

the following with fixed copper at labeled rates (for suppression only):

- Revus--8.0 fl oz 2.08F/A, or
- Ranman--2.75 fl oz 400 SC/A (plus an organosilicone or non-ionic surfactant, see label for details, do not apply with copper), or
- Presidio--3.0-4.0 fl oz 4F/A, or
- Forum--6.0 fl oz 4.18SC/A, or
- Tanos--8.0-10.0 oz 50 WDG/A

Materials with different modes of action (i.e. FRAC codes) should always be alternated to reduce the chances for fungicide resistance development.

RADISHES, RUTABAGAS, AND TURNIPS

Radishes. Radishes are a quick-growing, cool-season crop developing its best quality and root shape when grown at temperatures of 50° to 65°F (10° to 18.3°C) in moderate to short day lengths. Crop must be grown rapidly (23 to 28 days) and with an adequate moisture supply. When growth is checked, the radish becomes hot, tough, and pithy. Long days (15 hours) and warm temperatures induce seedstalk formation. Under medium to short day lengths, roots are generally well shaped and tops are small.

Rutabagas. A cool-season crop developing best at temperatures of 60° to 65°F (15.6° to 18.3°C). Usually considered a fall crop; it can be grown in the spring.

Varieties

Varieties ¹	DE	MD	NJ	PA	VA	WV
Radishes: spring to fall						
Cheriette*				P		
Improved Red Prince	D	M	N	P	V	WV
Champion	D	M	N	P	V	WV
Radishes: winter						
China Rose				P		WV
Round Black Spanish				P		
Rutabagas						
Laurentian	D	M	N			
Improved American Purple Top	D	M	N	P	V	WV
Purple Top Yellow Globe				P		
Turnips: white						
White Lady*				P		WV
Hakeuri			N	P		WV
Turnips: purple top						
Royal Globe II*			N			
Royal Crown*			N	P		
Purple Top White Globe (MR)	D	M	N	P	V	WV
Just Right*				P		

¹ Varieties listed by maturity, 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.

	Soil Phosphorus Level				Soil Potassium Level		
	Pounds N per Acre	Low Pounds	Med P ₂ O ₅ per Acre	Opt. 50 ¹	Low Pounds	Med Pounds	Opt. 50 ¹
Radishes, Rutabagas, & Turnips	50 ¹	150 ¹	100 ¹	50 ¹	150 ¹	100 ¹	50 ¹

¹ Broadcast and disk-in before seeding.
NOTE: Growers producing vegetables on soils with high clay contents should reduce the recommended nitrogen and potassium rates by 20% and increase the phosphorus rate by 25%.
 Apply 1 - 2 pounds of boron (B) per acre with broadcast fertilizer. See Table B-10 for more specific boron recommendations.

Seed Treatment

Check with your seed company to determine if seed is hot water-treated. Purchase hot water treated seed if possible or request hot water seed treatment. See the Disease section for more information to prevent disease.

Spacing and Seeding

Radishes. Seed as early in the spring as soil can be worked, then at 8 to 10 day intervals through September. Seed 10 to 15 pounds per acre. Space rows 8 to 15 inches apart with 12 to 15 plants per foot in the row.

Rutabagas. Seed in early spring for the early summer crop and at least 90 days before the early freeze date in the fall. Sow 1½ to 2 pounds of seed per acre at a depth of ¼ inch in rows 30 to 36 inches apart. Thin to 4 to 8 inches in the row when plants are 2 to 3 inches tall.

Turnips. Seed as early in the spring as soil can be worked or at least 70 days before the early freeze date in the fall. Seed in rows 1 to 2 pounds per acre, 1/8 to 1/4 inch deep, in rows 14 to 18 inches apart. Plants should be 2 to 3 inches apart in the row. Seed can also be broadcast at the rate of 2.5 pounds per acre.

Harvesting and Storage

Rutabagas. Pull and trim tops in field. Bruised, damaged, or diseased rutabagas will not store well. Wash rutabagas in clean water, spray-rinse with clean water, then dry as rapidly as possible before waxing or shipping. Rutabagas can be stored 2 to 4 months at 32°F (0°C) and at a relative humidity of 90 to 95 percent.

