

# Chapter 36.

## Radish Production in Florida

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### BOTANY

#### Nomenclature

**Family** - Brassicaceae (Cruciferae)

**Radish** - *Raphanus sativus*

#### Origin

Radish is believed to be native to China.

#### Related Species

Virtually every plant part is consumed across the various vegetables in the Brassicaceae family. Other root crops are horseradish, turnip, and rutabaga. The stem is utilized from kohlrabi. Leaves of mustard, kale, collards, and watercress are food sources. Cabbage and Brussels sprouts vegetative buds are consumed, while the reproductive buds of broccoli and cauliflower are the plant parts used.

### VARIETIES

Some radish varieties grown in Florida are:

Fireball (H)

Fuego

Red Silk

### SEEDING AND PLANTING

Planting dates and seeding information are given in Table 1.

### FERTILIZER AND LIME

For mineral soils, broadcast all P<sub>2</sub>O<sub>5</sub>, micronutrients, and 25 to 50% of N and K<sub>2</sub>O. Topdress remaining N and K<sub>2</sub>O 10 to 15 days after seeding. Amount of P fertilizer should be satisfactory for up to three crops. K amount is for each crop.

For Histosol soils, broadcast all fertilizers. Supplemental N at a rate of 30 lbs/A might be needed in cool winter weather or after leaching rain.

Soil test and fertilizer recommendations for mineral soils are given in Table 2. Soil test and fertilizer recommendations for Histosols are given in Table 3.

### IRRIGATION

Radish water requirements (see Chapter 8, *Principles and Practices for Irrigation Management of Vegetables*, Table 4 to 6) may be less than other root crops. Peak water use during rapid growth and development will be about 80% of ETo. Water requirements will decrease to around 75% of ETo during the latter stages of plant growth (see Chapter 8, *Principles and Practices for Irrigation Management of Vegetables*, Table 3).

### WEED MANAGEMENT

At this time, there are no preemergent or postemergent herbicides labeled for radish grown on organic soils. DCPA (Dacthal W-75) and several trifluralin labels are registered for use on mineral soils. Glyphosate may be used preplant in a cropping system scheme. Clethodim (Select) now is labeled for use for the postemergence control of grasses.

Preparing a good clean seedbed is very important in radish production. In many cases, the radish may emerge, grow, and be ready for harvest before competing weeds germinate and cause a problem in growth and harvest of the crop.

Several herbicides are now being evaluated in the IR-4 system to establish tolerances for radish on muck soils as well as the Chinese radish (Daikon) on both organic and mineral soils.

**Table 1.** Seeding and planting information for radish.

Planting dates	
North Florida	Sept - Mar
Central Florida	Sept - Mar
South Florida	Oct - Mar
Seeding information	
Distance between rows (in)	6
Distance between plants (in)	1
Seeding depth (in)	0.25
Seed per acre (lb)	10 - 20
Days to maturity from seed	20 - 30
Plant population <sup>1</sup> (acre)	1 million +
<sup>1</sup> Population based on closest between and within row spacing.	

### PLANT TISSUE ANALYSIS

Plant tissue analysis information for radish is given in Table 4. The analysis was done near harvest, using the most recently matured leaf.

### INSECT MANAGEMENT

Table 6 outlines the insecticides approved for use on insects attacking radish.

### DISEASE MANAGEMENT

Chemicals approved for disease management in radish are shown in Table 5.

**Table 2.** Soil test and fertilizer recommendations for mineral soils for radish.<sup>1</sup>

Target pH	N lb/A <sup>2</sup>	P <sub>2</sub> O <sub>5</sub> <sup>2</sup>					K <sub>2</sub> 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

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

<sup>2</sup> 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 P<sub>2</sub>O<sub>5</sub>, and applied through the plant hole or near the seeds.

**Table 3.** Soil test and fertilizer recommendations for Histosol soils for radish, with target pH = 6.5 and N rate = 0 lb/A.

P and K index and fertilizer rate <sup>1</sup>				
P index	3	6	9	12
P <sub>2</sub> O <sub>5</sub> (lb/A)	100	40	0	0
K index	50	80	110	140
K <sub>2</sub> O (lb/A)	100	40	0	0

<sup>1</sup> 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 P<sub>2</sub>O<sub>5</sub>, and applied through the plant hole or near the seeds.

