

GROWING FOR MARKET

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Beets and carrots: what you need to succeed

publication date: Apr 1, 2010 | author/source: Pam Dawling

[Previous](#) | [Next](#)

By Pam Dawling

Carrots and beets are workhorse root crops that thrive in mild weather, store well, and are popular traditional foods. They are crops which can provide high yields for the time invested. They have similar requirements, so I'm writing about them together.

Varieties



Carrots come in several main types, and the factors influencing your choice will be soil type, climate, market, and harvest time and method. Nantes types are sweet, juicy and tender. They contain few terpenoids, the volatile flavor compounds we think of as "carroty". When poorly grown, they can be watery and bland. The heavier Emperor types contain more terpenoids, fewer sugars, and can be prone to bitterness if something goes wrong. Many hybrid varieties are a cross between Nantes and Emperor types. Emperor types are best for storage, and Chanceller has good cold tolerance.

The flavor of Chantenay types has been described as "parsley-like". Kuroda types have a drier, creamier flavor. They are tolerant to Alternaria. All carrots sweeten up

when days are warm and nights cool.

Here in central Virginia, on a sandy clay loam, we grow 'Danvers 126', a sturdy open-pollinated variety suited to high production of bulk carrots. We have also grown the 75 day 'Bolero', a 7-8" hybrid storage type, which looks a bit prettier, and has slightly better flavor than 'Danvers', but ultimately we decided the extra cost of the seed was not worth it to us.

Resistance to Alternaria or Cercospora has been important for our fall crop. In the past I have grown 'Chantenay Red Core' (65 days), a blocky variety with a blunt tip, 5" long and 2" at the shoulder. It resists splitting, and can deal with clay.

We sometimes grow the 56-day 'Nelson', (a Nantes variety for hot dry conditions), a nice slender 6", cylindrical, blunt root, tender and crisp with deep orange color, which has done well for us in early spring and also in summer. It is somewhat brittle, but less so than tapered types, such as 'Mokum'. In the past, before the soil here had been improved, it was necessary to grow shorter carrots, as the long ones would break in the tight soil. Most of the varieties recommended for clay soils are small, as well as short. Nearby at Southern Exposure Seed Exchange, they have had astounding success with 'Oxheart', a large open pollinated variety. Purple, white, yellow, rainbow varieties are also available, if you want glamour.



Beets too, come in several types, round, top-shaped and long. The size and quality of the greens is a factor if you sell bunched beets with tops, or use the tops for greens. We like the long Cylindra/Formanova/Forono ones which are 6" long, very tender and are easily cut into regular slices, for pickles or cooking (55 days to maturity, OP).

Among round ones we like 'Ace' (50 days to maturity, F1 hybrid), and 'Detroit Dark Red' (60 days), a tender open-pollinated variety. 'Detroit Crimson Globe' is said to maintain better flavor in hot weather than most others, which can develop off-flavors. 'Early Wonder Tall Top' (48 days), is also open-pollinated. 'Lutz Green Leaf' (70days) is a big long-



storage variety which hit some problems with seed supply in recent years. Check before you buy, to be sure of getting good seed.

‘Bulls Blood’ is a specialty variety grown for the dark shiny red leaves, to use in winter salad mixes. Beet leaves (and chard, spinach) grow faster in winter than lettuce does, and this beet has exceptionally dark leaves, which add strong color to the mix. Some people claim to like the roots of this one, but I find that after harvesting leaves all winter, the quality of the roots is not good. There are also golden beets, white beets and candy-striped ‘Chioggia’ beets, although in my experience, what they gain in appearance they lose in flavor and tenderness.

Crop requirements

Any decent soil will grow some carrots and beets, but the best ones grow in deep, loose, and fertile sandy loams with good moisture-holding capacity. Both prefer cool temperatures for best flavor and appearance. Old books warn against using manure before carrots as it will make them fork. This refers to uncomposted manure, not to compost. Compost will increase yields, and even reduce the culls with some varieties,

according to research by Dan Brainard at Michigan State University. Compost not only increases the organic matter in the soil, but also suppresses some diseases and nematodes (which can cause forked carrots).

Beets need a pH of 6.0-7.0, preferring 6.5-6.8. They require abundant potassium, which can be supplied by woodash.

