 fluid ounces to control larger annual weeds. Apply the maximum rate of 8 fluid ounces to suppress or control perennial weeds. Spray additives are not needed or required by the label, and are not recommended. Application of higher recommended rates, 0.094 to 0.188 lb/A (4 to 8 fluid ounces), may cause a crop response that appears as a more upright leaf development. Yield and maturity are not affected. Observe a minimum preharvest interval (PHI) of 21 days. Stinger is a postemergence herbicide with residual soil activity. Observe follow-crop restrictions, or injury may occur from herbicide carryover.

Phenmedipham--0.33-0.67 lb/A. Apply 2 to 4 pints per acre Spin-aid 1.3E. For use on spinach for processing only. Controls seedling broadleaf weeds. Only chickweed less than three inches long or tall can be controlled consistently. Scout fields regularly and reapply if weeds germinate after the initial application, but do NOT exceed 6 pints per acre per year and maintain a 40-day preharvest interval. Apply only during the fall months to spinach with a minimum of four to six true leaves. Apply in a spray volume of 10 to 18 gallons of water per acre. The use of an 8002 flat fan nozzle or a comparable nozzle is suggested. See label for application restrictions, mixing instructions, and weather restrictions to prevent crop injury or herbicide failure.

Sethoxydim--0.2-0.3 lb/A. Apply 1 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray

solution (1 gallon per 100 gallons of spray solution) postemergence to control annual grasses and certain perennial grasses. Choose Poast 1.5EC to control large crabgrass. **The use of oil concentrate may increase the risk of crop injury when hot or humid conditions prevail.** To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Annual bluegrass, yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 15 days and apply no more than 3 pints per acre in one season.

Postharvest

Paraquat--0.6 lb/A. **A Special Local-Needs 24(c) label has been approved for the use of Gramoxone Inteon 2SC for postharvest desiccation of the crop in Delaware, New Jersey and Virginia.** Apply 2.4 pints per acre Gramoxone Inteon 2SC as a broadcast spray after the last harvest. Add nonionic surfactant according to the labeled instructions. See the label for additional information and warnings.

Insect Control

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

Seed Corn Maggot

To prevent damage to spring- and fall-seeded plants, use a broadcast application of a soil incorporated insecticide. Treatments must be applied immediately before planting and lightly incorporated to be effective. Also, see the "Maggots" section in Soil Pests--Their Detection and Control.

Cutworms (Also see Chapter E "Cutworms" section in "Soil Pests--Their Detection and Control".)

methomyl (Lannate LV or OLF)
 permethrin (Perm-Up, Pounce 3.2EC or OLF)
 zeta-cypermethrin (Mustang MAX, Respect or OLF)

Flea Beetle

carbaryl (Sevin 80S or OLF)
 imidacloprid (soil-Admire 2F, Admire PRO; foliar-Nuprid 1.6F, Provado 1.6F or OLF)
 zeta-cypermethrin (Mustang MAX, Respect or OLF)

Aphids

acetamiprid (Assail 30SG or OLF)
 dinotefuran (soil/foliar-Venom 70SG)
 flonicamid (Beleaf 50SG)
 imidacloprid (soil-Admire 2F, Admire PRO; foliar-Nuprid 1.6F, Provado 1.6F or OLF)
 pymetrozine (Fulfill 50W)
 thiamethoxam (soil-Platinum 2SG; foliar-Actara 25WDG)

Leafminers

abamectin (Abba EC, Agri-mek EC, Temprano or OLF)
 cyromazine (Trigard 75WSP)
 dinotefuran (soil/foliar-Venom 70SG)
 permethrin (Perm-Up, Pounce 3.2EC or OLF)
 spinosad (Entrust 80W, SpinTor 2SC or OLF)

Note. Use of imidacloprid at planting for control of aphids will reduce leafminer populations.

Cabbage Looper (CL), Beet Armyworm (BAW)

Bacillus thuringiensis (Biobit, Dipel, Dipel 2X, Javelin, XenTari or OLF) **(CL only)**
 emamectin (Proclaim 5SG)
 indoxacarb (Avaunt 30WDG)
 methomyl (Lannate LV or OLF)

Note. Continuous use of methomyl may result in leafminer outbreaks. DO NOT apply methomyl when minimum daily temperature is 32°F (0°C) or lower. DO NOT apply to spinach seedlings less than 3 inches in diameter.

methoxyfenozide (Intrepid 2F)
 spinetoram (Radiant 2SC)
 spinosad (Entrust 80W, SpinTor 2SC or OLF)
 tebufenozide (Confirm 2F)
 thiodicarb (Larvin 3.2F)

Grasshoppers

carbaryl (Sevin 80S or OLF)

Note. The use of permethrin for worm control will reduce grasshopper populations.