**Table 4.** Plant tissue analysis near harvest for radish. Dry wt. basis.

Status	N	P	K	Ca	Mg	S	Fe	Mn	Zn	B	Cu	Mo
	Percent						Parts per million					
Deficient	<3.0	0.25	1.5	0.5	0.3	0.3	30	20	30	15	3	0.1
Adequate range	3.0-4.5	0.25-0.4	1.5-3.0	0.5-2.0	0.3-0.5	0.3-0.6	30-50	20-40	30-50	15-30	3-10	0.1-2.0
High	>4.5	0.4	3.0	2.0	0.5	0.6	50	40	50	30	10	2.0
Toxic										>85		

Table 5. Disease management for radish.

Chemical (a.i.)	Fungicide Group <sup>1</sup>	Maximum Rate/Acre/ Application Season	Min. Days to Harvest	Pertinent Diseases	Select Comments <sup>2</sup>	
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 QoI fungicides. See label for soil applications.
Apron XL LS (Mefenoxam)	4	0.64 fl. oz./ 100 lb seed			Pythium seedling blight	Seed treatment only
Cabrio EG (Pyraclostrobin)	11	16 oz	48 oz	0	Various (see label)	Do not exceed 2 sequential and 3 total applications of Cabrio or other QoI fungicides.
Contans WG (Coniothyrium mini- tans)		6 lbs			Sclerotinia diseases	Apply to soil surface and incorporate prior to, at planting, or at transplanting.
Fosphite (Potassium phos- phate)	33	3 qt	18 qt		Pythium, Rhizoctonia, Fusarium	Do not exceed 6 applications per crop. Caution should be used when applying in a management program including copper fungicides. See label for foliar, and irrigation application details.
Kaligreen (Sodium bicarbonate)		3 lb		1	Powdery mildew	Apply in a minimum spray volume of 25 GPA.
Maxim 4FS (Fludioxonil)	12	0.16 fl oz/ 100 lbs of seed			Various seedling diseases	Seed treatment only.
Micro Sulf (Sulfur)	M2	10 lb			Powdery mildew	Do not apply during periods of warm temperatures (>90) or within 14 days of applying a crop oil.
Miconrized Gold (Sulfur)	M2	5 lb			Powdery mildew	Do not apply during periods of warm temperatures (>90) or within 14 days of applying a crop oil.
Microthiol Disperss (Sulfur)	M2	10 lb			Powdery mildew	Do not apply during periods of warm temperatures (>90) or within 14 days of applying a crop oil.
Oxidate (Hydrogen dioxide)		128 fl oz		0	Various (see label)	
Quadris (Azoxystrobin)	11	15.4 fl oz or 0.8 fl oz/1000 ft of row	3.75 qt	0	Various (see label)	Do not exceed 1 sequential and 4 total foliar applications of Quadris or other QoI fungicides. See label for soil applications.
Ridomil Gold EC (Mefenoxam)	4	4 pts/ trtd acre			Pythium seedling dis- eases Downy mildew	Apply at seeding in a 7-12" band on soil over seed furrow
Ridomil Gold/Copper (Mefenoxam; Copper hydroxide)	4, M1	2 lb	8 lb	7	Downy mildew	Limit of 4 applications per crop
Serenade ASO (Bacillus subtilis)		6 qt		0	Various (see label)	
Serenade Max (Bacillus subtilis)		3 lb		0	Various (see label)	
Sonata (Bacillus pumilus)		4 qt		0	Downy mildew Powdery mildew	

Table 5. Continued.

Chemical (a.i.)	Fungicide Group <sup>1</sup>	Maximum Rate/Acre/ Application Season	Min. Days to Harvest	Pertinent Diseases	Select Comments <sup>2</sup>
Sporan (Clove, Thyme, and Rosemary Oils)		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
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		Nematodes and other soil-borne diseases	Soil fumigant. Restricted use pesticide. See label for restrictions.
Topaz (Potassium phosphite)	33	3 qt	18 qt	Various (see label)	Use caution if used in a program with copper based compounds or phytotoxicity may result.
Trilogy (Neem Oil)		2 gal	0	Various (see label)	Apply at a rate of 0.5% - 1.0% in 25 to 100 gallons of water per acre or at 2 pt in a minimum of 5 GPA for low volume applications.
Ultra Flourish (Mefenoxam)	4	4 pt/trd acre		Pythium seedling diseases Downy mildew	Apply at seeding in a 7-12" band on soil over seed furrow
<p><sup>1</sup> 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:<a href="http://www.frac.info/">http://www.frac.info/</a> (FRAC = Fungicide Resistance Action Committee). Be sure to read a current product label before applying any chemicals,</p> <p><sup>2</sup> 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.</p>					