Boron deficiency can show up in beets as internal browning, or dark dead tissue, as well as distorted leaf growth. It is most likely to occur in alkaline soils after long hot, dry spells. Beets can suffer from “zoning,” white rings in the roots, if there are acute weather fluctuations.



Sowing

Sow carrots and beets whenever the soil is between 50°F and 95°F, as long as you can keep the surface damp. We start with carrots in February and sow every couple of weeks in spring, once a month in summer if we think we’ll need more, and then finish with a big sowing at the end of July or early August. No, our soils are not 50°F in February, but the seed comes to no harm in the ground, and it’s a job we can get done early. With beets we do a single sowing in mid March and another in early August. We are growing for fresh use, pickling and storage, but not bunch sales, so we don’t need to do frequent sowings. The table above shows days to germination at various soil temperatures. The optimum range for carrots is 50-85°F, and for beets 50-95°F.

For carrots, aim to sow 30 seeds/ft., 0.25-0.5” deep. Some people sow in single rows 8-10” apart. Others sow in bands 2” wide, at 8” apart, with one length of drip tape serving two bands in one 16-24” bed. Carrots do well on raised beds, because the soil stays loose and the roots can easily grow deep. Hard rain in the first 3 or 4 days after planting can dry to a crust which could stymie the emergence. To prevent this, irrigate for half an hour each day until the carrots come up. Keep the soil surface moist. Some people use shade cloth to help with this. Old books recommend covering the rows with boards, though clearly that isn’t practical on a large scale. There are precision seeders which save you from thinning, but most growers I know use an Earthway type seeder, and then have to thin. Some people mix inert materials with the seed to help get a spaced stand. Sand at 1 quart to 0.5 teaspoon seed per 25’ of row, is one recipe. For a continuous supply, sow every two or three weeks, then make a big fall sowing 10-12 weeks before the usual first frost date, to be harvested soon after the first frosts.

For beets, we often presoak the seed for a couple of hours, and in summer pre-sprout it. Beet seed “drowns” easily, so don’t soak in water for too long. Then we hand sow, mixing the damp seed with dry bran or grits. We sow 1” apart in single rows 8-10” apart. Others sow in bands 2-4” wide, at about 15 seeds/ft., with bands 12-18” apart. Sow 0.5” deep in spring, deeper in hot summers, but never more than an inch. It is important to get good soil contact between the soil and the corky seedballs, so tamp or roll the rows after seeding. Avoid soil crusting. For a continuous supply of greens and baby beets, sow every two weeks until eight weeks before frosts usually occur, or about 10 weeks before a heavy freeze is expected.

In May 2004, Kate Stout from Wisconsin reported in Growing For Market on a very successful innovation that solved her problem with soil crusting and poor carrot emergence. She used a soil erosion control blanket, made from excelsior wood product quilted between layers of plastic. For \$44 she covered a 300’ bed, until the carrots germinated, when she rolled the blankets for re-use. They are available from American Excelsior in Rice Lake, Wisconsin. (715) 234-6861. Call and ask for seconds. <http://www.americanexcelsior.com/erosioncontrol/products/clblankets.php>

Transplanting

Carrot tap roots get too damaged by transplanting, but surprisingly, beets can be successfully moved about. For early crops in cold climates, start seed indoors in early spring, and transplant at about five to six weeks old, after really cold weather subsides. Plant out 3” apart in rows 12-18” apart. We have sometimes transplanted beets within a bed to fill out gaps.

Flaming

Carrots and beets are ideal crops for pre-emergence flame weeding. The goal is to flame the bed the day before the emergence of the crop is expected. Use a soil thermometer and the table above to figure out which day to flame. For carrots it's possible to sow a few "indicator beets" at one end of the bed, and as soon as you see the red loops of the beet seedlings breaking the surface, flame the carrots. (But look for carrots too, just in case). The table shows that beets are always a bit quicker than carrots in germinating. Another way to get an alarm call is to put a piece of glass over part of a row. The theory is that the soil under the glass will be warmer and the crop there will come up sooner than the rest. I tried this once, but the soil under the glass dried out, and those carrots came up later than the rest! Nowadays we have a "no glass in the garden" rule, for safety, so I use the beets, the thermometer and the chart.

