



Spinach

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Varieties

Bloomsdale, Melody, Space, Tyee

Soil Preferences

Well-drained, clay loam; will tolerate wide range of loamy soils with pH range of 6.5 - 8.0.

Optimum Growing Conditions

Cool dry conditions; 65-75°F days, 40-45°F nights. Will withstand freezing temperatures (low 20's).

Establishment Methods

Planting Method	Direct seeded
Optimum Time	Soil temperature <100°F in seed zone and/or day time air temperature < 95°F
Seeding rate	5-10 lbs/acre (high seeding rate when planting in high temperature soils)
Approx seed/oz	120-400
Seeding depth	0.25 - 0.5"
Seedling spacing	3-6 plants/foot of seed row Normally 2-4 seed rows on 40" raised bed Baby leaf - 15-30 seed rows on 80" wide bed with 1-2" in-row spacing (may require approximately 2,000,000 seed/acre)

Fertility/Fertilization

Rates presented as actual lbs/acre N₂, P₂O₅, and K₂O (base actual rates applied on soil test results).

Generalized rate: 120 - 75 - 80 lb/acre	
N*	100-150 lbs 75-100 lbs applied pre-plant 20-30 lbs after each cutting Use tissue analysis to determine supplemental N rates
P	75-100 lbs banded 2" below seed at planting
K	70-100 lbs (not normally needed in most spinach production areas of Texas)

* Ammonium nitrate is very stable and least likely to evaporate. Urea and ammonium sulfate evaporate if not incorporated.

Water/Irrigation

Low to moderate demand: 10-15". If soil moisture is low, irrigate after each cutting. Overhead sprinkler irrigation not advisable as it may increase incidence of foliar diseases.

Pest Management

Spinach Diseases and Common Name of Fungicidal Controls

DISEASE	FUNGICIDE*	OMRI LISTED FUNGICIDE**
Cercospora leaf spot	Azoxystrobin, Copper Sulfate, Pyraclostrobin	Copper Hydroxide, Cuprous Oxide
Damping-off	Thiram, Fludioxonil	
Downy mildew (blue mold)	Acibenzolar-S-Methyl, Azoxystrobin, Fenamidone, Fluopicolide, Fosetyl-Al, Mandpropamid, Mefenoxam, Metalaxyl, Potassium Phosphite, Pyraclostrobin, Sodium Tetraborohydrate Decahydrate, <i>Streptomyces Lydicus</i>	<i>Bacillus pumilus</i> , <i>Bacillus subtilis</i> , Clove, Rosemary and Thyme Oil, Copper Hydroxide, Cuprous Oxide, Extract of <i>Reynoutria Sachalinensis</i> , Hydrogen Dioxide, Neem Oil, Potassium Bicarbonate
Nematode	1,3-Dichloropropene, Chloropicrin, Metam-Potassium, Metam-Sodium, Sesame Oil	Azadirachtin
White rust	Acibenzolar-S-Methyl, Azoxystrobin, Azoxystrobin, Copper Sulfate, Fenamidone,	Copper Hydroxide, Cuprous Oxide, Extract of <i>Reynoutria Sachalinensis</i>

	Fluopidolide, Fosetyl-Al, Mefenoxam, Metalaxyl, Potassium Phosphite, Pyraclostrobin	
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Spinach Insect Pests and Common Name of Insecticidal Controls

