

Root Crops

Beet, Carrot, Parsnip, Radish, and Turnip

Varieties	
Beets	Ruby Queen, Crosby Greentop, Red Ace, Asgrow Wonder, Pacemaker III, Rosette
Carrots	Imperator: Premium, First Class, Avenger, Apache, Condor, Six-pack II, Navaho
	Dicer types: Red Cored Chantenay, Goliath, Royal Chantenay, Danvers 126, Gold King
	Slicer types: Heritage, Protege, PY 60 Improved
	Nantes: Atlanta, Bolero, Mokum
Parsnips	Harris' Model, Andover, Anoka
Radishes	Cherry Belle, Comet, Red Prince
Turnips	Purple Top White Globe, Seven Top (greens)

Spacing

Beets: Rows 18 to 24 inches apart. Seed 8 to 10 pounds per acre for bunching.

Carrots: Rows 16 to 30 inches apart. Plant 20 to 30 per foot for slicing/fresh market; 10 to 20 plants per foot for dicing.

Parsnips: Rows 18 to 24 inches apart. Seed 2 to 3 pounds per acre.

Radishes: Rows 15 inches apart. Plant 12 to 15 per foot of row. Seed 10 to 15 pounds per acre.

Turnips: Rows 14 to 18 inches apart. Plant 2 to 3 inches apart in row. Seed 1 to 2 pounds per acre.

Fertilizing

Lime: To maintain a soil pH of 6.0 to 6.8; for beets, 6.5 to 7.0.

Preplant: N: 60 pounds per acre. P₂O₅: 20 to 160 pounds per acre. K₂O: 0 to 200 pounds per acre. Adjust according to soil type, previous management, and soil test results for your state. If soil tests indicate that a high amount of K is

necessary, plow down at least half the requirement. Beets also respond to boron when grown on sandy soils, light-colored silt and clay loams, and alkaline, dark-colored soils. Boron may be omitted on acid, dark-colored soils. Based on a boron soil test, include boron at 2 1/2 to 5 pounds per acre applied over the row at planting. Do not contact with seed. Boron is toxic to many vegetables, particularly beans, peas, and cucurbits. Thus, rotational plans may have to be adjusted. For carrots grown on muck soil with a soil pH greater than 6.0, add 6 pounds of manganese per acre.

Sidedress N

Beets, carrots, parsnips: for soils with more than 3 percent organic matter and following soybeans, alfalfa or a grass-legume hay crop, apply 30 pounds N per acre 4 to 6 weeks after planting. For soils with less than 3 percent organic matter and the above rotation, apply 45 pounds N per acre. Following corn, rye, oats, wheat, or a vegetable crop, apply 60 pounds N per acre.

Radish, turnip: none needed.

Disease Control

Diseases Controlled	Treatment	Comments
Cercospora Leaf Spot (Early blight), Alternaria Leaf Blight (Late Blight)	3-4 year crop rotation.	Start applying contact fungicides at the first sign of disease.
	Cabrio EG® 8-12 oz. per acre.	Do not apply more than 1 application before alternating to a fungicide with a different mode of action. 0-day PHI.
	Several chlorothalonil formulations (e.g., Bravo®, Echo®, Equus®) are labeled for use at various rates. Note that rates vary for different diseases. Carrots and parsnips only.	0-day PHI for carrot. 10-day PHI for parsnip.
	RR Endura 70WG® at 4.5 oz. acre. Alternaria leaf blight on carrot only.	Apply no more than twice before alternating to a fungicide with a different mode of action. 0-day PHI.
	Monsoon 3.6F® at 3-7.2 fl. oz. per acre. Cercospora on garden beet only.	7-day PHI.
	RR Pristine 38WG® at 8-10.5 oz. per acre. Carrot only.	Apply no more than twice before alternating to a fungicide with a different mode of action. 0-day PHI.
	RR Quadris Flowable 2.08SC® at the following rates: Alternaria leaf blight: 6-15.5 fl. oz. per acre. Cercospora leaf spot: 9.2-15.4 oz. per acre.	Do not make more than 1 application before alternating to a fungicide with a different mode of action. 0-day PHI.
	Quadris Opti® at 2.4 pts. per acre. Carrot only.	Do not make more than 1 application of Quadris Opti® before alternating to a non-group 11 fungicide. 0-day PHI.
	Rovral® at 1-2 pts. per acre for flowable (F) formulations. Alternaria leaf blight on carrot only.	When tank mixed with another fungicide registered for use on carrot, use low rate. 0-day PHI.
	Switch® at 11-14 oz. per acre. Alternaria leaf blight on carrot only.	Do not make more than 2 applications before applying a fungicide with a different mode of action. 7-Day PHI.
	Toledo 3.6F® at 3-7.2 fl. oz. per acre. Cercospora on garden beet only.	7-day PHI.