We use a hand-held flamer attached to a propane cylinder that is in a wheelbarrow pushed by a second person behind the first. This person also acts as a "fire warden." Some growers mount the propane on a backpack frame. Walking along the aisle between beds, and wafting the wand diagonally back and forth across the bed takes about 10 minutes for a 100' bed. Flame weeding alone can reduce hand weeding to one hour/100'. Flame weeding plus stale beds 3 or 4 times can reduce hand weeding to 6 minutes/100'.

Cultivation

Carrots do poorly with competition, so try to start early carrots in a bed that had only light weeds the year before. Later sowings can make use of the stale seedbed technique, where the bed is prepared ahead of time, and one or more flushes of weeds are germinated and flamed or hoed off.

Get to the initial thinning as soon as you can, spacing to about 1" apart, weeding at the same time. We usually have someone with good eyesight and eye-hand coordination take a scuffle hoe between the rows the day before the hand weeding. If you are in an area with carrot rust fly, you will want to remove all thinnings and broken foliage from the field, so you don't lure the low-flying pest with the wonderful smell of the broken leaves. We do a second thinning, to 3" at the stage when the baby carrots can be used for salads. If we get more weeds, we might do another round of weeding before harvesting the full size carrots. If the shoulders of the carrots are prone to greening, you can hoe soil up over the crowns. If carrots are spaced too widely, they will be more likely to split, and the overall yield will be reduced. The Complete Know and Grow Vegetables by JKA Bleasdale, PJ Salter, and others has good information on researched crop spacing for maximum yields, among other gems. For carrots, they recommend 1.5 x 6" for maximum total yield (medium sized carrots), and 4 x 6" for early carrots to minimize competition and get rapid growth. If you want to have rows more than 6" apart, calculate the area of these optimum spacings, then divide by your chosen row space. For example, if your rows are 12" apart, the carrots can be as close as 0.75" if total yield is more important than individual size, or 2" for fast early carrots. Dry soil at the 3-4 leaf stage can cause forked or irregular carrots. Hairy carrots indicate either too little water or too much nitrogen.

Beets come up in clusters, and they too will benefit from hoeing, thinning and weeding. Beets deal with weed pressure and crowding a lot better than carrots do, so if you have to choose which to weed, the carrots win! Once again, we thin in stages, so that at the second thinning, the baby beets can be used as a crop. For mature beets, allow each a minimum of 3". The Cylindra beets can be left a bit closer, and will push themselves up out of the soil as they grow. Know and Grow Vegetables recommends establishing 5 plants per square foot for early beets. This translates to a final spacing of 4 x 7". For main crop beets, aim for 10-15 per square foot, or spacing of 1 x 12" for maximum total yields of small sized roots.

Pests and Diseases

Carrots can be troubled by *Alternaria* and *Cercospora*, which both reduce yield and quality. *Alternaria* blight starts on the oldest leaves, which blacken and shrivel. We have had this in the summer, and our response is to cut our losses and harvest them right away. *Cercospora* leaf spot starts as small dark spots with yellow edges on younger leaves and stems. Copper fungicides (if you use them) can be employed as a preventive measure or control.

There are several insect pests of carrots. The main two are the carrot rust fly and the carrot weevil, both of which tunnel in the roots. I have been trying to figure out which we have, because if we don't have any rust fly, we can stop being so careful about removing all the thinnings from the field. Eric Day, the entomologist at Virginia Tech, just told me carrot rust fly has not been seen in Virginia for 20 years, so I'm ready to relax my vigil. I believe the rust fly usually tunnels in the lower third of the root, and the weevil (with wider, more open tunnels) works on the shoulders. We do have the colorful striped Parsley Worm, but not in high enough numbers to cause economic damage. This white, yellow and black worm can be identified by (gently!) pressing down on its back. It projects a pair of orange "horns" and emits a "fake strawberry flavor" smell. Some areas struggle with wireworms, which can be caught by burying carrot slices, and daily removing the captives. If necessary, row cover can be used to exclude flying pests. The book *Garden Insects of North America* by Crenshaw is a good resource. The Ontario Ministry of Agriculture, Food and Rural Affairs has good fact sheets on carrot insects.

www.omafra.gov.on.ca/english/crops/facts/93-077.htm. Some research has been done at Washington State University, using pathogenic nematodes and other possible parasitoids and predators. <http://agsyst.wsu.edu/CRFreport03.pdf>.

