About the Author

Mr. Nakagawa is an Assistant Specialist in Horticulture with the Extension Service. He has been a staff member of the University since 1941, with the exception of the 1951–53 years when he was with a private firm. He has prepared this leaflet as part of a series for the farmers of Hawaii.
Foreword

Most of the carrots sold on the Hawaiian market today are imported from California. About 2-1/2 million pounds are imported annually, as compared with about a million pounds produced locally. More carrots could and should be grown locally by the farmers, especially those farming at higher elevations where the climate is cool and the soil deep and loose, both conditions being especially suited to carrot growing.

Varieties

The market prefers the long, or half-long cylindrical varieties, such as Imperator, Morses Bunching and Nantes, over the blocky, half-long varieties such as Chantenay, Danvers-Half Long, and Oxheart. In a recent varietal trial conducted by the Vegetable Crops Dept. of the Hawaii Expt. Station on the lowlands of Oahu, the Nantes variety proved the most adaptable from the standpoint of quality. The Imperator and other long-rooted varieties developed poor, misshapen roots. The Chantenay variety yielded heavily but the root was not of the best quality. Farm trials conducted throughout the Territory by the Extension Service also showed that the Nantes variety produced the best quality carrots.

Soil Type

Nantes Variety, Grade A

The carrot will do best in loose, deep soil free from clods, stones, and trash. The soil should be well-drained and free from nematodes with a pH of 5.7–7.0.

Climatic Requirements

The carrot will do best under cool growing conditions at temperatures between 60° and 70°F. Temperatures over 75°F. will tend to produce shorter, lighter colored roots with a strong flavor. Temperatures below 60°F. will retard growth. The best growing conditions for carrots in Hawaii are found at the higher elevations such as Kula, Maui, and Kamuela, Hawaii.
Carrots grown in the warmer lowlands will usually have a lighter root color and a shorter root with a stronger flavor than the same variety grown at the higher elevations.

**Soil Preparation**

The fleshy roots of the carrot may become misshapen as a result of poor soil structure or obstructions such as stones or coarse trash in the soil. It is therefore especially important that the soil for carrots be deeply plowed and disked thoroughly to break up soil clods. All rocks and debris should be removed. If manure is used, it should be applied several weeks in advance or to the preceding crop since there is evidence that fresh manure or commercial fertilizer placed too near the roots will cause deformed or forked roots.

**Planting**

Carrots can be grown the year round in Hawaii, although the best quality roots are produced during the cooler months of the year. The crop will be ready for harvest in 90–120 days from planting.

One of the greatest problems in growing carrots is to get a good stand of plants. The seeds are small, and slow and irregular to germinate. The seedlings are delicate, and few can emerge through crusty soil. If the seeds are planted too deep, the seedlings may not come through, while if they are planted too close to the surface, the soil may be too dry for the seeds to germinate.

The carrot seeds should be planted not over ¼-inch deep in heavy soils, and not over ½-inch deep in light soils. The seeds should be scattered lightly over a strip 3 to 4 inches wide, with the strips spaced 12–15 inches apart. This method of planting will require about 4–5 pounds of seeds per acre.

**Thinning**

Hand thinning of stands of carrots that are too thick is a costly job and uneconomical for the commercial grower. Seed planting should be light to avoid this hand thinning operation. On thick stands, thinning must be done to give the young plants enough room to grow and produce normally shaped roots.

The crop should be given a steady supply of water for its best growth. Over-irrigation will usually produce light-colored roots and enlarged lenticels which will give the carrots a rough appearance. Prolonged periods of drought followed by irrigation may cause growth cracks on the roots, thus making them unmarketable.

**Weeding**

Hand weeding of carrots, especially in the seedling stages, is very laborious, costly, and uneconomical for the commercial grower. Petroleum products such as Stoddard Solvent, thinners, and cleaning fluids are used as selective weed sprays on the carrots from the time the first two true leaves appear up to 40 days before harvest. These weedicides are used as a spray at the rate of 50–100 gallons per acre depending upon the size of the plants. For maximum weed killing and least damage to the crop, the sprays should be applied when the weeds are young and small and when the temperature is below 75°F. The heavier petroleum products, such as stove oil and kerosene, should not be used after the crop is 2½ months before harvest stage because these products will impart their objectionable odor and flavor to the carrots.

