

Chapter 37.

Spinach Production in Florida

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BOTANY

Nomenclature

Family - Chenopodiaceae

Spinach - *Spinacia oleracea*

Origin

Spinach is believed to be native to the Middle East in the general area of Iran (Fig. 37-1).

Related Species

Beet and Swiss chard are the only other vegetables of significance in the Chenopodiaceae family. The most important economic plant in this family is the sugar beet.

VARIETIES

Spinach varieties grown in Florida include:

Smooth leaf

A&C #30 (H)¹

Semi-savoy leaf

Chinook II (H)

Gladiator (H)

Skookum (H)

Savoy leaf

Ambassador (H)

Hybrid 612 (H)

¹H = hybrid.

SEEDING AND PLANTING

Planting dates and seeding information are given in Table 1.

FERTILIZER AND LIME

For mineral soils, broadcast all P₂O₅, micronutrients, and 25 to 50% of N and K₂O. Topdress remaining N and K₂O about 2 to 3 weeks after seeding (see Table 2).

For organic soils, broadcast all fertilizer before seeding. Up to 30 lbs/A of N might be needed in cool, winter weather or after leaching rain.

PLANT TISSUE ANALYSIS

Plant tissue analysis information for spinach is given in Table 3. The analysis was done 30 days after seeding, using the most recently matured leaf.

IRRIGATION

Initial water requirements of spinach (see Chapter 8, *Principles and Practices for Irrigation Management of Vegetables*, Table 4 to 6) will be low (20% to 40% of ETo, see Chapter 8, *Principles and Practices for Irrigation Management of Vegetables*, Table 3) until rapid leaf growth occurs. Water requirements rapidly increase to 95% of ETo and remain at or only slightly below that level through harvest.

WEED MANAGEMENT

Herbicides labeled for weed control in spinach are listed in Table 4.

Table 1. Seeding and planting information for spinach.

Planting dates	
North Florida	Sept - Mar
Central Florida	Sept - Mar
South Florida	Oct - Feb
Seeding information	
Distance between rows (in)	12 - 36
Distance between plants (in)	2 - 6
Seeding depth (in)	0.5
Seed per acre (lb)	10 - 15
Days to maturity from seed	45 - 60
Plant population ¹ (acre)	261,136
¹ Population based on closest between and within row spacing.	

Table 2. Soil test and fertilizer recommendations for mineral soils for spinach.¹

Target pH	N lb/A	P ₂ O ₅					K ₂ O				
		VL	L	M	H	VH	VL	L	M	H	VH
		(lb/A/crop season)									
6.5	90	120	100	80	0	0	120	100	80	0	0

¹ See Chapter 2 section on supplemental fertilizer application and best management practices, pg 11.

¹ Seeds and transplants may benefit from applications of a starter solution at a rate no greater than 10 to 15 lbs/acre for N and P₂O₅, and applied through the plant hole or near the seeds.

Table 3. Plant tissue analysis for spinach 30 days after seeding. Dry wt. basis.

Status	N	P	K	Ca	Mg	S	Fe	Mn	Zn	B	Cu	Mo
	Percent						Parts per million					
Deficient	<3.0	0.3	3.0	0.6	1.0	0.3	50	50	50	20	5	0.1
Adequate range	3.0-4.5	0.3-0.5	3.0-4.0	0.6-1.0	1.0-1.6	0.3-0.6	50-150	50-100	50-80	20-40	5-10	0.1-1.0
High	>4.5	0.5	4.0	1.0	1.6	0.6	150	100	80	40	10	1.0

Table 4. Chemical weed controls: spinach.

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre)	
			Mineral	Muck
Carfentrazone (Aim)	Spinach	Preplant Directed-hooded Row-middles	0.031	0.031
Remarks: Aim may be applied as a preplant burndown treatment and/or as a post-directed hooded application to row middles for the burn-down of emerged broadleaf weeds. May be tank mixed with other registered herbicides. May be applied at up to 2 oz (0.031 lb ai). Use a quality spray adjuvant such as crop oil concentrate (coc) or non-ionic surfactant at recommended rates.				
Glyphosate (Roundup, Touchdown Durango, Glyphomax)	Spinach	Prior to crop emergence or pretransplanting	0.5 - 1.0	0.5 - 1.0
Remarks: Apply as directed for "Cropping Systems" under conditions described on label. Does not provide residual weed control.				
Pelargonic Acid (Scythe)	Spinach	Preplant Directed-Shielded	3-10% v/v	3-10% v/v
Remarks: Product is a contact non-selective, foliar applied herbicide. There is no residual activity. May be tank mixed with soil residual compounds. Consult the label for rates and other information.				
Sethoxydim (Poast)	Spinach	Postemergence	0.188 - 0.28	0.188 - 0.28
Remarks: Controls actively growing grass weeds. A total of 3 pts. product per acre may be applied in one season. Do not apply within 30 days of harvest for head lettuce and 15 days of harvest for leaf lettuce and spinach. Apply in 5 to 20 gals. of water adding 2 pts. of crop oil concentrate per acre. Unsatisfactory results may occur if applied to grasses under stress. Use 0.188 lb. ai. (1 pt.) to seedling grasses and up to 0.28 lb. ai. (1.5 pts.) to perennial grasses emerging from rhizomes, etc. Consult label for grass species and growth stage for best control.				