Webworms

Note: Sprays must be applied before webbing occurs.

Bacillus thuringiensis (Biobit, Dipel, Dipel 2X, Javelin, XenTari or OLF)
 methoxyfenozide (Intrepid 2F)
 tebufenozide (Confirm 2F)

Pesticide	Use Category ¹	Hours to Reentry	Days to Harvest
INSECTICIDE			
abamectin	R	12	7
acetamiprid	G	12	7
<i>Bacillus thuringiensis</i>	G	4	0
carbaryl	G	12	14
cyromazine	G	12	7
dinotefuran (soil/foliar)	G	12	21/7
emamectin	R	48	7
flonicamid	G	12	0
imidacloprid (soil/foliar)	G	12	21/7
indoxacarb	G	12	3
methomyl	R	48	7
methoxyfenozide	G	4	1
permethrin	R	12	1
pymetrozine	G	12	7
spinetoram	G	4	1
spinosad	G	4	1
tebufenozide	G	4	7
thiamethoxam (soil/foliar)	G	12	30/7
thiodicarb	R	48	14
zeta-cypermethrin	R	12	1

(table continued)

Pesticide	Use Category ¹	Hours to Reentry	Days to Harvest
FUNGICIDE (FRAC code)			
Actigard (Group P)	G	12	7
Aliette (Group 33)	G	12	3
Cabrio (Group 11)	G	12	0
coppers, fixed (Group M1)	G	24	0
MetaStar (Group 4)	G	48	21
Presidio (Group 43)	G	12	2
Quadris (Group 11)	G	4	0
Ridomil Gold (Group 4)	G	48	21
Ridomil Gold Copper (Groups 4 + M1)	G	48	21
Ultra Flourish (Group 4)	G	48	21

See Table D-6.

¹ G = general, R = restricted

shortly after cutting and repeat every 7 to 10 days. If more than 2 applications are needed, apply a copper fungicide prior to making a third application of either FRAC code 11 fungicide:

Quadris--6.0-15.5 fl oz 2.08SC/A, or
Cabrio--12.0-16.0 oz 20EG/A

FRAC code 11 fungicides, such as Quadris and Cabrio should not be applied more than twice before switching to a fungicide with a different mode of action

Cucumber Mosaic Virus

Use resistant (MR and MMR) varieties. See table.

Disease Control

Damping-Off

Apply the following preplant incorporated or as a soil surface spray after planting:

mefenoxam (Ridomil Gold--1.0-2.0 pt 4E/A or 2.0-4.0 pt Ultra Flourish 2E/A), or
metalaxyl (MetaStar)--4.0-8.0 pt 2E

At planting application of mefenoxam or metalaxyl will also help control early-season white rust infections in spinach.

Downy Mildew (Blue Mold) and White Rust

Rotate away from spinach for at least 2 years. Use resistant varieties where possible. 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.

Foliage Application: Beginning 2 to 3 weeks after emergence (or prior to symptom development), apply the following on a 7 to 10-day schedule (do not use if temperature is 90°F [32.2°C] or above):

Actigard--0.75 oz 50WG/A, or
Quadris--6.0-15.5 fl oz 2.08SC/A (use 12.0-15.5 fl oz/A for downy mildew), or
Presidio--3.0-4.0 fl oz 4SC/A, or
Cabrio--12.0-16.0 oz 20EG/A (white rust only use 8.0-12.0 oz.), or
Aliette--3.0 lb 80WDG/A, or
Fixed copper, see labels for rates and details, or
Ridomil Gold Copper--2.5 lb 65WP/A (14-day schedule)

FRAC code 11 fungicides, such as Quadris and Cabrio should not be applied more than twice before switching to a fungicide with a different mode of action.

Shanked application: mefenoxan--0.25 pt Ridomil Gold 4EC/A, 0.5 pt Ultra Flourish 2E/A or 1.0 pt MetaStar 2E/A 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.

Leaf Spots and Anthracnose

These diseases can be prevalent in overwintered, and during periods between second and third, cuttings. Apply the following as soon as symptoms appear in the spring or