CARROTS

Varieties

Processing: Dicing	Market
Danvers 126	Achieve*
Danvers Half Long	Apache*
Royal Chantenay*	Bolero*
Red Cored Chantenay	Cellobunch*
	Enterprise*
	Envy* (early)
Processing: "Coins"	Goldfinger* (early)
Baltimore*(Nantes Type)	Maverick (early)*
Bolero (early)*	Napoli*
Scarlet Nantes	Nantindo* (early)
YaYa*	Nelson* (early)
	Romance*
	Sugarsnax 54*
	Tendersnax*
	Tendersweet
	Top Cut 95*
	Trooper*

*Indicates hybrid variety

Recommended Nutrients Based on Soil Tests

Before using the table below, refer to important notes in the Soil and Nutrient Management chapter in Section B and your soil test report. These notes and soil test reports provide additional suggestions to adjust rate, timing, and placement of nutrients. Your state's soil test report recommendations and/or your farm's nutrient management plan supercede recommendations found below.

		Soil Phosphorus Level				Soil Potassium Level				
	Pounds N	Low	Med	High (Opt.)	Very High	Low	Med	High (Opt.)	Very High	
Carrots	per Acre	Pounds P_2O_5 per Acre				Pounds K_2O per Acre				Nutrient Timing and Method
	50-80	150	100	50	0	150	100	50	0	Total nutrient recommended.
	50	150	100	50	0	150	100	50	0	Broadcast and disk-in.
	25-30	0	0	0	0	0	0	0	0	Sidedress if needed.

Apply 1.0 to 2.0 pounds of boron (B) per acre with broadcast fertilizer. See Table B-9 for more specific boron recommendations.

Seed Treatment

Seeds can be treated to prevent disease. This explanation can be found in the Disease Control Section of this chapter. Seed treatments are not a substitute for high-quality seed.

Seeding Dates

For early harvest (late June to September), sow March 20 to April 30; for late harvest, sow May 1 to July 5 (May 1 to June 15 in Pennsylvania and northern New Jersey). Practice crop rotation, and plant after a small grain crop for highest yields.

Seeding Rate and Spacing

Processing: Rows 18 to 36 inches apart; "coins," sow at a density of 16 plants per foot; dicing: sow 6 plants per foot (8 if soil is on the fine-textured side); dicers: 1-2 lbs per acre using 2-inch scatter shoe. Depth of seeding should be no greater than one- fourth inch.

Fresh market and Cut and Peel: Rows 18 to 36 inches apart; sow for 6 to 8 plants per foot or 2 to 4 pounds per acre using 4-inch scatter shoe. Depth of seeding should be no greater than ¼ inch

Processing and Fresh: Sowing with a precision vacuum seeder produces more uniform carrots. In a row, each vacuum plate meters seed to three separate lines. Lines are generally 1.5 to 2 inches apart and seeds are dropped about 1.5 to 2 inches apart within the line, resulting in 4 to 6 seeds per foot of seed-line for dicers and 6 to 8 plants per foot for slicers or fresh market. If triple line sets are used, increase the distance between seeds in the center row.

Cultivation

Hill with 2 inches of soil to cover shoulders to minimize greening.

Harvest and Post Harvest Considerations

Early fresh market carrots are harvested from July to September. Late market carrots are harvested from September into early winter. Fresh market carrots should be over 5 inches long and between 0.75 and 1.5 inches in diameter. Carrots harvested and handled in hot weather are more prone to rapid decay, and care should be exercised in handling to prevent wilting. Fresh market carrots in small plantings are harvested by loosening soils around the plants with a garden

fork and then pulling gently out of the ground by the tops. For larger acreages carrots with intact tops are harvested with a belt pick-up harvester that lifts carrots by their foliage. Belt pick up, coulter pick up, or modified potato harvester types are used for processing carrots.

Carrots are processed immediately after harvest, and not stored. Most are scalped (tops removed) just before digging. A reduction in yield of about 15-20% occurs when carrots are field scalped. Scalped carrots, and those with inadequate, or frozen tops are harvested with a coulter pick-up or a modified potato harvester. Carrots with intact tops are harvested with a belt pick-up harvester that lifts carrots by their foliage then cuts off the tops.

Fresh market carrots are washed, sorted, and packed in one or two-pound plastic bags then the bags are packed into 48 1-lb bags, or 24 2-lb bags per carton; or loose in 50-pound mesh or plastic sacks at a packing house. Store carrots at 32°F and relative humidity of 98 to 100 %. Carrots for processing may be given a pre-storage dip treatment in a 0.1 % solution of sodium o-phenylphenate (SOPP) to reduce storage decay. The solution is not rinsed off after treatment. Careful handling during and after harvest to avoid bruising, cutting and breakage, will help ensure successful storage.

