

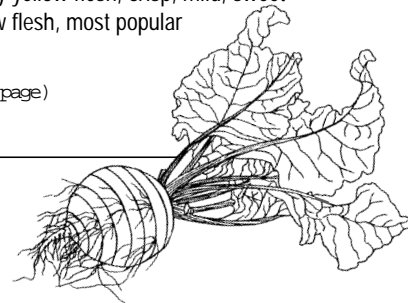
Growing Root Crops

(Beets, Carrots, Parsnips, Radishes, Rutabaga, and Turnips)

SUGGESTED VARIETIES AND DESIRABLE CHARACTERISTICS

| Variety (F1 hybrids) | Days to maturity | Disease resistance | Suggested uses | Comments |
|-----------------------------------|---------------------|-----------------------|--------------------------------------|--|
| Beets | | | | |
| Kleine Bol (Little Ball) | 50 | | G | True baby beet, harvest at 1" diameter |
| Early Wonder | 50 | | G | Early, for greens, bunching, or roots |
| Red Ace*53 | | C, G | Sweetest, best-tasting beet, uniform | |
| Forono | 55 | | C, G | 5" x 2", makes uniform slices; improved Formanova/Cylindra |
| Golden Beet | 55 | | C, G | Yellow flesh, does not bleed |
| Chioggia | 58 | | G | Specialty beet, interior white with red rings |
| Green Top Bunching | 60 | | G | Glossy green tops, for bunching and greens |
| Ruby Queen | 60 | | C, G | Standard, improved Detroit-type, AAS |
| Detroit Dark Red strains | 63 | | C, F, G | Old standard variety |
| Carrots | | | | |
| Coreless Amsterdam | 55 | | C, F, G | Early Nantes type, 6" |
| Thumbelina | 58 | | G | Best round baby carrot, harvest at golf-ball size, AAS |
| Touchon Deluxe | 58 | | C, F, G | Highly colored Nantes type, 7" |
| Nelson* | 60 | | C, F, G | Hybrid Nantes that takes stress, tender, crisp |
| Ingot* | 67 | | C, F, G | High carotene, deep color, full-flavor, 8" |
| Scarlet Nantes | 68 | | C, F, G | Standard Nantes type |
| Nevis* | 68 | ALS | C, F, G | Heat-tolerant, deep orange Nantes type |
| Bolero* | 72 | ALS | C, F, G | For fall and winter harvest, storage |
| Danvers 126 (Half-Long) | 72 | | C, F, G | Ideal for all processing and cooking uses |
| Parsnips | | | | |
| All American | 110 | | G | Broad shoulders, large, strongly tapered |
| Javelin* | 110 | | G | Earlier, larger, smoother than Harris Model |
| Harris Model | 120 | | G | Narrow shoulders, smooth, gradual taper |
| Lancer | 120 | C | G | Uniform roots, sweet, improved Harris Model |
| Radish | | | | |
| <i>Spring or fall planting</i> | | | | |
| Cherriette* | 20 | | G | Early, uniform, stress tolerant |
| French Dressing | 21 | | G | Improved French Breakfast type (for slicing), 1" x 2" |
| Cherry Belle | 22 | | G | Tops very short, AAS |
| Cabernet* | 22 | CR, R | G | Very uniform, disease resistant, split resistant |
| Sparkler | 25 | | G | Scarlet roots with white tips, tops long |
| Vintage | 25 | BR, FY | G | Disease resistant, mild |
| Champion | 26 | | G | Very large, firm, mild, crisp, tall crops, AAS |
| Flamivil | 28 | | G | Improved French Breakfast type, late, 1" x 2" |
| White Icicle | 28 | | G | Long, cylindrical, white, tender and mild |
| Parat German Giant | 29 | | G | Good from marble-size to 2" diameter |
| Winter | | | | |
| Nero Tondo | 50 | | G | Improved Round Black Spanish |
| Chinese Rose | 55 | | G | Long, rosy skin, flesh white, long storage |
| Oriental/Diakon | | | | |
| Summer Cross (Minowase) | 45 | | G | Crisp, white, mild, 6–14", late spring/fall use |
| Rutabaga (or Swede turnip) | | | | |
| American Purple Top | 90 | | G | Top purplish-red, creamy yellow flesh, crisp, mild, sweet |
| Laurentian | 90 | | G | Deep purplish top, yellow flesh, most popular |
| York | 95 | CR | G | Similar to Laurentian |

