CARROTS | VEGETABLES

Getting to the Root of Good Carrot Production

NATE ROACH AND CURT HARLER — FEBRUARY 16, 2016

PHOTO: OKTAY ORTAKCIOGLU/ISTOCK

Producers who expect to sell mass quantities of carrots to stores for a profit can glean tips on how to help them grow the best carrots in their state.

The largest producer of carrots in the United States is Grimmway Farms in Bakersfield, California.

Processing carrots usually produce 12 to 14 tons per acre; a good year can see yields of 30 tons per acre. Fresh-market carrots yield less, typically ranging from eight to 12 tons up to 20 tons per acre. Of all the varieties available to commercial producers, the most commonly grown varieties for fresh markets, restaurants and commercial sale are Imperator and mini-carrots. Both grow well and are very popular among consumers.

According to the virtual World Carrot Museum at *http://www.carrotmuseum.co.uk*, there are two distinct categories of carrot in the modern world – the cultivated carrot (domesticated) and the wild carrot. Within these two groups there are many different shapes, sizes and colors of carrot, including orange – and sometimes red – varieties.

Imperator carrots can be grown in many colors. According to the University of Minnesota, this type of carrot is "becoming more popular and often grown for farmers markets, restaurants and other specialty markets." If you do wish to sell colored carrots to restaurants and supermarkets, Cosmic Red Imperator carrots may be the answer.

An old standby is the Nantes. According to Steve Masley, a San Francisco-based horticulture consultant, “Nantes varieties are usually the easiest carrots to grow.” Nantes performs well in uneven and rocky soil and will not twist and become deformed like many other types of carrots. Nantes is great for the home gardener but probably not the commercial producer.

Better for the supermarket trade is the Imperator carrot. These carrots are long in size and will decrease in diameter toward the bottom. They are commonly found in supermarkets and fresh produce stands.

There is a downside with the length of Imperator carrots. Because they are long, they twist and become deformed if planted in rocky soil.

Masley said, “Soil has to be prepared to fine tilth at least a foot deep to grow Imperator carrots.”

A third variety is Chantenay, which is short, so it grows well in rocky soil. Chantenay was actually the most common variety before the appearance of Nantes.

PHOTO: REDMAL/ISTOCK

If your main buyers are high-end restaurants, you most likely are growing mini or baby carrots, the last main variety of carrot. Baby carrots are harvested young, typically after 120 to 140 days. Full-size carrots average 160 to 200 days.

Because of their small size, baby carrots usually produce four to six tons per acre. Still, yields from eight to 10 tons are not uncommon. These carrots can be harvested when they are still mini, hence the name, or allowed to grow a little larger in size, according to Masley.

Many supermarkets and fresh produce stores will sell minis in bags to their shoppers.

North Carolina State (NCSU) Extension Entomologist Kenneth A. Sorensen said Danvers 126 and Camden are the varieties most commonly grown for processing in the East because they produce better plant stands than other varieties. Both varieties can be harvested for fresh market. Other popular fresh market varieties are Scarlet Nantes, Long Imperator 58, Orlando Gold and Spartan Fancy.

Planting tips

Producers should order medium or large seed (150,000 to 180,000 per pound) to maximize seedling vigor and produce better stands.

Most carrots will grow well in fertile sandy loam if the correct variety of carrot is chosen, according to High Mowing Organic Seeds (HMOS). Once the soil is prepared, the optimal temperature for proper carrot maturation is 55 to 75 degrees Fahrenheit. When preparing the beds, HMOS suggested producers raise the beds so rocks and stubs do not interfere with carrot growth. Ten- to 12-inch tillage zones are recommended.

Seed position, seed depth and seeding rates play a vital role in producing the best carrots. Carrots should be planted about 1/4 to 1/2 inch deep. They need full sun.

HMOS recommends planting about 45 seeds per foot for early, small bunching varieties. For full-size carrots, plant 30 seeds per foot. For soup size or storage carrots, 15 seeds per foot is fine. Suggested row spacing can be anywhere from 18 to 24 inches.

Handling disease

Once a producer settles on a variety and style of carrot, it is time to do some pencil-pushing on pest control. Between planting time and harvest, insects, weeds (more details on page 26), disease and fungi will most likely invade the crop. With proper planning, these challenges can be tackled.

While insects and weeds will likely infect the carrots, disease has the highest capability to destroy the value of a carrot crop because of how many different diseases there are.