Mature topped carrots can be stored 7 to 9 months at 32° to 34°F with a very high relative humidity, 98 to 100 %. Prompt cooling to 40°F or below after harvest is essential for extended storage. Poorly precooled roots decay more rapidly. Humidity should be kept high to prevent wilting. Carrots stored at 98 to 100 % relative humidity develop less decay, lose less moisture, and remain crisper than those stored at 90 to 95 % relative humidity. A temperature of 32° to 34°F is essential if decay and sprouting are to be minimized.

Pre-storage washing of carrots may be desirable if they are harvested under wet conditions. Many potential decay-causing organisms are removed by washing and better air circulation is fostered. Air circulation between crates of pallet boxes in which carrots are stored is desirable to remove respiratory heat, maintain uniform temperatures, and help prevent condensation. An air velocity of about 14 to 20 ft/min is adequate at low storage temperatures.

Bitterness in carrots, which may develop in storage, is due to ethylene exposure. This gas is given off by apples, pears, and certain other fruits and vegetables and from decaying tissues. Bitterness can be prevented by storing carrots away from such products. Also, ethylene and development of bitterness can be minimized by low-temperature. Surface browning or oxidative discoloration often develops in carrots stored for extended periods.

Weed Control

Identify the weeds in each field and select recommended herbicides that control those weeds. See Tables E-3 and E-4.

Match preplant incorporated and preemergence herbicide rates to soil type and percent organic matter in each field.

Apply postemergence herbicides when crop and weeds are within the recommended size and/or leaf stage.

Determine the preharvest interval (PHI) for the crop. See Table E-4 and consult the herbicide label.

Find the herbicides you plan to use in the Herbicide Resistance Action Committee's (HRAC) **Herbicide Site of Action Table E-8** and follow the recommended good management practices to minimize the risk of herbicide resistance development by weeds in your fields.

Preplant Incorporated

Trifluralin--0.50 to 0.75 lb/A. Apply 1.0 to 1.5 pints per acre Treflan 4EC. Preferably, use two diskings to incorporate treatment into the top 3 inches of soil within 8 hours after application. Plant carrots immediately. Trifluralin is particularly effective on barnyardgrass, foxtail, crabgrass, fall panicum, and other annual grasses. It will not control ragweed or jimsonweed.

Preemergence

Linuron--0.5 to 1.5 lb/A. Apply 1.0 to 3.0 pints per acre Lorox 50DF after seeding, but before crop emergence. Sow seed at least one-half inch deep. Use lower rate on lighter coarse-textured sandy soils and the higher rate on heavier fine-textured soils. Follow with overhead irrigation if rainfall does not occur. Primarily controls annual broadleaf weeds. Annual grasses may only be suppressed. Do NOT exceed a total of 2 pounds of active ingredient linuron per acre per season. Labeled for use in New Jersey ONLY!

Prometryn--1.0 to 2.0 lb/A. Apply 2.0 to 4.0 pints per acre Caparol 4L after seeding, but before crop emergence. Use lower rate on lighter coarse-textured sandy soils and the higher rate on heavier fine-textured soils. Follow with overhead irrigation if rainfall does not occur. Primarily controls annual broadleaf weeds. Annual grasses may only be suppressed.

S-metolachlor--1.26 to 1.90 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Dual Magnum 7.62E to control weeds in carrots in New Jersey. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, "farmassist.com". Go to the website "farmassist.com" and register (or sign in if previously registered), then under "products" on the toolbar, click on indemnified labels and follow the instructions.** Apply 1.33 to 2.00 pints per acre Dual Magnum 7.62E preemergence to control annual grasses, yellow nutsedge, and certain broadleaf weeds, including galinsoga. Dual Magnum will NOT control emerged weeds. **Use ONLY on high organic matter (>20%) muck soils.** Read and follow all notes and precautions on the label. DO NOT incorporate Dual Magnum prior to planting. Make only one application per crop. Observe a minimum preharvest interval of 64 days after application. **Other generic versions of metolachlor and s-metolachlor may be available, and may or may not be labeled for use in the crop.**

Postemergence

Sethoxydim--0.2 to 0.5 lb/A. Apply 1.0 to 2.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1.0 gallon per 100 gallons of spray solution) postemergence to control annual grasses and certain perennial grasses. **The use of oil concentrate 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 30 days and apply no more than 5 pints per acre in one season.

Clethodim--0.094 to 0.125 lb/A. Apply 6.0 to 8.0 fluid ounces per acre Select 2EC with oil concentrate to be 1 percent of the spray solution (1.0 gallon per 100 gallons of spray solution) or 12.0 to 16.0 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 30 days.