**Hilling**

In cases where the shoulders of the carrots become exposed to sunlight, soil should be hilled over the exposed roots to prevent greening.
Fertilizer Applications

Fertilizers, such as 5-10-10 applied at the rate of 1,000–1,500 pounds per acre, or 10-5-20 at the rate of 500–750 pounds per acre, is sufficient for the crop. The fertilizer is best given in two applications—one-half of the total fertilizer at time of seeding followed by another application of the remaining fertilizer four weeks later.

Insect Control

The most common insect pests on carrots are the mealybugs, aphids, cutworms, and wireworms. The vegetable weevil may become troublesome at the higher elevations.

Mealybugs are tiny, white insects, usually found feeding on the crown and growing points of the carrot just below or above the ground. Infestation of mealybugs is usually associated with an abundance of ants which feed on the secretion of mealybugs. Malathion or Parathion sprays directed at the base of the crop will give good control of this insect.

The aphids, either green or black in color, are tiny insects found feeding on the young leaves or growing points of the carrot. A Malathion spray or dust will control them.

Cutworms usually attack the young seedlings. These worms are seldom seen because they feed at night and hide in the soil during the day. The presence of cutworms can be detected by the damaged seedlings which look as though they have been cut off at the ground. Cutworms can be controlled by spraying or dusting with DDT, Toxaphene, or Malathion.

Wireworms and vegetable weevils are found in the soil. They usually feed on the maturing roots of the carrots. Infested roots show holes and tunnels caused by the feeding of the wireworms. Splitting of the roots may also occur on infested roots. Wireworms and vegetable weevils are controlled by soil fumigation with 12–15 gallons per acre of 20 percent EDB, applied 2–3 weeks before planting. The EDB will also control nematodes. Soil treatment with Dieldrin, and Heptachlor are reported to give good control of both wireworms and vegetable weevils.

Disease Control

Early and Late blights are the two most common diseases of carrots. The disease appears as numerous circular brown spots on the leaves. A serious outbreak of blight may cause withering of the whole top of the carrots. The blights can be controlled by weekly sprayings with a copper fungicide or with Maneb, or Zineb. Blight becomes serious especially during wet weather.

When applying insecticides and fungicides, read the label carefully and follow the directions accurately. If a certain chemical is not registered for use on carrots, for example, don’t use it on carrots. If the instructions call for two pounds in 100 gallons of water per acre, use this exact amount and no more. If the instructions call for the last application 14 days before harvest, observe this provision exactly so you will stay within the limit of the residue tolerance established by the Pure Food and Drug Act.

Harvesting

The carrots should be harvested 3–4 months after planting. Carrots harvested after 4 months become woody and tough and their larger size is objectionable to the market.

Most varieties of carrots are held so firmly in many soil types that in harvesting commercial plantings, the roots must be loosened with a plow.
The carrots are marketed either with their tops on and bunched, or with the tops off and packed in sacks or crates. Bunched carrots with their tops on are preferred for the fresh carrot market but this practice is practical only on small scale market gardening because of the labor involved in bunching and the problem of storage. Most of the carrots are marketed with their tops off, either packed loose in crates or packed in plastic consumer packages.

The carrots should be graded strictly as to size and uniformity of roots whether they are marketed, bunched, or topped. Only the reasonably straight roots, free from insect and disease damage, should be marketed.

Storage

 Stored carrots should be kept at a temperature of 32°F. to 34°F. with high humidity to preserve their quality. Low humidity in storage will cause shrivelling of the roots from loss of moisture. Inadequate storage facilities at the wholesale level has encouraged Hawaiian farmers to produce large, old and woody carrots, harvested 5–8 months after planting. This type of carrot will store longer without proper refrigeration and humidity control but it is not acceptable to the consumer because of its woody texture.

Good quality carrots can be grown in Hawaii, especially on farms in the cool, higher elevations where the soil is loose, deep, and free from rocks. The points to remember in growing and marketing of good quality carrots are:

1. The choice of a suitable variety, such as Nantes or Morses Bunching.
2. Thorough preparation of the soil, and soil treatment for nematodes.
3. Control of insects and diseases.
4. Harvest at the proper stage—3 to 4 months after planting.
5. Grade the carrots strictly as to size and shape.
6. Store the carrots properly at temperatures between 32°F and 34°F with high humidity to reduce shrivelling from loss of moisture.

References:
