

Spinach and Swiss Chard

Culture

Spinach is a cool-season crop that does best with temperatures between 55-70°F. Seed germination occurs from 32-60°F. Spinach goes to seed, or bolts, when days are hot and long. Generally, spinach is not harvested in July.

Field seeding begins in early April and continues through August. Maturity is reached in 30-50 days, depending on growing conditions.

Varieties

Melody

Avon (trial)

Tyee

Lime and Fertilizer

Maintain a soil pH between 6.0-6.4.

On acid soils, spinach grows slowly and develops chlorosis. Broadcast and disk in all fertilizer prior to planting. Apply per acre: 40-60 lb N, 40-60 lb P₂O₅ and 40-60 lb K₂O.

Spacing and Seeding

Rows: 12-16 inches between rows.

In-row: 6-8 plants/ft of row.

Seeding rate: 6-8 lb/A.

Disease Control

Damping Off

Buy seed commercially treated with fungicide. If Pythium has been a problem, apply **Ridomil Gold** EC at 1-2 pt/A. (See label instructions.)

Downy Mildew and White Rust

When possible, use mildew-resistant varieties. Avoid overhead irrigation late in the day. If disease threatens, apply: **Basic copper 53** 2-4 lb/A (1 day-PHI).

Aliette 2.0-5.0 lb/A (3 days-PHI). Do not tank mix Aliette and copper fungicides. Under some conditions, leaf speckling may occur. See label for precautions.

***Ridomil Gold** EC (spinach only). Apply 1-2 pt/A at planting followed by 0.25 pt/A shanked in 21 days after planting or after first cutting.

***Quadris** 12.3-15.4 fl oz/A. Do not make more than one application of Quadris before alternating with a fungicide with a different mode of action. Quadris may be phytotoxic to spinach under certain conditions—see label for precautions.

***Cabrio EG** 12-16 oz/A (0 days-PHI). May cause speckling in some varieties under certain conditions. See label.

***Tanos** 8.0-10.0 oz/A (1 day-PHI). Apply preventatively; follow fungicide resistance management recommendations on label.

***Actigard 50WG** 0.5-0.75 oz/A (7 days-PHI). Apply (spinach only) preventatively on a 7-10 day schedule; make no more than three consecutive applications.

***Presidio** 3.0-4.0 fl oz/A (2 days PHI). Tank mix with another effective fungicide with a different mode of action.

*Follow label recommendations for fungicide resistance management.

Insecticides for Use on Spinach and Swiss Chard in Ohio

(E = excellent; G = good; F = fair; P = poor; ✓ = pest listed on label but efficacy uncertain; - = pest not on label; rating in parentheses = pest not on label but product known to provide some control)