Fluazifop--0.125 to 0.188 lb/A. Apply 0.5 to 0.75 pints per acre Fusilade DX 2E with oil concentrate to be 1 percent of the spray solution (1.0 gallon per 100 gallons of spray solution) or a nonionic surfactant to be 0.25 percent of the spray solution (1.0 quart per 100 gallons of spray solution) to control annual grasses and certain perennial grasses. 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. It will not control yellow nutsedge, wild onion, or any broadleaf weed. Do not tank-mix with 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 45 days and apply no more than 6.0 pints per acre in one season. Do not plant corn, sorghum, cereals, or any other grass crop within 60 days of the last application.

Linuron--0.75 to 1.5 lb/A. Apply 1.5 to 3.0 pounds per acre Lorox 50DF or 1.5 to 3.0 pints per acre Lorox 4L. Apply when carrots are approximately 3 to 6 inches tall. Avoid postemergence applications when daily temperatures are 90^{o}F (32.2^{o}C) or above or during a period of cloudy weather or just after rain or irrigation. Linuron is effective on most weeds including ragweed. Do not plant treated area to crops not on the label within a 4-month period after treatment.

Metribuzin--0.25 lb/A. Apply 0.33 pound per acre Sencor 75DF postemergence to carrots with a minimum of six true leaves to control many broadleaf weeds, including tropic croton, spotted spurge, and horseweed. Do not use to control triazine-resistant weeds. Do not apply within 3 days after periods of cool, wet, cloudy weather. Do not tank-mix with any other pesticide or apply within 3 days, or excessive crop injury may result. Do not apply to carrots with less than six true leaves or excessive crop injury may result. Varietal differences exist in carrot tolerance to Sencor. Use caution when treating new varieties.

Prometryn--1.0 to 2.0 lb/A. Apply 2.0 to 4.0 pints per acre Caparol 4L after the crop has 3 true leaves, through the 6 true leaf stage of growth. Primarily controls many seedling annual broadleaf weeds less than 2 inches tall. Annual grasses may only be suppressed. Follow with overhead irrigation if rainfall does not occur. Use lower rate when the crop and weeds are small, or when cloudy, humid growing conditions prevail and the higher rate when the crop and weeds are more mature and hot dry growing conditions prevail. Add nonionic surfactant to be 0.5% of the spray solution (2.0 quarts per 100 gallons) or oil concentrate to be 1% of the spray solution (1.0 gallon per 100 gallons). One preemergence treatment of up to 4 pints per acre plus two postemergence treatments of 2.0 pints per acre may be applied, but do not exceed 8 pints per acre per crop cycle. Observe a minimum preharvest interval of 30 days.

Postharvest

Paraquat--0.6 lb/A. **A Special Local-Needs 24(c) label has been approved for the use of Gramoxone SL 2.0 or OLF or postharvest desiccation of the crop in Delaware, New Jersey and Virginia.** Apply 2.4 pints per acre Gramoxone SL 2.0 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

THE LABEL IS THE LAW. PLEASE REFER TO THE LABEL FOR UP TO DATE RATES AND RESTRICTIONS

NOTE: Copies of specific insecticide product labels can be downloaded by visiting the websites www.CDMS.net or www.greenbook.net. Also, specific labels can be obtained via web search engines.

Aphids

Apply one of the following formulations:

flonicamid--2.0 to 2.8 oz/A Beleaf 50SG

imidacloprid--**soil** 4.4 to 10.5 fl oz/A Admire Pro (or OLF), **foliar** 1.2 fl oz/A Admire PRO (or OLF)

imidacloprid + beta-cyfluthrin--2.4 to 2.8 fl oz/A Leverage 360

malathion--2.0 pts/A Malathion 57EC (or OLF)

thiamethoxam--1.5 to 3.0 oz/A Actara 25WDG

Carrot Weevil

Begin treatment when weevils become active. Apply one of the following formulations:

beta-cyfluthrin--2.8 fl oz/A Baythroid XL

cyfluthrin--2.8 fl oz/A Tombstone (or OLF)

esfenvalerate--9.6 fl oz/A Asana XL

imidacloprid + beta-cyfluthrin--2.4 to 2.8 fl oz/A Leverage 360

oxamyl--2.0 to 4.0 pts/A Vydate L

Cutworms

Apply one of the following formulations:

beta-cyfluthrin--1.6 to 2.8 fl oz/A Baythroid XL (or other labeled mixtures containing beta-cyfluthrin, like Leverage 360)

cyfluthrin--1.6 to 2.8 fl oz/A Tombstone (or OLF)

esfenvalerate--5.8 to 9.6 fl oz/A Asana XL
methomyl--Lannate LV (see label for rates and current registration status)

Leafhoppers

Begin spraying when true leaves first appear. Repeat every 14 days or as needed.