Diseases Controlled	Treatment	Comments
Downy Mildew, White Rust	3-year crop rotation. Plow crop residue as soon as possible after harvest.	Avoid volunteer plants and cruciferous weeds.
	Cabrio EG® at 8-16 oz. per acre. White rust only.	Do not apply Cabrio® more than twice before alternating to a fungicide with a different mode of action. 0-day PHI.
	RR Quadris® at 6-15.5 oz. per acre for root crops. White rust only.	Do not apply Quadris® more than once before alternating to a fungicide with a different mode of action. 0-day PHI.
White Mold (carrot and parsnip)	3-4 year crop rotation.	Avoid including beans, cucurbits, celery, and late cabbage in the rotation.
Aster Yellows (carrot and parsnip)	Use an insecticide to control leafhoppers that transmit the disease.	Excellent early season leafhopper control is essential. Control must occur before leafhoppers feed.
Root Knot Nematode	Methyl bromide or sodium methyl dithiocarbamate or Vydate L®. Carrot only.	Sample fields for plant parasitic nematodes before planting. Avoid fields with high numbers of root-knot nematodes. Methyl bromide and sodium methyl dithiocarbamate give best results when nematode populations are moderate to high. Vydate® gives adequate control when populations are low to moderate. Vydate® and methyl bromide formulations are RUPs.

Weed Control

Weeds Controlled ¹	Treatment ²	Comments
Annuals (emerged) — treatment applied before crop emergence	Gramoxone Inteon 2L® at 2-4 pts. per acre. Carrots and turnips only. Not for beets, horseradish, parsnips, or radishes.	Use 1 qt of COC or 4-8 fl. oz. of nonionic surfactant per 25 gallons of spray solution. Apply before or after seeding but before crop emerges. RUP.
Annuals and Perennials (emerged) — crop not present or protected from spray	RR Glyphosate products at 0.75-3.75 lbs. acid equivalent (ae) per acre. Use formulations containing 3 lbs. ae/gal. (4 lbs. isopropylamine salt/gal.) at 1-5 qts. per acre, or formulations containing 4.5 lbs. ae/gal. (5 lbs. potassium salt/gal.) at 0.66-3.3 qt. per acre.	Broadcast before seeding, or apply between crop rows with wipers or hooded or shielded sprayers. Use lower rate for annuals and higher rates for perennials. See label for suggested application volume and adjuvants. 14-day PHI.
	Lorox 50DF® at the following rates: Carrots in Minnesota only: 1-2 lbs. per acre. Parsnips: 1.5-3 lbs. per acre.	Do not use on sand, loamy sand, or soils with less than 1% organic matter. Apply after seeding before crop emerges. Plant seed at least 1/2 inch deep. Do not use on other root crops.
	Nortron SC® at the following rates: Preemergence: 60 fl. oz. per acre. Early postemergence: 5.25 fl. oz. per acre. Postemergence: 10.5 fl. oz. per acre. Beets only.	Apply preemergence at, or soon after seeding, and before weeds germinate. Apply early postemergence when beets have 2-4 true leaves. Apply postemergence when beets have 6-8 true leaves. May cause temporary leaf fusion. May injure stressed plants. Use on mineral soils only. Do not exceed 96 fl. oz. per acre per season.
	Outlook® at 12-21 fl. oz. per acre. Horseradish only.	Apply from 2-leaf stage to 8-leaf stage of horseradish. Cold, wet conditions at application may stunt horseradish. Will not control emerged weeds.
	Prowl H ₂ O® at 2 pts. per acre. Carrots only.	Apply within 2 days after seeding and before crop and weeds emerge. Or apply at layby as a directed spray between rows. Do not allow spray to contact carrot plants. Will not control emerged weeds. Do not exceed 2 pts. per acre per season. 60-day PHI.
	Trifluralin products at 0.5-0.75 lb. a.i. per acre. Use 4EC formulations at 1-1.5 pts. per acre. Carrots and radishes only.	Use lowest rate on coarse soils. Apply and incorporate before planting. Not effective on soils with high organic matter.
Broadleaves (not emerged)	Goal 2XL® at 2 pts. per acre. Horseradish only.	Apply after planting prior to crop emergence.
	Spartan 75DF®, at 1.5-5.3 oz. per acre, or Spartan 4F®, at 2.25-8.0 fl. oz. per acre, or Spartan Charge® at 2.9-10.2 fl. oz. per acre. Horseradish only.	Spartan Charge® has postemergence contact activity. Broadcast in the spring before planting or after planting but at least 5 days before crop emergence; or band into row middles after crop emergence. Applications made in the spring shortly before planting may be incorporated, but do not incorporate at other times. Rainfall or irrigation is required to move herbicide into the soil when not incorporated. Do not broadcast if sprouts are close to soil surface, or over top of emerged crop. Do not use on sand soils with less than 1% organic matter. Do not exceed 5.3 oz. of Spartan 75DF® per 12-month period. Do not exceed 8 fl. oz. of Spartan 4F® per 12-month period. Do not exceed 10.2 fl. oz. of Spartan Charge® per 12-month period.