Pests >>	Pre-harvest interval (days)	Flea beetles	Leaf-miners	Caterpillars	Aphids	Leaf-hoppers	Mites	Bugs	<i>Impact on beneficial insects</i>
<i>How often an insecticide has been needed on Ohio farms for this pest in the past></i>		occasional	most years	occasional	occasional especially in late season	rare	rare	rare	
ORGANOPHOSPHATES									
diazinon	14	-	✓	F	F	-	-	✓	moderate
dimethoate (Cygon)	14	-	✓	-	G	G	✓	-	disruptive
malathion (Cythion)	7	-	-	-	F	-	-	-	low/moderate
CARBAMATES									
Lannate (methomyl)	7	-	-	G	-	-	-	-	disruptive
Larvin (thiodicarb)	14	-	-	G	-	-	-	-	moderate
Sevin (carbaryl)	14	G	-	F	-	G	-	✓	disruptive
PYRETHROIDS									
Baythroid (cyfluthrin)	0	✓	-	✓	-	✓	-	✓	disruptive
Brigade, Capture (bifenthrin)	40	G	✓	✓	-	-	✓	✓	disruptive
Mustang (z-cypermethrin)	1	G	-	G	-	G	-	G	disruptive
Pounce (permethrin)	1	-	✓	G	F	G	-	-	disruptive
NEONICOTINOIDS									
Actara (thiamethoxam)	7	✓	-	-	✓	✓	-	-	low/moderate
Admire (imidacloprid)	21, 45	-	-	-	G	-	-	-	low/moderate
Assail (acetamiprid)	7	G	-	-	G	(G)	-	-	low/moderate
Platinum (thiamethoxam)	30	✓	F	-	✓	✓	-	-	low/moderate
Provado (imidacloprid)	7	✓	-	-	G	-	-	-	low/moderate
Venom (dinotefuran)	7, 21	-	✓	-	✓	✓	-	-	low/moderate
OTHER INSECT NERVE POISONS									
Agri-Mek (abamectin)	7	-	✓	-	-	-	✓	-	low/moderate
Avaunt (indoxacarb)	3	-	-	✓	-	-	-	-	low/moderate
Beleaf (flonicamid)	0	-	-	-	✓	-	-	-	-
Fulfill (pymetrozine)	7	-	-	-	G	-	-	-	low impact
Proclaim (emamectin benzoate)	7	-	-	✓	-	-	-	-	low/moderate
Pyronyl, PyGanic (pyrethrins)	0	G	✓	G	✓	✓	-	✓	moderate
Radiant (spinetoram)	1	-	✓	✓	-	-	-	-	-
SpinTor (spinosad)	1	-	✓	G	-	-	-	-	low
Thionex (endosulfan)	21	G	-	✓	G	F	✓	-	moderate
INSECT GROWTH REGULATORS									
Confirm (tebufenozide)	7	-	-	G	-	-	-	-	low
Intrepid (methoxyfenozide)	1	-	-	G	-	-	-	-	low
Neemix, Aza-Direct (azadirachtin)	0	-	✓	✓	✓	-	-	-	low/moderate
Trigard (cyromazine)	7	-	✓	-	-	-	-	-	low/moderate
MISCELLANEOUS									
<i>Bacillus thuringiensis</i> (B.t.)	0	-	-	G	-	-	-	-	very low
Coragen (chlorantraniliprole)	1	-	✓	✓	-	-	-	-	low
Movento (spirotetramat)	3	-	-	-	✓	-	-	-	low
Oberon (spiromesifen)	7	-	-	-	-	-	-	-	-
soap (M-Pede)	0	-	-	-	F	F	✓	✓	low
Synapse (flubendiamide)	1	-	-	✓	-	-	-	-	low

Insect Control

See the table on the previous page for overview of insecticides used to control spinach and Swiss chard pests.

• Soil treatment before or at planting

Diazinon (spinach only)

For cutworms, wireworms.

Diazinon 14G: 14-28 lb/A.

Diazinon 4EC: 2-4 qt/A.

Dinotefuran (21 days-PHI)

For aphids (suppression), leafminers, whiteflies, leafhoppers.

Venom 70SG: 1-3 oz/A. Limit 12 oz/A per season.

Imidacloprid (21 days-PHI, spinach; 45 days, Swiss chard)

For aphids, whiteflies.

Admire 2F, Alias 2F: 10-24 fl oz/A. Apply before planting, or during planting, or as post-seeding drench.

Admire Pro (4.6F): 4.4-10.5 fl oz/A.

Thiamethoxam (30 days-PHI)

For aphids, leafhoppers, suppression of leafminer.

Platinum 2SC: 5-11 fl oz/A.

Platinum 75SG: 1.66-3.67 oz/A. Limit 3.67 oz/A per year.

Thiamethoxam + chlorantraniliprole (30 days-PHI)

For aphids, leafminers, caterpillars.

Durivo 1.67SC: 10-13 fl oz/A.

• Via drip (trickle) irrigation

Thiamethoxam + chlorantraniliprole (30 days-PHI)

For aphids, leafminers, caterpillars.

Durivo 1.67SC: 10-13 fl oz/A.

• Foliar treatment

Abamectin (7 days-PHI)

For mites, leafminers.

Agri-Mek 0.15EC, Abba 0.15EC: 8-16 fl oz/A. Limit 48 fl oz/A per season.

Acetamiprid (7 days-PHI)

For aphids, whiteflies.

Assail 30SG: 1.8-4.0 oz/A.

Bacillus thuringiensis (B.t.) (0 days-PHI)

For caterpillars.

Agree (3.8% a.i.): 1-2 lb/A.

Biobit XL 2.1%FC: 1-3 pt/A.

CryMax WDG (15% a.i.): 0.5-1.5 lb/A.

DiPel DF (10.3% a.i.): 0.25-1 lb/A.

Javelin 6.4%WG: 0.25-1.25 lb/A.

XenTari WDG: 0.25-1 lb/A.

Bifenthrin (40 days-PHI)

For leafminers, flea beetles, other pests.

Brigade 2EC, Capture 2EC, Discipline 2EC, Fanfare 2EC, Sniper 2EC, Tundra 2EC: 2.1-6.4 fl oz/A.

Brigade 10WSB: 5.3-16 oz/A.

Bifenthrin + imidacloprid (40 days-PHI)

For aphids, leafminers, beetles, caterpillars.

