



MoFA



REPUBLIC OF GHANA

DIRECTORATE OF AGRICULTURAL EXTENSION SERVICES (DAES)



Carrot

PRODUCTION GUIDE

2021

CARROT PRODUCTION GUIDE

This production guide was developed to complement existing Information, Education and Communication (IEC) materials available on the Agronomy of selected commodities under the “Planting for Food and Jobs” campaign. It is designed for use by Agricultural Extension Agents and other farmers who can equally use to train their colleague farmers.

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1.0 INTRODUCTION

Botanical name: *Daucus carota*

Carrot is believed to have originated in Afghanistan which remains the centre of diversity of *D. carota*. They were known to the Greeks and the Romans and their early use was mainly medicinal, to cure stomach problems, treat wounds, ulcers, liver and kidney ailments. Carrots were established as a food crop in India, China and Japan in the 13th century.

Carrot (*Daucus carota*.) is an important vegetable among the succulent vegetables in world production. In Ghana, it is one of the exotic vegetables with high value and great demand in urban centres and a potential export crop. The edible roots are nutritious and contain water, protein, ash, vitamins and minerals. Carotene, which is extracted from the roots, is used in colouring margarine and to improve the colour of egg yolk when added to layer feed. The leaves and mature roots are used in the preparation of animal feed. Carrot which belongs to the family Apiaceae is a biennial and usually cultivated as an annual crop in the tropics. The root is the edible part and it is basically a swollen base of the tap root that also includes the hypocotyls. It is conical and its length varies from 5 to 25 cm. The colour of the roots varies from white, yellow, orange-yellow, light purple, deep red to deep violet.



A typical carrot farm

Stem

The stem consists of a small plate-like 'crown'.



Leaves

Leaves are produced in the first season. They have long petioles.



Flower

The inflorescence is a terminal compound umbel, subtended by pinnatifid bracts. The flowers of the umbel are white except for the central ones which are either red or purple. Flowers are produced in the second year.



Seeds

Like flowers, seeds are produced in the second year. Carrot seeds contain essential oils. The carrot is an erect, biennial plant, 30-100 cm in height and usually cultivated as an annual in the tropics.



Carrot Seeds

2.0 SITE SELECTION/CLIMATIC REQUIREMENTS

Carrots thrive well and best in cool temperatures between 16°C-21°C for the production of good edible long roots and good colour development. Carrots require deep, well-drained soil rich in well-decomposed organic matter. Better root development and quality are obtained under cool temperatures. It requires large amount of moisture therefore a reliable source of water supply must be ensured. The crop is tolerant to soil pH of 5.5 to 6.5.

3.0 SEED/VARIETAL SELECTION

Use certified and high yielding seeds from reputable agro - input dealers. Some of the improved varieties are Improved 38, Touch on 407, Amsterdam special, Tokita, Nantes and Kuroda. The seeding rate is 4kg/Ha

3.1 Germination Test

Conduct a germination test before planting to be sure of the viability of your seed lot.

- Pick 100 seeds from the lot
- Sow in a seed box or bed.
- Count number of seeds germinated after 5-7days
- 85% - 95% means seeds are very good but if below 85% increase seed rate to make up for the losses.
- Discard seeds with germination rate below 60%.

4.0 LAND PREPARATION

Clear the land and prepare the field beds incorporating well-decomposed organic manure before planting. Beds must be raised. The soil must be prepared thoroughly and carefully to a fine tilth removing obstructions such as stones or undecomposed organic matter that cause misshaped edible roots.

5.0 PLANTING

- Mix seeds with clean sand and sow directly on the bed in drills spacing of 5 x 30cm. This will make it easier to sprinkle seed across the bed and you will know exactly where the seed has been sown.
- Erect a shed over the bed when prevailing temperatures are high.
- After germination, soil must be stirred regularly by forking up to harvesting time.
- Thinning within the rows at 5cm apart is done 4 weeks after germination.