(Table continued on next page)



(Table continued from front page)

| Variety (F1 hybrids) | Days to maturity | Disease resistance | Suggested uses | Comments |
|-------------------------|---------------------|-----------------------|-------------------|--|
| Turnip (Greens) | | | | |
| Royal Crown* | 28 | | G | Rapid growing, deep green |
| Just Right* | 28 | | G | Glossy, tender leaves, AAS |
| All Top* | 35 | | G | Slow-bolting, rapid growth, greens only |
| Topper | 35 | DM | G | Greens only, deep green, aphid tolerant |
| Turnip (Roots) | | | | |
| Tokyo Cross | 35 | | G | Early harvest, white, smooth roots, long harvest, AAS |
| Hakueri | 38 | | G | Smooth white roots, harvest before 2" |
| White Lady | 40 | | G | Tender white roots, resists bolting |
| Just Right* | 60 | | G | All white, very crisp, best for fall crop, AAS |
| Royal Crown* | 50 | | G | Hybrid form of Purple Top White Globe that is more tender, |
| Purple Top White Globe | 58 | | G | Popular, white skin and flesh, top reddish-purple |

CODES

Variety: * = F1 Hybrid

Disease Resistance/Tolerance: **ALS** = Alternaria Leaf Spot, **BR** = Black Rot, **C** = Canker, **CR** = Club Root, **DM** = Downey Mildew, **FY** = Fusarium Yellow, **R** = Rhizoctonia

Suggested use: **C** = Canning, **F** = Freezing, **G** = Use fresh from the garden.

Comments: **AAS** = All-America Selection award winner

CULTURAL PRACTICES

Soil pH and Fertility

All root crops, except beets, grow best in soils with a pH of 6.2 to 6.8; beets require a pH of 6.6 or higher for maximum yields. Fertilize and lime as directed by soil test results (kit can be purchased from your county's Penn State Cooperative Extension office). Soil testing is recommended every 3 years to monitor soil pH and fertility. For beets, carrots, and parsnips, in the absence of a soil test, apply to each 100 square feet either 4½ pounds of 5-10-10 (or equivalent) fertilizer (where potash tends to be low) or 4½ pounds of 5-10-5 (where potash levels are expected to be high; for example, areas where wood ashes, manures, or high rates of complete fertilizers have previously been applied). For radish, rutabaga, and turnip apply 1½ pounds of 5-10-10 fertilizer plus ½ pound of 0-20-0 (regular superphosphate) or steamed bonemeal. Do not apply excess nitrogen to radish and turnip or you may get more top growth than root development.

Four to six weeks after seeding, sidedress carrots and parsnips with either ¼ pound (4 oz.) of ammonium nitrate or 1½ pounds of 5-10-10 per 100 linear feet of row and rutabagas with 1½ pounds of 5-10-10 fertilizer per 100 linear feet of row. Place the fertilizer about 3 inches to either side of the plants and lightly work into the soil.

Carrots, parsnips, radishes, and turnips require loose soils to develop proper size and quality. Good soil depth

is also very important for carrots and parsnips. Heavy soils can be made lighter by adding compost, leaf mold, peat moss, or coarse vermiculite. Spade deeply to thoroughly mix in the amendments and then plant seeds.

Selecting Carrot Varieties

For all processing uses, *Danvers* types are best for over-all production and quality in our predominantly limestone soils. For fresh table use, *Nantes* types are superior since they are bred for flavor. *Nantes* types have a blunt shape that can easily penetrate our soils and are also excellent for processing. Hybrid *Nantes* varieties are almost always superior to the original, open-pollinated varieties.