Brigadier 2EC: 3.8-6.14 fl oz/A.

Carbaryl (14 days-PHI, spinach and Swiss chard)

For flea beetles, leafhoppers, corn earworm.

Carbaryl 4L; Sevin 4F; Sevin XLR Plus(4EC): 0.5-1 qt/A for flea beetle, leafhoppers; 1-2 qt/A for caterpillars.

Sevin 50WP: 1-2 lb/A for flea beetles; 1-3 lb/A for leafhoppers.

Sevin 80S: 0.62-1.25 lb/A for flea beetle, leafhoppers; 1.25-2.5 lb/A for caterpillars.

Chlorantraniliprole (Rynaxypyr) (1 day-PHI)

For leafminers, caterpillars.

Coragen 1.67SC: 3.5-7.5 fl oz/A. Apply as a foliar spray or via drip irrigation.

Cyfluthrin and beta-cyfluthrin (0 days-PHI)

For caterpillars, flea beetles.

Baythroid 2EC: 0.8-3.2 fl oz/A. Limit 4 applications per crop.

Baythroid XL 1EC: 0.8-3.2 fl oz/A.

Cyromazine (7 days-PHI)

For leafminer.

Trigard 75WP WSP: 1/6 lb (1 packet)/A. Limit 5 applications per crop.

Diazinon (14 days-PHI, spinach only)

For aphids, leafminers.

Diazinon AG500 (4E): 0.5-1 pt/A.

Diazinon 50WP: 0.5-1 lb/A.

Dimethoate (14 days-PHI, Swiss chard only)

NOTE: Dimethoate use on spinach was canceled in 2006.

For aphids, leafminers, leafhoppers.

Dimethoate 4EC, Dimate 4EC: 0.5 pt/A.

Dimethoate 2.67EC: 0.75 pt/A.

Dinotefuran (7 days-PHI)

For aphids (suppression), leafminers, whiteflies, leafhoppers.

Venom 70SG: 1-3 oz/A. Limit 6 oz/A per season.

Emamectin benzoate (7 days-PHI)

For caterpillars.

Proclaim (5WDG): 2.4-4.8 oz/A.

Endosulfan (21 days-PHI, spinach only)

For aphids, crown mite, flea beetles, leafhoppers, armyworms.

Apply only once per season; limit 1.3 qt/A per year.

Thionex 3EC; Endosulfan 3EC: 1-1.3 qt/A.

Thionex 50WP: 1.5 lb/A.

Flonicamid (0 days-PHI, spinach, swiss chard)

For aphids.

Beleaf 50SG: 1.2-2.8 oz/A. Limit 3 applications per year.

Flubendiamide (1 day-PHI)

For caterpillars.

Synapse 24WG: 2-3 oz/A. Limit 9 oz/A per crop season.

Imidacloprid (7 days-PHI, spinach only)

For aphids, flea beetles, whiteflies.

Provado 1.6F, Pasada 1.6F: 3.75 fl oz/A.

Imidacloprid + cyfluthrin (7 days-PHI)

For caterpillars, aphids.

Leverage 2.7SE: 3.8 fl oz/A.

Indoxacarb (3 days-PHI, spinach, swiss chard)

For beet armyworm, cabbage looper.

Avaunt 30WG: 3.5 oz/A. Limit 14 oz/A per crop on swiss chard, 24 oz/A per crop for spinach.

Malathion (7 days-PHI, spinach and Swiss chard)

For aphids, leafhoppers, mites.

Malathion 5EC; Malathion 57EC: 1-2 pt/A for aphids.

Malathion 8 Aquamul: 1-2 pt/A for aphids.

Malathion 8EC: 0.5-1 pt/A for aphids, leafhoppers, mites.

Malathion 8F: 1.5 pt/A.

Methomyl (7 days-PHI, spinach; 7 days-PHI, Swiss chard)

For loopers, other caterpillars.

Limit 8 applications/crop.

Lannate 90SP: 0.5-1 lb/A.

Lannate LV(2.4 SL): 1.5-3 pt/A.

Methoxyfenozide (1 day-PHI)

For caterpillars.

Intrepid 2F: 4-10 fl oz/A.

Permethrin (1 day-PHI, spinach and Swiss chard)

For leafhoppers, leafminers, loopers.

Arctic 3.2EC, Permethrin 3.2EC: 2-8 fl oz/A for leafhoppers, loopers; 4-8 fl oz/A for leafminers. Limit 80 oz/A per season.