Root Crops (continued)
Weed Control (continued)

Weeds Controlled ¹	Treatment ²	Comments
Broadleaves (not emerged or newly emerged)	Pyramin 4.5SC [®] at 2.75-3.25 qts. per acre, or Pyramin 65DF [®] at 4.6-5.4 lbs. per acre. Beets only.	Apply after seeding before crop emerges, or use high rate after beets have 2 expanded true leaves and before weeds have more than 2 leaves. Rainfall or irrigation necessary for effective control of nonemerged weeds. Do not apply if beets are stressed or injured. Do not use preemergence on muck soils; do not use at all on sands or sandy loam soils. Do not exceed 6.5 qts. of Pyramin 4.5SC [®] or 11.25 lbs. of Pyramin DF [®] per acre.
Grasses (not emerged)	Ro-Neet 6E [®] at 0.5-0.67 gals. per acre. Beets only.	Apply before planting and incorporate immediately. Mineral soils only.
Broadleaves (emerged)	Aim EC [®] at 0.5-2 fl. oz. per acre.	Apply with hooded sprayers as a directed application between crop rows. Use COC or nonionic surfactant. Weeds must be actively growing and less than 4 inches tall. Do not allow spray to contact crop. Do not exceed 6.1 fl. oz. per acre per season.
	Sencor 4F [®] at 0.5 pt. per acre, or Sencor 75DF [®] at 0.33 lb. per acre. Carrots only.	Broadcast after carrots have 5-6 true leaves and when weeds are less than 1 in. tall or across. Do not apply within 3 days of cool, cloudy weather, or other pesticide application, or when temperature is above 85°F. Do not exceed 1 application per season if carrots are rotated with onions, otherwise do not exceed 1 pt. of Sencor 4F [®] or 0.66 lb. of Sencor 75DF [®] per acre. 60-day PHI.
	Spin-Aid 1.3E [®] at 3-6 pts. per acre in 11-22 gals. of water. Beets only.	Apply to beets with 4 true leaves to avoid injury. Do not apply if beets are stressed. Does not control pigweed. 60-day PHI.
Broadleaves (emerged) — primarily composites and nightshade	Stinger 3L [®] at 8 fl. oz. per acre. Beets and turnips only.	Do not exceed 1 application per acre. 30-day PHI for beets and turnip roots.
Broadleaves and Grasses (emerged)	Lorox 50DF [®] at 1.5-3 lbs. per acre. Carrots only.	Apply when crop is at least 3 in. tall. Not for postemergence use on other root crops. Will provide some residual control of nonemerged weeds. Do not apply if temperature is above 85°F. Do not exceed 4 lbs. per acre per season. Do not use on sand, loamy sand, or soils with less than 1% organic matter. 14-day PHI.
Grasses (emerged)	Clethodim products at the following rates: Select Max [®] at 9-16 fl. oz. per acre. 2EC formulations of clethodim products at 6-8 fl. oz. per acre.	Use Select Max [®] with 8 fl. oz. of NIS per 25 gallons of spray solution (0.25% v/v). Use 2EC formulations with 1 qt. COC per 25 gallons of spray solution (1% v/v). Spray on actively growing grass. Wait at least 14 days between applications. Do not exceed 64 fl. oz. of Select Max [®] per acre per season. Do not exceed 32 fl. oz. of 2EC formulations per acre per season. 15-day PHI for radishes. 30-day PHI for root crops. 14-day PHI for turnip greens.
	Fusilade DX [®] at 10-12 fl. oz. per acre. Carrots only.	Use 1-2 pts. of COC or 0.5-1 pt. of nonionic surfactant per 25 gallons of spray solution. Spray on actively growing grass. 45-day PHI.
	Poast 1.5E [®] at 1-1.5 pts. per acre. Beets, carrots, horseradish, parsnips, radishes, and turnips only. Not for beet greens.	Use 1 qt. of COC per acre. Spray on actively growing grass. Do not exceed 2.5 pts. per acre per season for parsnips, radishes, and turnips; or 5 pts. per acre per season for beets, carrots, and horseradish. 14-day PHI for parsnips, radishes, and turnips. 30-day PHI for carrots. 60-day PHI for beets and horseradish.