Imperator types generally require very deep and loose soils or else they become distorted, forked and split. They will then frequently break when pulled.

Chantenay types grow very well in our soils but are generally inferior for all uses.

Planting Dates

Approximate planting dates for central Pennsylvania:

Beets and carrots: April 1 to July 10

Parsnips: April 15 to 30

Radish (spring and fall type): April 1 to 30 and August 10 to September 1

Winter radish: July 25 to August 5

Rutabagas: July 1

Turnips: April 1 to 30 and July 25 to August 5

NOTE: Seed spring crops about 3 weeks earlier in the warmest regions of the state

and about 10 days later in the coldest regions. Fall crops should be seeded up to 10 days earlier in the colder, short-season areas and up to 3 weeks later in the warm, long-season areas of the state.

Depth of Seeding

Sow carrots, parsnips, and turnips ¼ to ½ inch deep. A planting depth of ¾ inch is recommended for beets; 1½ inches for radish and rutabagas.

Spacing

Between rows: Radish (spring or fall planting) 1 foot; beet 1 to 1½ feet; parsnip and rutabaga 1½ to 2 feet; carrot, turnip, and winter radish 1 to 2 feet.

Within rows: Radish (spring or fall planting) 1 inch; beet and carrot 1 to 3 inches; turnip and winter radish 2 to 6 inches; parsnip 3 to 4 inches; rutabaga 5 to 8 inches.

SPECIAL PRECAUTIONS

Since carrots and parsnips are slow to germinate, every effort should be made to avoid soil crusting. Minimize soil crusting by placing a thin band of vermiculite, sand, or perlite over the seed row. You can help break the crust by not overworking heavier garden soils, not working soils that are too wet, or by scattering a few radish seeds among the carrot and parsnip seeds.

Spade soil fairly deep for carrots and parsnips and avoid compacting the soil as much as possible during the growing

season. To reduce greening of the tops or shoulders of the roots, cover them during the last cultivation.

Parsnip seeds retain vitality only 1 to 2 years, so old seed should not be used. After plants are well established (in 5 to 6 weeks), thin the stand to 3 to 4 inches apart.

Ethylene gas is one cause of the bitter flavor in stored carrots and parsnips. Never store these crops with or near apples, pears, tomatoes, or other natural ethylene producers.

Since beets have a fairly high boron requirement, consider sprinkling each 100 square feet of seeded row with a solution of 2 level teaspoons of Borax powder dissolved in 2 gallons of water. *Although boron is an essential element, higher rates can be toxic to beets and other crops. Do not apply Borax more than one time per season.*

Radish, rutabagas, and turnips are cool season vegetables giving the best quality when reaching useable size under moderately cool temperatures. Close relatives such as cabbage, broccoli, cauliflower, and kohlrabi should not be planted twice in the same location because of the potential to increase disease and insect problems.

Radishes are sensitive to temperature and the length of days. Long days cause flowering or seed stalk formation and warm temperatures encourage elongated tops and misshapen, elongated roots.

HARVEST SUGGESTIONS

Harvest beets when the roots are from 1 to 3 inches in diameter. The smaller size is best when the tops are to be used as greens.

Carrots are harvested when the roots reach acceptable size. Normally, this is when the roots of Nantes types are $\frac{3}{4}$ to 1 inch in diameter and Danvers types are up to $2\frac{1}{2}$ inches in diameter at the top.

Parsnips are usually left in the ground until late fall, or they can be overwintered. If you plan to dig them from time to time during the winter, cover the row with a suitable mulch to keep the soil from freezing too deeply. Turnips reach edible size in 60 days or less and rutabagas need about 90 days. "Mature" turnips are harvested when the roots are about $1\frac{1}{2}$ inches to 2 inches in diameter and rutabagas should be $2\frac{1}{2}$ to 4 inches in diameter.