The main disease highlighted by University of California Agriculture (UCA) is alternaria leaf blight. The pathogen that causes this disease is Alternaria dauci. It is distinguished by black dots with a yellow outer circle. These dots will appear first on the oldest leaves and, as those leaves die, will move to newer leaves. Leaves die when the disease goes from a single dot on the leaf to a blanket of black covering its surface. Alternaria leaf blight, according to UCA, thrives in temperatures around 82 degrees Fahrenheit. This does not mean that the disease cannot survive in temperatures as low as 57 degrees Fahrenheit and as high as 95 degrees Fahrenheit, though.

As a result, producers in California, Texas and Louisiana will more than likely have to deal with alternaria leaf blight since average temperatures during the growing season in all of those states hover around the 80- to 81-degree mark.

If alternaria leaf blight does infect your fields, there are a few simple steps to take. UCA highly recommends fighting back by planting alternaria-indexed seed or treating seed in a hot water bath.

Always turn under carrot residue by plowing to hasten decomposition of debris. This is because the pathogen only survives in soil in infected carrot residue. Avoid continuous carrot culture. Practice two-year rotations. Do not plant new fields near existing fields with blight symptoms.

Differences in susceptibility exist among cultivars. Most growers use sprinkler irrigation throughout the growing season. If possible, use of furrow irrigation may aid in disease reduction.

If you choose to forego this route and instead use organic methods to beat alternaria leaf blight, UCA recommends foliar sprays of Serenade ASO and MAX. The amount of product per acre will depend on the type of material. Azoxystrobin is a common quinone outside inhibitor method to defend against the disease. UCA suggested using 9.2-15.5 fluid ounces per acre. Do not apply this solution more than one time per growing season.

For a multisite contact solution, the University of California suggests chlorothalonil; 1.5-2 pounds per acre is sufficient. UCA recommends the solution be reapplied every seven to 10 days to maintain the control over the situation.

Carrot motley dwarf is another common disease and is actually the combination of two diseases: carrot redleaf and carrot mottle virus.

According to UCA, it is almost solely found in cool regions of California. This disease can be transmitted from plant to plant via the willow carrot aphid. UCA said that, “Once aphids acquire the viruses, they transmit them for the remainder of their lives. Disease development is associated with nearby carrot motley dwarf-affected fields and willow carrot aphids. The host ranges of the carrot motley dwarf viruses are relatively narrow and largely limited to carrot, parsley and cilantro. The host range of willow carrot aphid is also narrow. Cilantro is not an aphid host, and although it is a virus host, it is not a likely source for subsequent virus spread.

“Carrots appear to be the best host for both viruses and the aphid vector, and overwintered carrots are the most important inoculum source for subsequent spring carrot motley dwarf development,” UCA said. This information is vital in understanding proper treatment of the disease. Insecticides will help stop the disease from continuing to spread from carrot to carrot.

Cultural control is key in carrot motley dwarf treatment and avoidance. UCA suggested a strategy of not overwintering the carrots in order to prevent the disease from even happening. If the carrots do become infested, an attempt should be made to eliminate overwintered fields.

“If overwintered carrots are present, avoid planting early spring (December-January) carrots within close proximity (about 5 miles),” UCA said.

Nearly 90 species of nematodes have been reported in association with carrots. - University of California

Insect pests

If disease does not attack a carrot field, then insects and mites likely will. Aphis fabae, better known as the bean aphid, is common. According to UCA, this pest is a dark, olive-green to black-colored aphid. It is most easily confused with the cowpea aphid. Bean aphid has a dull matte appearance while the cowpea aphid is shiny. The cauda (tail-like structure) of the bean aphid has more hairs than that of the cowpea aphid and thus appears bushy.

Except for the presence of wings, the winged form of the bean aphid is similar in appearance to the wingless forms. These pests have the capability to transmit celery mosaic but beyond that cause little damage. These pests can be controlled by their natural predators, the lady beetle and multiple larva.

Another pest worth scouting for in Western fields is the palestriped flea beetle. Flea beetle adults are small (about 0.12 inch long), shiny beetles with enlarged hind legs that allow them to jump like fleas. The palestriped flea beetle has a broad white stripe down each brown wing.

Because of their small size, UCA has discovered that detection of these beetles may be difficult. One giveaway a producer can look for is the irregularly shaped gaps in the carrot leaves. This is how the beetle kills the host plant.

UCA recommends controlling the beetle by removing weeds along field margins and deeply disking plant residue in infested fields after harvest.

NCSU's Sorensen warned that soil-inhabiting pests such as wireworms and vegetable weevils have the most direct effect on produce quality. Armyworms, however, may cause indirect injury to the taproot by cutting stems or consuming foliage above ground. Few other insect problems are common in North Carolina.

Both the adult and larva stages of the vegetable weevil are troublesome with carrots. The weevil is dull grayish-brown in color with a short, stout snout and light V-shaped marks on its wing covers. It can be difficult to detect at first since it feeds primarily at night. Weevils and grubs are about 6.4 mm long. The pale green legless larvae grow up to 10 mm long and have dark mottled heads.