Turnips. The crop is dug mechanically and either bunched or topped. Turnips can be stored over winter at 32° to 35°F (0° to 1.67°C) and at a relative humidity of 90 to 95 percent.

Weed Control

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.
 Use shallow cultivation as necessary to control seedling weeds.
 Find the herbicides you plan to use in the Herbicide Resistance Action Committee's (HRAC) **Herbicide Site of**

Action Table E-7 and follow the recommended good management practices to minimize the risk of herbicide resistance development by weeds in your fields.

Preemergence

Turnips. DCPA--6-10.5 lb/A. Apply 8 to 14 pints per acre Dacthal 6F immediately after seeding.

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 15 days for radish and 30 days for rutabagas and turnips.

Clopyralid--0.047-0.188 lb/A. Turnips ONLY! (roots and tops) 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. Observe a minimum preharvest interval (PHI) of 30 days for turnip roots and 15 days for turnip tops. Stinger is a postemergence herbicide with residual soil activity. Observe follow-crop restrictions, or injury may occur from herbicide carryover.

Postharvest

Paraquat--0.6 lb/A. **A Special Local-Needs 24(c) label has been approved for the use of Gramoxone Inteon 2SC or OLF for postharvest desiccation of the crop in Delaware, New Jersey and Virginia.** Apply 2.4 pints per acre Gramoxone Inteon 2SC or OLF 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 websites www.CDMS.net or www.Greenbook.org. Also, specific labels can be obtained via web search engines.

Cabbage Maggot

chlorpyrifos (Lorsban 4EC) Apply in a 4-inch band across the seed row behind the planter shoe and ahead of the press wheel, or apply as a water based spray directed to the base of plants immediately after setting. Do NOT apply as a foliar application.

diazinon (**radish, rutabaga only**) (Diazinon 4E or OLF) Apply as preplant broadcast or as a transplant solution.

Note. When yellow-rocket (mustard family) first blooms, cabbage maggot adults (flies) begin laying eggs on roots or soil near roots.

Cutworms

beta-cyfluthrin (Baythroid XL)
carbaryl (Sevin 80S or OLF)
cyfluthrin (Renounce 20WP, Tombstone or OLF)
imidacloprid + cyfluthrin (Leverage 2.7)

Flea Beetles

beta-cyfluthrin (Baythroid XL)
carbaryl (Sevin or OLF)
cyfluthrin (Renounce 20WP, Tombstone or OLF)
esfenvalerate (Asana XL)
imidacloprid (soil, drip-Admire PRO; foliar-Nuprid 1.6F, Provado 1.6F or OLF)
imidacloprid + cyfluthrin (Leverage 2.7)
spinosad (Entrust 80W, SpinTor 2SC or OLF)
thiamethoxam (soil, drip-Platinum 75SC or OLF; foliar-Actara 25WDG)

Aphids

dimethoate (Dimate 4EC or OLF)
imidacloprid (soil, drip-Admire PRO; foliar-Nuprid 1.6F, Provado 1.6F or OLF)
imidacloprid + cyfluthrin (Leverage 2.7)
malathion (Malathion 57EC or OLF)
thiamethoxam (soil, drip-Platinum 75SC or OLF; foliar-Actara 25WDG)

Leafminers

spinetoram (Radiant 2SC)
spinosad (Entrust 80W, SpinTor 2SC or OLF)

Cabbage Looper (CL), Imported Cabbageworm (ICW), Diamondback Larvae

Note: For best worm control, underleaf spray coverage is essential.

Bacillus thuringiensis (Biobit, Dipel, Dipel 2X, Javelin, XenTari or OLF)
esfenvalerate (**CL and ICW only**) (Asana XL)
methoxyfenozide (**CL and ICW only**) (Intrepid)
spinetoram (**CL only**) (Radiant SC)
spinosad (**CL only**) (Entrust, SpinTor or OLF)

The following chart gives minimum days wait between last application of pesticide and harvest of root crucifers.