¹For specific weeds controlled by each herbicide, check Table 21 on page 39.

²Rates given are for overall coverage. For band treatment, reduce amounts according to the portion of acre treated.

Insect Control

Insects Controlled	Treatment	Comments
Beets		
Aphids	RR Actara® at 1.5-3 oz. per acre.	Do not exceed 8 oz. per acre per season. 7-day PHI.
	Admire PRO® at 4.4-10.5 fl. oz. per acre.	Do not exceed 0.38 lb. a.i. or 1 application per season. 21-day PHI.
	Diazinon 50W® at 0.5-1 lb per acre.	Do not exceed 5 applications per season. 14-day PHI. RUP.
	Malathion 5EC® at 2.5 pts. per acre.	7-day PHI.
	M-Pede® at 1-2% by volume.	Must contact aphids to be effective. 0-day PHI.
	RR Platinum® at 5-12 fl. oz. per acre.	Apply at planting.
Variegated Cutworms	Baythroid® at 1.6-2.8 fl. oz. per acre.	Do not exceed 14.0 fl. oz. per acre per season. 0-day PHI. RUP.
	Brigade WSB® at 12.8-16.0 oz. per acre.	1-day PHI.
	Lannate SP® at 0.5 lb. per acre.	Do not exceed 8 applications or 3.6 lbs. a.i. per acre per crop. 0-day PHI for roots. 10-day PHI for tops. RUP.
	Mustang MAX® at 1.28-4 fl. oz. per acre.	Do not exceed 0.3 lb. a.i. per acre per season. 1-day PHI.
Carrots		
Aphids	RR Actara® at 1.5-3 oz. per acre.	Do not exceed 8 oz. per acre per season. 7-day PHI.
	Admire PRO® at 4.4-10.5 fl. oz. per acre.	Do not exceed 0.38 lb. a.i. or 1 application per season. 21-day PHI.
	Diazinon 50W® at 1 lb. per acre, or Diazinon AG500® at 1 pt. per acre.	Do not exceed 5 applications per acre per season. 14-day PHI. RUP.
	Endosulfan 3EC® at 0.66-1.33 qts. per acre.	Do not exceed 1 application per year. 7-day PHI.
	M-Pede® at 1-2% by volume.	Must contact aphids to be effective. 0-day PHI.
	RR Platinum® at 5.12 fl. oz. per acre.	Apply at planting.
Cutworms	Asana XL® at 5.8-9.6 fl. oz. per acre.	Do not exceed 0.5 lb a.i. per acre per season. 7-day PHI. RUP.
	Baythroid® at 1.6-2.8 fl. oz. per acre.	Do not exceed 14.0 fl. oz. per acre per season. 0-day PHI. RUP.
Cutworm Threshold 25% of plants infested	Brigade WSB® at 12.8-16.0 oz. per acre.	21-day PHI.
	Diazinon 50W® at 4-8 lbs. per acre, or Diazinon AG500® at 2-4 qts. per acre.	Broadcast just before planting and immediately incorporate into the soil. Do not exceed 5 applications per season. 14-day PHI. RUP.
	Lannate SP® at 0.25-0.5 lb. per acre.	Do not exceed 6.3 lbs. a.i. per acre per season. 1-day PHI. RUP.
	Sevin XLR PLUS® at 1-2 qts. per acre.	Do not exceed 6 qts. per acre per season. 7-day PHI.
Leafhoppers	Plant resistant varieties.	Use varieties resistant to aster yellows.
	RR Actara® at 1.5-3.0 oz. per acre.	Do not exceed 8 oz. per acre per season. 7-day PHI.
Leafhopper Threshold For susceptible varieties: 20 leafhoppers per 100 sweeps	Admire PRO® at 4.4-10.5 fl. oz. per acre.	Do not exceed 0.38 lb. a.i. or 1 application per season. 21-day PHI.
	Asana XL® at 5.8-9.6 fl. oz. per acre.	Do not exceed 0.5 lb. a.i. per acre per season. 7-day PHI. RUP.
	Baythroid® at 1.6-2.8 fl. oz. per acre.	Do not exceed 14.0 fl. oz. per acre per season. 0-day PHI. RUP.
	Lannate SP® at 0.5-1 lb. per acre.	Do not exceed 6.3 lbs. a.i. per acre per season. 1-day PHI. RUP.
	RR Platinum® at 5-12 fl. oz. per acre.	Apply at planting.
	Sevin XLR PLUS® at 0.5-1 qt. per acre.	Do not exceed 6 qts. per acre per season. 7-day PHI.