Leafhoppers transmit aster yellows. Seedling protection from leafhoppers is important. Apply one of the following formulations:

beta-cyfluthrin--1.6 to 2.8 fl oz/A Baythroid XL
cyfluthrin--1.6 to 2.8 fl oz/A Tombstone (or OLF)
esfenvalerate--5.8 to 9.6 fl oz/A Asana XL
imidacloprid--**soil** 4.4 to 10.5 fl oz/A Admire Pro (or OLF), **foliar** 1.2 fl oz/A Admire PRO (or OLF)
imidacloprid + beta-cyfluthrin--2.4 to 2.8 fl oz/A Leverage 360
malathion--2.0 pts/A Malathion 57EC (or OLF)
methomyl--0.75 to 1.5 fl oz/A Lannate LV
thiamethoxam--1.5 to 3.0 oz/A Actara 25WDG

Pesticide	Use Category[1]	Hours to Reentry	Days to Harvest
INSECTICIDE			
beta-cyfluthrin	R	12	0
cyfluthrin	R	12	0
esfenvalerate	R	12	7
flonicamid	G	12	3
imidacloprid(soil/foliar)	G	12	21/7
imidacloprid + beta-cyfluthrin	R	12	7
malathion	G	24	7
methomyl	R	48	1
oxamyl	R	48	14
thiamethoxam	G	12	7
FUNGICIDE (FRAC code)			
azoxystrobin (Group 11)	G	4	0
Cabrio (Group 11)	G	12	0
chlorothalonil (Group M5)	G	12	0
Contans WG (biological)	G	4	0
Endura (Group 7)	G	12	0
fixed copper (Group M1)	G	see label	2
Fontelis (Group 7)	G	12	0
iprodione (Group 2)	G	24	0
Merivon (Groups 7 +11)	G	12	7
Mertect (Group 1)	G	12	--
Omega (Group 29)	G	12	7
Pristine (Groups 11 + 7)	G	12	0
Quadris Top (Groups 3 + 11)	G	12	7
Ridomil Gold (Group 4)	G	48	0
Switch (Groups 9 + 12)	G	12	7
Ultra Flourish (Group 4)	G	48	0

See Table D-6. [1] G = general, R = restricted

Nematode Control

Nematode control is essential for successful production. See Chapter E "Nematodes" section of Soil Pests-Their Detection and Control. Use fumigants listed in the "Soil Fumigation" section or use Vydate L. Heavy rainfall following application and prior to emergence can result in less effective control with Vydate L. Consult label before use.

Disease Control

Seed Treatment

Use seed treated with Maxim 4FS (0.08 to 0.16 fl oz/100 lb seed) for *Rhizoctonia* and *Fusarium* control and Apron XL or (0.32 to 0.64 fl oz/100 lb seed or Allegiance FL (0.75 fl oz/100 lb seed) for Pythium damping-off protection. Seed treatments are not a substitute for high-quality seed.

Damping-Off (*Pythium* and *Phytophthora*)

Use seed treatments as instructed above. Apply the following preplant incorporated or as a soil-surface spray after seeding. If the seed treatment contains mefenoxam (Apron) or metalaxyl (Allegiance) do not use soil application.

Mefenoxam--Ridomil Gold 0.5 to 1.3 pt 4SL/A or Ultra Flourish--2.0 to 4.0 pt 2E/A

Aster Yellows

Use insecticides to control leafhoppers. Control weed populations (including carrot volunteers) on periphery of fields early in the season to prevent transmission by leafhoppers from the weeds into the crop. The severity of aster yellows and damage to the crop will depend on the age of the crop and when the infection occurs. The earlier the infection occurs, the more severe and widespread the symptoms may become later in the season. See leafhopper management under "Insect Control".

Leaf Blights (*Alternaria* and *Cercospora*)

Several varieties such as Bolero, Calgary, Carson, Cheyenne, and Choctaw exhibit tolerance to leaf blight and should be grown where adapted. For susceptible varieties, begin applications when disease threatens or early July, and continue every 7 to 10 days until frost. For processing crops or situations when the crop is not being marketed with its foliage, a 25% disease incidence threshold may be used to time the first fungicide application. Scout carrot fields by variety. While walking across the field in a 'V' or 'W' shaped transect for each variety, evaluate disease incidence on five leaves from five adjacent plants in a minimum of ten locations. A leaf is infected if one or more fungal leaf blight lesions are observed. Apply the first fungicide spray when twelve of the fifty leaves scouted show symptoms (~25%). Subsequent sprays should be applied based on the label recommended spray interval or on increased disease severity. Under severe defoliation, add urea (10.0 lb/A) to encourage new leaf growth.