Ambush 25WP; Pounce 25WP: 3.2-12.8 oz/A for leafhoppers, 6.4-12.8 oz/A for leafminers. Limit 128 oz/A per season.

Pymetrozine (7 days-PHI)

For aphids.

Fulfill 50WDG: 2.75 oz/A.

Spinetoram (1 day-PHI)

For leafminers, caterpillars.

Radiant 1SC: 5-10 fl oz/A. Limit 6 applications per crop.

Spinosad (1 day-PHI)

For looper, armyworms, leafminers.

SpinTor 2SC: 4-10 oz/A. Limit 29 oz/A/year.

Entrust (80WP): 0.5-3 oz/A.

Spiromesifen (7 days-PHI)

For whiteflies.

Oberon 2SC: 7.0-8.5 fl oz/A. Limit 3 applications per crop season.

Spirotetramat (3 days-PHI)

For aphids, whiteflies.

Movento 2SC: 4-5 fl oz/A. Limit 10 fl oz/A per crop season.

Tebufenozide (7 days-PHI)

For caterpillars.

Confirm 2F: 6-8 oz/A for small plants; 8 oz/A for larger plants and heavy infestation. Limit 56 fl oz/A per year.

Thiamethoxam (0 days-PHI)

For aphids, leafhoppers, flea beetles.

Actara 25WDG: 1.5-3 oz/A.

Thiamethoxam + chlorantraniliprole (7 days-PHI)

For aphids, leafhoppers, caterpillars.

Voliam Flexi (20+20WDG): 4-7 oz/A.

Thiodicarb (14 days-PHI, spinach and Swiss chard)
For armyworms, loopers.
Larvin 3.2F: 16-30 fl oz/A. Limit 60 fl oz/A per season.

Zeta-cypermethrin (1 day-PHI, spinach, Swiss chard)
For flea beetles, caterpillars.
Mustang 1.5EW: 2.4-4.3 fl oz/A.
Mustang Max 0.8EC: 2.24-4 fl oz/A.

Weed Control

Preplant Incorporated

Ro-Neet 6E: Controls germinating annual grasses and broadleaf weeds. Apply 4 pt/A Ro-Neet 6E. Mineral soils only.
Apply before planting and incorporate 2-3 inches immediately.

Postemergence

Poast: For postemergent control of annual and perennial grasses. Apply 1-1.5 pt/A Poast (15 days-PHI). Do not exceed 3 pt/A/season. Add 1 qt/A nonphytotoxic crop oil concentrate. Rate is dependent on grass species and stage of development.

Select 2E: For control of grasses apply 0.5 pt/A. Include COC at 1% V/V (14 days-PHI).

Spin-Aid: Processing spinach only. Controls several common broadleaf weeds if applied when weeds are at the 2 true-leaf stage. Apply 3 to 6 pt/A when beets are in the 4 to 6 true-leaf stage. Severe crop injury may result if applied before this stage.

Spinach Only

Stinger: For emerged broadleaf weeds apply 0.25-0.5 pt/A when spinach is in the 2-5 leaf stage. More than one application permissible with a maximum of 0.5 pt/A/season (21 days-PHI).

Clopyr Ag (United Phosphorus): For control of sensitive annual, biennial and perennial broadleaf weeds apply 1/6 to 1/3 pt/A when weeds are actively growing. Two applications are permissible with no more than 1 pt/A applied for the growing season (30 days-PHI).

Garrison (Nufarm Americas, Inc.): For control of sensitive annual, biennial and perennial broadleaf weeds apply 1/6 to 1/3 pt/A when weeds are actively growing. Two applications are permissible with no more than 1 pt/A applied for the growing season (30 days-PHI).

Spinach and Swiss Chard

SelectMax: Controls annual and perennial grasses. Apply 9-16 fl oz/A plus non-ionic surfactant at 0.25% of final volume. Repeat applications can be made at 14-day intervals for a maximum allowed use per season of 64 fl oz/A. Pre-harvest interval is 1 day. **Select 2 EC** (14 day PHI) may also be used. Apply 6-8 fl oz/A plus crop oil concentrate at 1% of final volume. Do not apply more than 8 fl oz/A in a single application.

Directed/shielded application

Aim EC: Controls emerged broadleaf weeds. Apply as a directed spray, using a shielded sprayer, to actively growing weeds up to 4 inches in height. Add non-ionic surfactant at 0.25% or crop oil concentrate at 1-2%. Formulations available include: **Aim EC:** Use 1-2 fl oz/A, and **Aim EW HERBICIDE:** Use 0.5 to 1.6 fl oz/A.