Radishes develop from planting to harvest more quickly than any other

garden crop. They remain in prime condition only a short time, especially in warm weather. Harvest promptly or the roots will become pithy.

All of these crops are best stored at temperatures near 32°F with a relative humidity of 95 percent. Beets, carrots, parsnips, and winter radish will keep most of the winter when stored properly. Turnips and rutabagas keep from several weeks to a few months, while spring radishes keep only about a week.

WEED CONTROL

Dense weeds in the garden not only rob vegetable crops of moisture, light, and nutrients but also can harbor insects and create an ideal environment for the development of some diseases. Eliminate young weed seedlings with shallow hoeing or cultivating. Never allow weeds to become too big. Always pull or mow weeds around your garden before they form seeds. Place mulch such as straw around plants and between rows to reduce weeds and conserve moisture. Perennial weeds near and in gardens provide a location for the carrot yellows pathogen to overwinter and should be eliminated whenever possible.

To help keep weeds and weed seeds out of the garden during the fall and winter months, sow a cover crop in late summer or fall (example: annual ryegrass or spring oats mixed with hairy vetch). Turn the cover crop under about one month before spring planting.

As a general rule, avoid using herbicides for weed control in the home garden for several reasons. First, there is no one herbicide available that can be safely used on all kinds of vegetables growing in the garden. Second, herbicides are difficult to apply at proper rates in small areas with hand sprayers. In most cases some areas will receive too little herbicide for effective weed control and other areas may receive such heavy rates that the crop will be damaged or killed. Finally, you risk damaging or killing your plants from spray drift.

DISEASES AND INSECTS

Pest control programs for home garden vegetables can use both cultural and chemical control measures. Nonchemical methods should be used to prevent plant injury. Resistant varieties, proper cultural practices, and sanitation are important in an effective pest control program.

Diseases or insects may cause a serious reduction in the vigor, quality, and productivity of plants. The success or failure of a fungicide or an insecticide is related to correct identification of the pest problem, the method of application, weather conditions, correct timing, pesticide dose, and the selection of the correct pesticide.

Always follow the directions on the container package when mixing and applying pesticides. Never increase the amount of pesticide or decrease the amount of water you mix with the pesticide.

DISEASE IDENTIFICATION AND CONTROL

Cercospora Leaf Spot of Beets

These spots are brown or gray with a purple border and may develop late in the season. Most table beets are resistant to this disease.

Control: Follow a 2- to 3-year rotation. (Don't plant beets in the same area for 2 or 3 years.) Remove refuse from the garden as soon as beets are harvested. If disease develops, use pesticides that contain copper (fixed); follow the directions for mixing and application.

Leaf Spot and Root Canker of Parsnips

Spots develop on leaves and dead canker areas develop at the top of parsnip roots. This disease is promoted by wet conditions.

Control: Practice a 2-year rotation. Provide good soil drainage. Lime soil to obtain pH 7. Ridge soil over shoulders of roots.

Leaf Spots of Carrots

Lower leaves become spotted and may die.

Control: Grow carrots in sunny location. At harvest, remove the tops from the garden. Tops may be placed in compost. Avoid growing carrots in the same area in succeeding years. When a leaf spot problem is anticipated, spray with a labeled fungicide and repeat application at 7 to 10 day intervals as needed and according to the label. Use a pesticide that contains one or both of the following fungicides: chlorothalonil or fixed copper. Note: This information will be listed on the label.

Root-Knot Nematodes

Nematodes are microscopic worms that live in soil. Root-knot nematodes enter the root and cause small swellings to develop on the side of the main root and on fine roots. Damage to roots will reduce vigor of the plant.

Control: Rotate crop types in the garden. Avoid planting susceptible crops in succeeding years. Susceptible crops include carrots, parsnips, tomatoes, lettuce, and cucurbits (squash, cucumber, melons, and pumpkin). Sweet corn is seldom affected and is a good crop for affected areas.