RR This is a reduced-risk pesticide. See pages 23-24 for details.

Insects Controlled	Treatment	Comments
Radishes		
Aphids, Flea Beetles	RR Actara® at 1.5-3 oz. per acre.	Do not exceed 4 oz. per acre per season. 7-day PHI.
	Admire PRO® at 4.4-10.5 fl. oz. per acre.	Do not exceed 0.38 a.i. or 1 application per season. 21-day PHI.
	Asana XL® at 5.8-9.6 oz. per acre. Flea beetles only.	Do not exceed 0.1 lb. a.i. per acre per season. 7-day PHI. RUP.
	Baythroid® at 1.6-2.8 fl. oz. per acre. Flea beetles only.	Do not exceed 14.0 fl. oz. per acre per season. 0-day PHI. RUP.
	Brigade WSB® at 12.8-16.0 oz. per acre.	21-day PHI.
	Diazinon 50W® at 0.5-1 lb. per acre, or Diazinon AG500® at 0.5-1 pt. per acre.	Do not exceed 3 applications per acre per season. 14-day PHI. RUP.
	M-Pede® at 1-2% by volume. Aphids only.	Must contact aphids to be effective. 0-day PHI.
	RR Platinum® at 5-6.5 fl. oz. per acre.	Apply at planting.
Sevin XLR PLUS® at 0.5-1 qt. per acre. Flea beetles only.	Do not exceed 6 qts. per acre per season. 7-day PHI.	
Cutworms	Baythroid® at 1.6-2.8 fl. oz. per acre.	Do not exceed 14.0 fl. oz. per acre per season. 0-day PHI. RUP.
	Brigade WSB® at 12.8-16.0 oz. per acre.	21-day PHI.
	Diazinon 50W® at 4-8 lbs. per acre, or Diazinon AG500® at 2-4 qts. per acre.	Broadcast just before planting and immediately incorporate into the soil. 14-day PHI. RUP.
	Sevin XLR PLUS® at 1-2 qts. per acre.	Do not exceed 6 qts. per acre per season. 7-day PHI.
Root Maggots	Lorsban 4E® at 1 fl. oz. per 1,000 linear ft. of row, or Lorsban 75WG® at 0.67 oz. per 1,000 linear ft. of row. Apply as a furrow application at planting.	Apply as a water-based drench and use a minimum of 40 gallons of water. Do not exceed 1 application per season.
Turnips		
Aphids, Flea Beetles	RR Actara® at 1.5-3 oz. per acre.	Do not exceed 8 oz. per acre per season. 7-day PHI.
	Admire PRO® at 4.4-10.5 fl. oz. per acre.	Do not exceed 0.38lb. a.i. or 1 application per season. 21-day PHI.
	Ambush 25W® at 3.2-6.4 fl. oz. per acre. Aphids in Illinois and Indiana only.	Do not exceed 8 applications per acre per season. 1-day PHI. RUP.
	Asana XL® at 5.8-9.6 oz. per acre. Flea beetles only.	Do not exceed 0.4 lbs. a.i. per acre. 7-day PHI. RUP.
	Baythroid® at 1.6-2.8 fl. oz. per acre. Flea beetles only.	Do not exceed 14.0 fl. oz. per acre per season. 0-day PHI. RUP.
	Brigade WSB® at 12.8-16.0 oz. per acre.	21-day PHI.
	BP Neemix® according to label directions.	0-day PHI.
RR Platinum® at 5-12 fl. oz. per acre.	30-day PHI.	
Root Maggots	Lorsban 4E® at 1.6-2.75 fl. oz. per 1,000 linear ft. of row, or Lorsban 75WG® at 1.1-1.8 oz. per 1,000 linear ft. of row. Apply as a furrow application at planting.	Apply as a water-based drench and use a minimum of 40 gallons of water. Do not exceed 1 application per acre per season.

RR This is a reduced-risk pesticide. See pages 23-24 for details.

BP This is a biopesticide, see pages 23-24 for details.