Table 5. Disease management for spinach.

Chemical (a.i.)	Fungicide Group ¹	Maximum Rate/Acre/ Application	Season	Min. Days to Harvest	Pertinent Diseases	Select Comments ²
Actigard 50 WG (Acibenzilar-s-methyl)	21	0.75 oz	2.25 oz	7	Downy Mildew White rust	Do not apply to stressed plants
Aliette 80WDG (Fosetyl AI)	33	5 lb	35 lb	3	Downy Mildew White rust	Do not mix with copper fungicides or apply unbuffered to foliage with copper residues.
Amistar 80DF (Azoxystrobin)	11	5 oz or 0.25 oz/1000 row ft	20 oz	0	Various (see label)	Do not exceed 1 sequential and 4 total applications of Amistar or other Qol fungicides. See label for soil applications.

Table 5. Disease management for spinach.

Chemical (a.i.)	Fungicide Group ¹	Maximum Rate/Acre/ Application Season	Min. Days to Harvest	Pertinent Diseases	Select Comments ²	
Apron XL LS (Mefenoxam)	4	0.64 fl. oz./ 100 lb seed		Pythium seedling blight	Seed treatment only	
Armicarb (Potassium bicarbonate)		5 lb	0	Anthrachnose Downy mildew		
Basic Copper 53 (Basic copper sulfate)	M1	4lb	1	Anthrachnose Downy mildew Cercospora leaf spot	May cause spotting on leaves	
Basicop WP (Basic copper sulfate)	M1	4lb	1	Anthrachnose Downy mildew Cercospora leaf spot	May cause spotting on leaves	
Champ Formula 2 F	M1	2 pt	1	Anthrachnose Downy mildew Cercospora leaf spot	May cause spotting on leaves	
Cabrio (Pyraclostrobin)	11	16 fl oz	64 fl oz	0	Anthrachnose Downy mildew Powdery mildew White rust	Do not exceed 2 sequential and 4 total applications of Cabrio or other QoI fungicides.
Contans WG (Coniothyrium minitans)		6 lbs		Sclerotinia diseases	Apply to soil surface and incorporate prior to, at planting, or at transplanting.	
Copper-Count-N (Copper ammonium complex)	M1	1.5 qt	1	Anthrachnose Downy mildew Cercospora leaf spot	May cause spotting on leaves	
Cuprofix Disperss (Basic copper sulfate)	M1	4 lb		Anthrachnose Downy mildew Cercospora leaf spot White rust	May cause spotting on leaves	
Dusting Sulfur – IAP (Sulfur)	M2	12 lb			Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.	
Fosphite (Potassium phosphite)	33	3 qt	18 qt	Pythium, Rhizoctonia, Fusarium Downy mildew	Do not exceed 6 applications per crop. Caution should be used when applying in a management program including copper fungicides. See label for foliar, root dip and irrigation application details.	
Helena Prophyt (Potassium phosphite)	33	3 qt	18 qt	Pythium, Rhizoctonia, Fusarium Downy mildew	Do not exceed 6 applications per crop. Caution should be used when applying in a management program including copper fungicides. See label for foliar, root dip and irrigation application details.	
Kaligreen (Potassium bicarbonate)		3 lb	1	Powdery mildew	Apply in a minimum spray volume of 25 GPA.	
Kocide 101 (Copper hydroxide)	M1	3 lb	1	Anthrachnose Downy mildew Cercospora leaf spot	May cause spotting on leaves	
Kocide 2000 (Copper hydroxide)	M1	2.25 lb	1	Anthrachnose Downy mildew Cercospora leaf spot	May cause spotting on leaves	
Kocide 4.5 LF (Copper hydroxide)	M1	2 pt	1	Anthrachnose Downy mildew Cercospora leaf spot	May cause spotting on leaves	

Table 5. Continued.