Damage from vegetable weevils will show up on buds and foliage as well as on large taproots, NCSU said.

The university also suggests producers be aware of the vegetable leaf miner. These bright yellow maggots grow up to 3.0 mm long and make S-shaped leaf mines, which are often enlarged at one end. *For more on insect-infested carrots, read page 24.*

Nematode damage

Carrot producers also need to scout for nematodes. Nematodes are microscopic roundworms that live in diverse habitats. Plant-parasitic nematodes live in soil and plant tissues. They feed on plants by puncturing cell walls and sucking the cell contents with a needle-like mouthpart called a stylet.

University of Florida Nematologist J.W. Noling said important nematode pests of carrots in sandy soil are root-knot and sting nematodes; in muck soils, root-knot nematodes predominate.

Summer flooding and drying aids in control of root-knot nematodes in Florida's muck soils. Early fall crops planted in muck soils that have not been flooded can be hurt severely.

Nearly 90 species of nematodes have been reported in association with carrots, UCA said. They usually destroy the root tip of the carrot. This becomes a major concern since it leads to misshapen taproots. Deformed taproots mean reduced marketability.

Before trying to rid of these organisms, UCA suggested sending a soil sample to a reputable lab for testing. This will pinpoint which of the many types of organisms and diseases that can cause taproot problems is the culprit.

If the soil test comes back positive for nematodes, there are only a few things farmers can do to control the situation. The very first step is to assure proper equipment cleaning. Every effort must be made not to move infected soil to healthy soil. This can help stop the spread of the disease.

Integrated pest management (IPM) for nematodes requires: 1) determining whether pathogenic nematodes are present within the field; 2) determining whether nematode population densities are high enough to cause economic loss; and 3) selecting a profitable management option.

Attempts to manage nematodes may be unprofitable unless all of the above IPM procedures are considered and carefully followed, Noling warned.

Another useful practice is soil solarization, a nonchemical method for controlling soil borne pests using high temperatures produced by capturing radiant energy from the sun. Solarization will, according to UCA, temporarily reduce the spread of soil borne diseases.

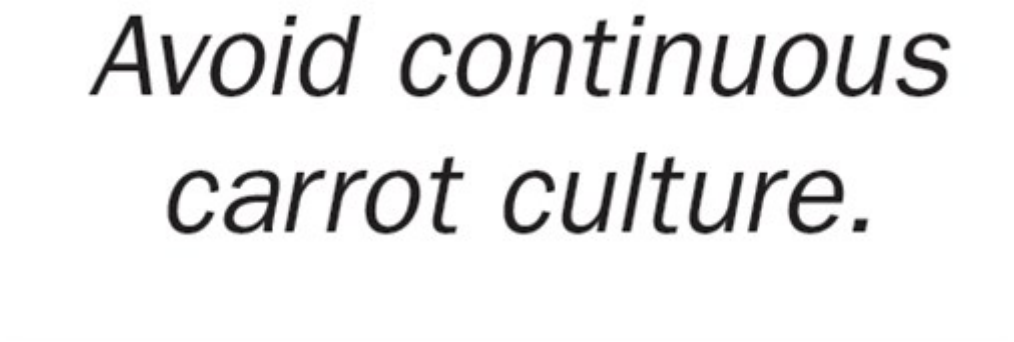
Anticipate trying some of the new carrot cultivators, which promise to provide good resistance. Although not yet available commercially, these show potential for beating nematodes.

Carrots with Root-knot Nematode infection

PHOTO: GOVERNMENT OF WESTERN AUSTRALIA – DEPARTMENT OF AGRICULTURE AND FOOD

All of the nonfumigant nematicides currently registered for use in carrots are soil applied, with the exception of Vydate, which can also be applied foliarly, Noling said. They must be incorporated with soil or carried by water into soil to be effective.

Fumigants like Telone, Pic-Clor, Vapam and K-Pam are available.



Harvest tips

With proper variety selection, good pest control and cooperation from Mother Nature, a producer should have a good crop.

In warm areas, it is not necessary to pull carrots out of the ground right away. Fall carrots can be stored in place in the field and harvested as needed. A carrot root in the soil can withstand air temperatures as low as 18 degrees Fahrenheit.

For best results, Sorensen recommends putting 1 to 2 inches of extra soil over the shoulder of the root. Carrots treated in this manner can be kept for up to two months after normal harvest, he added.

For above-ground storage, HMOS said that topped carrots can be stored near freezing temperatures with high humidity.

Whether you decide to wash carrots is a management decision, although both store the same. However, unwashed carrots run the risk of staining, HMOS said.

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