Clubroot of Turnip

Roots become swollen and distorted and leaves may wilt.

Control: Avoid areas where turnip and cabbage-related plants were grown within 7 years. If clubroot has been a problem in past years, apply hydrated lime (1 lb/30 sq ft) in the spring before preparing the seedbed. Remove plants including roots as soon as harvest is completed. Do not compost roots with clubroot; discard them.

INSECT IDENTIFICATION AND CONTROL

Flea Beetles

The most serious injury is caused to young plants early in the growing season. Small holes are eaten in the leaves, or the leaves are skeletonized by small, round, shiny beetles about $\frac{1}{16}$ inch long. These beetles jump readily when approached. Injury gives plants a ragged and bleached appearance and growth is slowed.

Control: Clean cultivation and weed control around the garden are important since the beetles feed on many weeds. Suspending a floating row cover above the crop immediately after planting can protect plants from damage. Plants with vigorous growth can withstand fairly high levels of feeding without reducing total plant health, and lightly infested leaves can be discarded. When injury exceeds your tolerance, spray with an insecticide labeled to control flea beetle on vegetables.

Green Peach Aphid

Aphids are small, soft-bodied, greenish, sucking insects. They feed by inserting their needle-like mouthparts into plants and sucking out the sap. They are often recognized in large colonies that form on the leaves and stems. They overwinter as eggs on peach trees. Eggs begin to hatch as peaches bloom. During early spring they stay on peach trees for several generations. Most aphids are wingless but when conditions become crowded or when food becomes depleted, some aphids develop wings and move to other garden plants and weeds. They produce many generations on the summer plants on which they feed.

Control: Clean cultivation and weed control around the garden are important since aphids feed on many weeds. When aphids first appear, spray with insecticidal soap or an insecticide labeled to control aphid on vegetable crops. Aphid populations are heavily influenced by temperature, rainfall, number of natural enemies present, and pesticide applications. Aphid outbreaks tend to be most frequent in hot, dry weather, while heavy rains (or directed sprays of water) will often reduce the aphid population to acceptable numbers.

Leafminers

Plants are often disfigured and damaged by several species of small flies that live in the maggot stage in the leaf tissue, between the upper and lower surface. Feeding causes large, white blotches and winding trails through the interior of the leaves, which are rendered unattractive and unfit for human consumption.

Control: Row covers can protect plants from leafminer damage. Remove and destroy individual leaves as feeding damage is noticed. Otherwise, when mines first appear, spray with an insecticide labeled to control leaf miner in vegetables. Note: insecticides cannot

control maggots already inside leaves at the time of application.

Carrot Rust Fly

The maggot of the rust fly is a pest of both carrots and parsnips.

Control: Since rust fly is not a problem every year, it may not be practical to attempt control. Row covers can be used to protect the crop. When rust fly injury is first noticed, spray with an insecticide labeled to control rust fly in vegetables.

Cabbage Maggot

Radish, turnip, and rutabaga are favorite hosts for the cabbage maggot. There are four and sometimes five broods (generations) of the maggot per season. The first brood emerges in April when the Yellow Rocket weed is in bloom.

Control: Do not plant in the same location that plants in the crucifer family (broccoli, Brussels sprouts, cabbage, cauliflower, kale) were grown the previous year. Avoid planting into areas immediately following the plowing under of animal manures or a cover crop. Maintain plant vigor. Remove and destroy infested plants. Crops can be protected by using a floating row cover held at least 6 inches from the plants to prevent the adult flies from laying eggs near the bases of the plants.

Cool, wet springs promote conditions that contribute to high populations of cabbage maggot. Cruciferous vegetables should be scouted and closely evaluated for cabbage maggot, especially during years with favorable conditions. The first summer generation of the cabbage maggot is the most damaging to plant health. Young plants are not able to withstand much root feeding from the cabbage maggot before wilting and death occur, especially if temperatures are low. Plants growing in warmer conditions can grow past low to moderate numbers of cabbage maggots.

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