INSECT	INSECTICIDE*	OMRI LISTED INSECTICIDE**
Aphid	Acetamiprid, Bifenthrin, Cypermethrin, Diazinon, Dinotefuran, Imidacloprid, Malathion, Permethrin, Petroleum Oil, Potassium Salts of Fatty Acids, Sodium Tetraborohydrate Decahydrate, Spirotetramat, Thiamethoxam, Zeta-Cypermethrin	Azadirachtin, Garlic Juice Extracts, Neem Oil
Armyworm	Cypermethrin, Beta-Cyfluthrin, Bifenthrin, Carbaryl, Cyfluthrin, Cypermethrin, Endosulfan, Flubendiamide, Thiodicarb, Zeta-Cypermethrin	Azadirachtin, <i>Bacillus thuringiensis</i> , Pyrethrins, Spinosad
Beetle		Azadirachtin, Pyrethrins
Cutworm	Beta-Cyfluthrin, Bifenthrin, Carbaryl, Cyfluthrin, Cypermethrin, Diazinon, Flubendiamide, Methoxyfenozide, Permethrin, Zeta-Cypermethrin	Azadirachtin, <i>Bacillus thuringiensis</i>
Grasshopper	Beta-Cyfluthrin, Bifenthrin, Carbaryl, Cyfluthrin, Diflubenzuron, Dinotefuran, Zeta-Cypermethrin	Azadirachtin, Garlic Juice Extracts, Kaolin
Looper	Bifenthrin, Cypermethrin, Petroleum Oil, Zeta-Cypermethrin	Azadirachtin, <i>Bacillus thuringiensis</i> , Garlic Juice Extracts, Pyrethrins
Webworm		<i>Bacillus thuringiensis</i> , Garlic Juice Extracts, Pyrethrins

Weeds and Common Name of Herbicidal Controls

WEED	HERBICIDE*	OMRI LISTED HERBICIDE**
Preplant incorporated		Corn Gluten Meal
Preemergence		
Postemergence	Carfentrazone, Sethoxydim, Glyphosate, Pelargonic Acid, Clethodim, Clopyralid	D-Limonene, Clove Oil, Cinnamon and Clove Oil

* The above is a partial listing of controls intended as examples. Some labels may have been revoked since the publication of this guide. Refer to product labels for specifics and use accordingly. Ensure that products with one of the listed active ingredients are registered for the crop it is to be used on. Failure to do the above may result in crop injury, death and/or citation for law violation. Humans, animals and the environment may also be adversely affected by misuse.

** As stated in §205.206 of the National Organic Standards, pest management decisions should follow a hierarchical approach, which should be defined in a farm's organic systems plan. Please ensure that you have followed the appropriate steps and any product to be used in certified organic production systems has been approved by your certifying agent.

Harvest

Days after planting	Fresh Market - 45-60 days (20-30 to second cut) Processing - 70-90 days
Normal method	Fresh Market - Hand cut loose leaf or root cut Processing - Machine cut
Containers	Fresh Market - Bushel baskets
Grades	Grades based on external appearance Spinach leaves: <ul style="list-style-type: none"> • U.S. Extra #1 • U.S. #1 • U.S. Commercial Bunched Spinach: <ul style="list-style-type: none"> • U.S. #1 • U.S. #2
Packaging/Handling	Fresh Market: <ul style="list-style-type: none"> • 25 lb bushel basket • Cardboard cartons • 45 lb plastic containers Processing: canned or frozen
Anticipated yield/acre	300-400 bushels

Transit Conditions

Fresh market - Containers are top iced and/or held at 90-95% RH. Very perishable: 10-15 days max shelf-life.

Processing - Layered with ice in bulk wagons or semi trailer. Best to transport at night if great distances need to be traveled. Do not leave in bulk wagons more than 24 hours as spinach is very perishable.

Comments/Production Keys

- High soil temperatures (95°F + in seed zone) can cause heat induced dormancy and subsequent stand reduction
- Raised beds suggested, as spinach cannot tolerate water logged soil.
- High air temperature (80°F +) tends to reduce leaf body, thickness, soluble solids and color.
- Excessive plant populations can cause poor leaf/stem ratio (critical for processing quality) and early bolting.
- Delayed insecticide applications for control of aphids avoid killing beneficial insects (no aphid control obtainable with insecticides).
- If Gibberellic acid (ProGibb) is used as a harvest aid, cease use by February 1. Later use enhances bolting rate.
- Bolting induced by long days (14 + hrs) following cold temperatures.
- Immediate crop destruction upon crop termination and 3-5 year rotation essential to reduce white rust/blue mold inoculum levels to assist white rust control.