Pesticide	Use Category ¹	Hours to Reentry	Days to Harvest ²		
			Radish	Rutabagas	Turnip
INSECTICIDE					
<i>Bacillus</i>					
<i>thuringiensis</i>	G	4	0	0	0
beta-cyfluthrin	R	12	0	0	0
carbaryl	G	12	7	7	7
chlorpyrifos 15G,	R	24	AP	AP	AP
4E 75WG	G	24	AP	AP	AP
cyfluthrin	R	12	0	0	0
diazinon	R	96	AP	AP	-
esfenvalerate	R	12	7	-	7
imidacloprid (soil/foliar)	G	12	21/7	21/7	21/7
imidacloprid + cyfluthrin	R	12	7	7	-
malathion	G	12	7	3	7
methoxyfenozide	G	4	-	-	1
spinetoram	G	4	3	3	3
spinosad	G	4	3	3	3
thiamethoxam (soil/foliar)	G	12	21/7	21/7	21/7
FUNGICIDE (FRAC code)					
Cabrio (Group 11)	G	12	0	0	0
copper, fixed (Group M1)	G	24	0	-	0
Quadris (Group 11)	G	4	0	0	0
Ridomil Gold (Group 4)	G	48	AP	AP	AP
Ridomil Gold Copper (Groups 4 + M1)	G	48	7	-	-
Ultra Flourish (Group 4)	G	48	AP	AP	AP

See Table D-6.

Dash (-) in table indicates pesticide is **not** labeled for that crop.

¹ G=general, R=restricted

² AP=At planting application

Disease Control

Seed Treatment

Heat treatment of seeds is a non-chemical alternative to conventional chlorine treatments that only kill pathogens on the surface of the seed coat. Heat treatment has the additional benefit of killing pathogens that may be found within the seed coat. Heat treatment is particularly useful for crops that are prone to seed-borne bacterial infections. Seed heat-treatment follows a strict time and temperature protocol, and is best done with thermostatically controlled water baths. Two baths are required; one for pre-heating, and a second for the effective (pathogen killing) temperature. The initial pre-heat cycle is for 10 minutes at 100°F (37°C) followed by the effective (pathogen killing) temperature. Soak radish seed at 122°F (50°) for 15 minutes. Immediately after removal from the second bath, seeds should be rinsed with cool water to stop the heating process. Afterward, seeds should be dried on screen or paper. Pelleted seed is not recommended for heat treatment. Heat treat only seed that will be used during the current production season.

An alternative to hot water seed treatment is to use 1 part Alcide (sodium chlorite), 1 part lactic acid, and 18 parts water as a seed soak. Treat seed for 1 to 2 minutes with constant agitation and rinse for 5 minutes in running water.

Following either treatment above, dry the seed, then dust with captan 50WP or thiram 75WP at 1 level teaspoon per

pound of seed (3 ounces per 100 pounds).

Damping-off (caused by *Pythium* and Basal stem rot caused by *Phytophthora*)

Apply the following as a pre-plant incorporated or as a soil surface spray after planting:

mefenoxam (Ridomil Gold--1.0-2.0 pt 4SL/A or Ultra Flourish--2.0-4.0 pt 2E/A)

Black Rot, Blackleg, *Alternaria*

Black rot, Black leg and *Alternaria* can survive on infested debris and on infested seed. Purchase certified or treated seed. Use hot water seed treatment to help reduce seed-borne infections. See the preceding "Seed Treatment" section. Thoroughly disc or plow under all plant debris after harvest. Eliminate cruciferous weeds from field which can act as hosts and rotate with non-cruciferous crops.

Clubroot

Radishes are susceptible to clubroot, whereas turnips are resistant. Use of irrigation water containing spores of the fungus is the principal way that the pathogen is spread to new fields. If clubroot occurs, take time to clean and disinfest any equipment to be used in other fields to its 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 using 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 (caused by *Cercospora* or *Alternaria*)

Long periods of wet weather and driving rains which promote soil splashing are conducive for development. Thoroughly disc or plow under all plant debris after harvest. Eliminate cruciferous weeds from field which can act as hosts and rotate with non-cruciferous crops.

Apply the following preventatively and/or when conditions favor development:

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.