**Table 6.** Insecticides approved for use on insects attacking radishes.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code <sup>1</sup>	Notes
<b>Actara</b> (thiamethoxam)	1.5-4.0 oz	12	7	aphids, flea beetles, leafhoppers, whiteflies	4A	Do not exceed 4 oz. acre per season. Use higher rate for whiteflies.
<b>Admire 2F</b> (imidacloprid) Admire Pro	10-24 fl oz 4.4-10.5 fl oz	12	21	aphids, flea beetles, leafhoppers, whiteflies	4A	Limited to one soil application.
<b>Agree WG</b> ( <i>Bacillus thuringiensis</i> subspecies <i>aizawai</i> )	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11B1	Apply when larvae are small for best control. OMRI-listed <sup>2</sup> .
<b>*Asana XL</b> <b>(0.66 EC)</b> (esfenvalerate)	5.8-9.6 fl oz	12	7	armyworms, beetles	3	Do not apply more than 0.1 lb active ingredient per acre per season. (19.2 oz)
<b>Aza-Direct</b> (azadirachtin)	1-2 pts, up to 3.5, if needed	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	26	Antifeedant, repellent, insect growth regulator. OMRI-listed <sup>2</sup> .
<b>Azatin XL</b> (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	26	Antifeedant, repellent, insect growth regulator.
<b>*Baythroid 2</b> (cyfluthrin)	1.6-2.8 fl oz	12	0	cutworms, flea beetles	3	Maximum applications per crop: 5. Do not consume tops.
<b>Biobit HP</b> ( <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> )	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11B2	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed <sup>2</sup> .
<b>BotaniGard 22 WP, ES</b> ( <i>Beauveria bassiana</i> )	<b>WP:</b> 0.5-2.0 lb/100 gal <b>ES:</b> 0.5-2 qts 100/gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
<b>Crymax WDG</b> ( <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> )	0.5-2.0 lb	4	0	caterpillars	11B2	Use high rate for armyworms. Treat when larvae are young.
<b>Deliver</b> ( <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> )	0.25-1.5 lb	4	0	caterpillars	11B2	Use higher rates for armyworms. OMRI-listed <sup>2</sup> .
<b>*Diazinon AG-500, *4 E, *50 W</b> (diazinon)	<b>foliar - AG500, 4EC:</b> 0.5-1 pt <b>50W:</b> 0.5-1 lb <b>preplant - AG500, 4E:</b> 1-4 qts <b>50W:</b> 2-8 lb	24	14	aphids, dipterous leafminers, flea beetles preplant cutworms, mole crickets, wireworms	1B	Do not make more than 3 foliar applications.
<b>DiPel DF</b> ( <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> )	0.5-2.0 lb	4	0	caterpillars	11B2	Treat when larvae are young. Good coverage is essential. OMRI-listed <sup>2</sup> .