Deer have been a major pest for us this past year, eating our carrot tops down to nubbins, and I hear row cover doesn't stop them. Fences, guns and dogs might.

Beet seedlings are susceptible to damping-off (*Pythium* fungus) in cool, wet conditions. To minimize the likelihood of this, help the beets germinate as quickly as possible, and cultivate between the rows to keep the soil aerated. We get something similar to damping-off in hot humid weather, although I don't know the name of it. Beets also suffer from *Cercospora*,

which can render the greens unsaleable, as well as possibly reducing yields of the roots. Beets can also get scab, (the disease that potatoes can get): raised rough brown patches. Keeping beets well watered can reduce the chance of scab. The spinach leaf miner is the only insect pest of beets that I know of, and they leave the roots unaffected. Lamb's-quarters is an alternate host.

Harvest

Carrots develop flavor and color at the same time, and harvest can begin as soon as they look and taste right. Carrots left in the ground too long may crack, and start to lose flavor. If the soil is dry, water just before harvest. This will ease the harvest mechanically and also improve the flavor of the carrots. How you harvest will depend on the scale of your carrot farming, the needs of your market and the equipment you have. To harvest by hand, dig or pull up the carrots, collecting them in a cart or wheelbarrows. This is our method. We then take the carrots into the shade, cut the tops off (flush with the transition from green to orange if for immediate use, or with a short length of green if for storage. As we cut, we put the carrots into buckets of water. When the bucket is full we give the carrots a quick rub over and put them into clean rinse water. From there we remove handfuls and drain them in buckets with holes in the bottom, before transferring to perforated plastic bags for the walk-in cooler. Other growers might mow the tops off first, then undercut the roots, making them easier to pick from the loosened soil. There are rotary barrel root washers, as described in the March 2010 issue of Growing For Market. Expect to pay \$2500-3000. The Organic Farmer's Business Handbook by Richard Wiswall includes information, too. Many have the barrel partly submerged in a tank of water so that the roots get a soaking on each rotation. Others include perforated piping delivering fresh water constantly.

Carrots are quite cold hardy when mature, down to 12°F.

Harvest of beets is similar, but should be done before a hard frost. We harvest our fall beets right after the celeriac, before the turnips, kohlrabi, and winter radish (which are hardy to 20°F. When trimming the tops, leave a short tuft of leaf stems, to avoid injuring the root, and to preserve the color when the beets are cooked.

Postharvest

Store carrots washed or unwashed in humid conditions at near-freezing temperatures. They keep well in perforated plastic bags under refrigeration, or in a root cellar. Washed roots store as well as unwashed ones and avoid the discoloration that can happen to unwashed carrots in storage. Avoid storing roots with fruits (such as apples, squash) as the ethylene exuded from the ripe fruits can turn the carrots bitter.

Young bunched beets can be stored for 10 days at 32°F and 95% humidity. Mature beets can be stored for winter for 6 months or more at 32°F and 95% humidity.

If your winters are mild enough, and you don't have voles, you can store carrots and beets in the ground until spring, covering the bed with loose organic mulch (straw, tree leaves, spoiled hay).

Rotations

To prevent blights, practice three-year crop rotation. Carrots are Umbelliferae, along with celery, celeriac, parsnips. Our fall carrots are planted where our garlic has been grown, often with a quick cover crop of buckwheat in between. In this way we get two produce crops in one calendar year. Our early carrots need beds with winter-killed cover crops (such as oats), or empty (but not weedy) beds. Early summer carrots often follow overwintered leeks. Late summer carrots often follow onions, which are harvested in June and July here.

Beets are Chenopods like spinach and chard. Our summer sowings often follow onions or brassicas.

Seed saving

As biennials, carrots and beets are more complicated crops to grow for seed than annuals. It is usually recommended to harvest and store the roots over the winter, then select the best to replant in spring in sufficient quantity to avoid inbreeding depression. Also, carrots can and do cross with Queen Anne's Lace, so these are only worth trying for areas that don't have that wild plant. Beets, Swiss Chard and fodder beets (mangel-wurzels) all cross with each other.

Pam Dawling is the garden manager at Twin Oaks Community in central Virginia. The gardens supply the 100 residents with nearly all their fresh and preserved vegetables. Pam writes regularly about vegetables in GFM. She can be reached at pam@twinoaks.org.

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