Chemical (a.i.)	Fungicide Group ¹	Maximum Rate/Acre/ Application Season	Min. Days to Harvest	Pertinent Diseases	Select Comments ²
Kocide DF (Copper hydroxide)	M1	3 lb	1	Anthracnose Downy mildew Cercospora leaf spot	May cause spotting on leaves
Maxim 4FS (Fludioxonil)	12	0.16 fl oz/ 100 lbs of seed		Various seedling dis- eases	Seed treatment only.
Micro Sulf (Sulfur)	M2	6 lb		Powdery mildew Rust	Micro Sulf (Sulfur)
Milstop (Potassium bicarbonate)		3 lb	0	Anthracnose Downy mildew Cercospora leaf spot	
Nu Cop 50WP (Copper hydroxide)	M1	2 lb	1	Anthracnose Downy mildew Cercospora leaf spot	May cause spotting on leaves
Nu-Cop 3L (Copper hydroxide)	M1	2.66 pt	1	Anthracnose Downy mildew Cercospora leaf spot	May cause spotting on leaves
Nu-Cop 50DF (Copper hydroxide)	M1	3 lb	1	Anthracnose Downy mildew Cercospora leaf spot	May cause spotting on leaves
Oxidate (Hydrogen dioxide)		1 gal	0	Bacterial blight	Oxidate (Hydrogen dioxide)
Phostrol (Potassium phosphite)	33	5 pt	35 pt	Downy mildew	Do not exceed 7 applications per season. See label regarding cautions regarding conditions during application to avoid pos- sible phytotoxicity.
PlantShield HC (Tricoderma harzianum)		5 oz			Foliar and root fungicide. Use as a drench. (see label for restrictions).
Quadris (Azoxystrobin)	11	15.4 fl oz or 0.8 fl oz/1000 row ft	2.88 qt 0	Anthracnose Downy mildew Powdery mildew	Do not exceed 1 sequential and 4 total applications of Quadris or other QoI fungicides. See label for soil applications.
Rhapsody (Bacillus subtilis)		6 qt	0	Powdery mildew Sclerotinia drop	For suppression or use as a preventative in a program with other registered fungicides. For Sclerotinia, apply as a banded spray (see label for placement and timings).
Ridomil Gold EC (Mefenoxam)	4	2 pts	21	Pythium seedling dis- eases	Apply at seeding in a 7-12" band on soil over seed fur- row, for white rust control and downy mildew control additional applications may be made, see label
Ridomil Gold GR (Mefenoxam)	4	40 lb	21	Pythium seedling dis- eases	See label for specifics regarding preplant incorporated applica- tions and surface applications at the time of planting, for white rust control and downy mildew control additional applications may be made, see label.

Table 5. Continued.

Chemical (a.i.)	Fungicide Group ¹	Maximum Rate/Acre/ Application Season	Min. Days to Harvest	Pertinent Diseases	Select Comments ²
Ridomil Gold/Copper Mefenoxam, Copper hydroxide)	4, M1	1 pack/2 acres		Pythium seedling diseases	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting, for white rust control and downy mildew control additional applications may be made, see label.
RootShield Granules (Tricoderma harzianum)		12 lb			Apply in-furrow.
Serenade Max (Bacillus subtilis)		3 lb	0	Downy mildew Powdery mildew	Begin application approx. 8 wks prior to harvest and repeat on 14 day interval. Direct spray at base of plants and surrounding soil surface.
Sonata (Bacillus pumilus)		4 qt	0	Powdery mildew Downy mildew	For suppression or use as a preventative in a program with other registered fungicides.
Sporan (Clove, Rosemary, and Thyme Oil)		1.5 qt	0	Powdery mildew	Sporan is a concentrated oil-based product. It requires the use of an approved adjuvant to improve spreading and sticking. OMRI listed.
Stretch (Copper hydroxide)	M1	4 pt	1	Anthracnose Downy mildew Cercospora leaf spot	May cause spotting on leaves
Sulfur 90W (sulfur)	M2	10 lb		Powdery mildew	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
Telone EC (1,3, dichloropropene)		18 gal		Nematode and soil-borne diseases	Apply as a soil fumigant. Restricted use pesticide. See label regarding specific application instructions.
Tenn-Cop 5E (Copper tallate)	M1	4 pt	1	Anthracnose Downy mildew Cercospora leaf spot	May cause spotting on leaves
Topaz (Potassium phosphite)	33	3 qt	18 qt	0	
Ultra Flourish (Mefenoxam)	4	4 pt		Pythium seedling disease	See label for specifics regarding preplant incorporated applications and surface applications at the time of planting, for white rust control and downy mildew control additional applications may be made, see label.

¹ Fungicide group (FRAC Code): Numbers (1-37) and letters (M, U, P) are used to distinguish the fungicide mode of action groups. All fungicides within the same group (with same number or letter) indicate same active ingredient or similar mode of action. This information must be considered for the fungicide resistance management decisions. M = Multi site inhibitors, fungicide resistance risk is low; U = Recent molecules with unknown mode of action; P = host plant defense inducers. Source: <http://www.frac.info/> (FRAC = Fungicide Resistance Action Committee). Be sure to read a current product label before applying any chemicals,

² Information provided in this table applies only to Florida. Be sure to read a current product label before applying any chemical. The use of brand names and any mention or listing of commercial products or services in the publication does not imply endorsement by the University of Florida Cooperative Extension Service nor discrimination against similar products or services not mentioned.