Table 6. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code <sup>1</sup>	Notes
<b>Extinguish</b> (S)-methoprene)	1-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
<b>Intrepid 2F</b> (methoxyfenozide)	6-16 fl oz	4	14	armyworms, cabbage-worm, loopers, saltmarsh caterpillar, webworms	18	Do not apply more than 64 fl oz per acre/season.
<b>Javelin WG</b> (Bacillus thuringiensis subspecies kurstaki)	0.12-1.5 lb	4	0	most caterpillars, but not Spodoptera species (armyworms)	11B2	Treat when larvae are young. Thorough coverage is essential. OMRI-listed <sup>2</sup> .
<b>*Lannate SP</b> (methomyl)	0.5 lb	48	3	beet armyworm	1A	SLN [24(c)] label for Florida.
<b>Lepinox WDG</b> (Bacillus thuringiensis subspecies kurstaki)	1.0-2.0 lb	12	0	for most caterpillars, including beet armyworm (see label)	11B2	Treat when larvae are small. Thorough coverage is essential.
<b>Lorsban 15 G</b> (chlorpyrifos)	<b>15G:</b> 3.3 oz 1000 ft of row	24	at planting	root maggot	1B	One application per season.
<b>Malathion 5 EC</b> (malathion)	1.5-2 pts	12	7	aphids, diamondback moth, flea beetles, leafhoppers	1B	
<b>M-Pede 49% EC</b> Soap, insecticidal	1-2% V/V	12	0	aphids, leafhoppers, mites, thrips, whiteflies	--	OMRI-listed <sup>2</sup> .
<b>Neemix 4.5</b> (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, beetles, caterpillars, leafhoppers, leafminers, thrips, whiteflies	26	Does not kill adult insects. IGR and feeding repellent. OMRI-listed <sup>2</sup> .
<b>Platinum</b> (thiamethoxam)	5.0-6.5 fl oz	12	at planting	aphids, flea beetles, leafhoppers, whiteflies	4A	Do not exceed 6.5 fl oz/acre per crop.
<b>Provado 1.6F</b> (imidacloprid)	3.5 oz	12	7	aphids, flea beetles, leafhoppers, whiteflies	4A	One application per season.
<b>Pyrellin EC</b> (pyrethrin + rotenone)	1-2 pt	12	12 hours	aphids, leafhoppers, leafminers, loopers, mites, plant bugs, thrips, whiteflies	3, 21	
<b>Sevin 80S; XLR; 4F</b> (carbaryl)	<b>80S:</b> 0.63-2.5 lb <b>XLR, 4F:</b> 0.4-2.0 qt	12	7	armyworms, aster leafhopper, corn earworm, fall armyworm, flea beetle, harlequin bug, imported cabbageworm, leafhoppers, stink bugs, tarnished plant bug	1A	Do not apply more than a total of 7.5 lb or 6 qt per acre per crop.
<b>SpinTor 2 SC</b> (spinosad)	3-6 fl oz	4	3	armyworms, flea beetle, leafminers, loopers, thrips	5	Do not apply more than 18 oz/acre per crop. Limited to 3 applications per year.
<b>Sun Spray 98.8%, others</b> Oil, insecticidal	1-2 gal/100 gal	4	0	aphids, leafhoppers, leafminers, mites, thrips, whiteflies	--	

Table 6. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code <sup>1</sup>	Notes
<b>*Telone C-35</b> (dichloropropene + chloropicrin)	See label	5 days - See label	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in certain Florida counties.
<b>*Telone II</b> (dichloropropene)						
<b>Trilogy</b> (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	26	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed <sup>2</sup> .
<b>Xentari DF</b> ( <i>Bacillus thuringiensis</i> subspecies <i>aizawai</i> )	0.5-2.0 lb	4	0	caterpillars	11B1	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

<sup>1</sup> Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v.3.3 October 2003. 1A. Acetylcholine esterase inhibitors, Carbamates 1B. Acetylcholine esterase inhibitors, Organophosphates

- 2A. GABA-gated chloride channel antagonists
- 3. Sodium channel modulators
- 4A. Nicotinic Acetylcholine receptor agonists/antagonists, Neonicotinoids
- 5. Nicotinic Acetylcholine receptor agonists (not group 4)
- 6. Chloride channel activators
- 7A. Juvenile hormone mimics, Juvenile hormone analogues
- 7D. Juvenile hormone mimics, Pyriproxifen
- 9A. Compounds of unknown or non-specific mode of action (selective feeding blockers), Cryolite
- 9B. Compounds of unknown or non-specific mode of action (selective feeding blockers), Pymetrozine
- 11B1. Microbial disruptors of insect midgut membranes, *B.t. var aizawai*
- 11B2. Microbial disruptors of insect midgut membranes, *B.t. var kurstaki*
- 12B. Inhibitors of oxidative phosphorylation, disruptors of ATP formation, Organotin miticide
- 15. Inhibitors of chitin biosynthesis, type 0, Lepidopteran
- 16. Inhibitors of chitin biosynthesis, type 1, Homopteran
- 17. Inhibitors of chitin biosynthesis, type 2, Dipteran
- 18. Ecdysone agonist/disruptor
- 20. Site II electron transport inhibitors
- 21. Site I electron transport inhibitors
- 22. Voltage-dependent sodium channel blocker
- 23. Inhibitors of lipid biosynthesis
- 25. Neuroactive (unknown mode of action)
- 26. Unknown mode of action, Azadirachtin

<sup>2</sup> OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

\* Restricted Use Only.