Tank mix and/or alternate one of the following fungicides *with* chlorothalonil--1.5 to 2.0 pt 6F/A or OLF:

Merivon--4.0-5.5 fl oz 2.09SC/A (use 5.5 fl oz 2.09SC for Cercospora)
azoxystrobin--6.0 to 15.5 fl oz 2.08F/A or OLF (Apply 9.0 to 15.5 fl oz 2.08F/A for Cercospora)
Cabrio--8.0 to 12.0 oz 20EG/A
Pristine--8.0 to 10.5 oz 38WG/A
Fontelis--16.0 to 30.0 fl oz 1.67SC/A

For Alternaria leaf blight only, tank mix and alternate one of the following fungicides *with* chlorothalonil--1.5 to 2.0 pt 6F/A or OLF**:**

Merivon--4.0-5.5 fl oz 2.09SC/A
Endura--4.5 oz 70W/A
Fontelis--16.0 to 30.0 fl oz 1.67SC/A
Switch--11.0 to 14.0 oz 62.5WG/A
iprodione--1.0 to 2.0 pt 50WP/A or OLF (check label for rotational restrictions)

chlorothalonil applied alone will not provide adequate control of Cercospora, Alternaria, or Powdery mildew

Powdery Mildew

For powdery mildew, if symptoms are observed early in the season initiate a fungicide spray program to protect foliage. Do not make more than one sequential application of Cabrio and/or Pristine before alternating with chlorothalonil alone or with Fontelis. Disease development mid to late season rarely results in reduced yield at harvest. Under severe defoliation, add urea (10.0 lb/A) to encourage new leaf growth.

Tank mix the following FRAC code 11 fungicides *with* chlorothalonil--1.5 to 2.0 pt 6F/A**:**
Cabrio--8.0 to 12.0 oz 20EG/A
Pristine--8.0 to 10.5 oz 38WG/A

and rotate with:

Fontelis--16.0 to 30.0 fl oz 1.67SC/A *plus* chlorothalonil--1.5 to 2.0 pt 6F/A
Merivon--4.0-5.5 fl oz 2.09SC/A

Bacterial Blight (*Xanthomonas*)

Initiate a fixed copper-based bactericide program as soon as symptoms are first observed. Not all copper-based products are created equal and vary by copper content as well as active ingredient(s) (see Table E-12 for a list of available fixed-copper products and check label for rates). Avoid walking and working in fields when the foliage is wet to reduce spread of the disease.

White Mold (*Sclerotinia sclerotiorum*)

Few products are available for the management of white mold. Avoid planting in shaded or poorly drained areas and areas with a history of severe white mold. Rotate infested fields to a non-host crop for at least 2 to 3 years. Maximize air movement through the plant canopy by using wider plant spacing. Remove and destroy infected plant material in the field.

Apply when symptoms appear:
Fontelis--16.0 to 30.0 fl oz 1.67SC/A
Omega--1.0 pt 500F/A

Apply Contans WG 3 to 4 months prior to planting to allow the active agent to reduce levels of sclerotia inoculum in the soil. Following application, incorporate to a depth of 1 to 2 inches. **Do not plow** before seeding carrots to avoid moving untreated sclerotia in lower soil layers to the upper soil layer. Most effective when used as part of an integrated pest management program.

Contans--2.0 to 4.0 lb 5.3WG/A

Storage rots caused by *Botrytis* and White mold (*Sclerotinia sclerotiorum*)

Remove roots from field, separate and discard all damaged roots before placing them in storage at 32^{o}F (0^{o}C) and 90 to 95 percent relative humidity immediately after digging.

Prior to harvest apply:

Fontelis--16.0 to 30.0 fl oz 1.67SC/A (0-day PHI)

or, as carrots are placed into storage, dip into Mertect 340F--41.0 fl oz/100 gal water for 5 to 10 seconds.

Southern blight (***Sclerotium rolfsii***)

Southern blight can cause significant losses if present. Once established in fields, southern blight will persist in infested soils for many years. Rotate away from known infested fields.

Apply every 7 to 14 days and rotate between the following when symptoms appear:

Fontelis--16.0 to 30.0 fl oz 1.67SC/A
azoxystrobin--15.5 fl oz 2.08F or OLF.
Omega--1.0 pt 500F/A
Quadris Top--14.0 fl oz 1.67SC