5.1 Irrigation

- Keep the soil well-watered, but not waterlogged.
- Irregular watering can produce split or diseased carrots. Avoid this by putting carrots on a regular watering schedule or by watering carrots with a timed irrigation system. Regular and abundant well-distributed water supply is necessary especially in the dry season to avoid development of woody and tough roots. Earth up the storage roots to prevent discoloration of the shoulders.

6.0 FERTILIZER APPLICATION

Use soil test as a guide to fertilizer application. Apply 30-40tons/Ha of well-decomposed manure or application of 10-20 t/Ha poultry manure for improved growth and yield is recommended. Where there is no previous application of manure, apply 250kg/ha (50kg bag) of NPK 15-15-15 (0.7g/plant) before planting has been recommended for improved growth and yield of the crop in Ghana. On well-manured land, the application of 100kg/ha (50kg bag) of urea, 4 weeks before harvesting promotes good root development.

7.0 WEED CONTROL

Ensure regular stirring with a hand fork for good aeration and weed management. Weeds can also be managed by hand.

8.0 PESTS AND DISEASES MANAGEMENT

8.1 Pests;

Leaf blight (*Alternaria dauci*)

Symptoms

- Leaves become brown to irregularly shaped lesions/spots on leaf blades and petioles. These lesions usually appear on older leaves first and have a yellow margin
- Leaves gradually join together causing leaves to shrivel and die
- Seeds shrivel and will not germinate
- Disease will first appear in small patches in a field and will gradually spread
- Symptoms of bacterial blight are also similar but leaf spots are usually confined between leaf veins



Carrot leaf blight damage

Management

- Plant a clean , certified seed or seed that has been treated with hot water at 50°C for 20 minutes
- Do not plant carrots downwind , or next to an infected field since the disease can spread via wind and water
- Apply farmyard manure as necessary to maintain soil nutrient levels. Nutrient deficiency can increase the susceptibility of carrot to the disease (particularly lack of potassium)
- Irrigate early in the day to allow crop to dry. Irrigating at night will leave the crop damp and promote disease development such as space damping off.

- Keep carrots free from injury. Injured carrots are more susceptible to the disease
- If growing carrots in a greenhouse cover it with a UV- absorbin vinyl film to inhibit development of *A. dauci*
- Clean machinery after use since it can spread the disease
- Rotate crops for at least three years with non-susceptible crops. Do not rotate with alternative hosts garlic, celery, cabbage, cucumber, lettuce, parsley, radish, tomato, aubergine
- Rogue infected leaves to reduce disease spread. Burn the leaves (if allowed in your area) to completely remove the source of the inoculum.
- After harvest, plough in crop debris to speed up decomposition. The pathogen only survives in the soil on infected carrot residues

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(ii) Root knot nematodes (*Meloidogyne incognita*, *M. hapla*, *M. javanica*)

Symptoms

- Stunted growth above ground, yellowing of the leaves, wilting of the plant despite adequate soil water content
- Forked, distorted or stunted taproot
- Fleshy galls on the roots that do not flick off easily on touching
- Formation of many adventitious roots
- Numerous deaths of plants in seed bed and seedlings do not survive transplanting
- Collapse of individual infected plants
- Symptoms can look similar to that of nutrient deficiency (stunting, leaf discoloration) and injury to the ground root tip



Carrots roots showing infestation by nematodes

Management

- Before planting, sample for nematodes at the end of a growing season when crop residues remain (when nematode population are high)
- Adjust planting dates to cooler times in the season when nematodes are less active
- Plant clean certified seeds or seedlings from reliable sources
- Use clean irrigation (water which is unlikely to have run through nematode infested fields)
- Encourage healthy plant growth by maintaining optimal irrigation and fertilization levels. Healthier plants are more resistant to nematode damage
- Clean farm tools and machinery with water after working in different areas of the field to prevent spread of nematodes
- Do not introduce soil from an infested field into one which is not infested

- Rotate every season with groundnuts, cereals (maize, sorghum, millet), nappier grass, onions or garlic as these crops are less susceptible to nematodes
- Plant marigolds (*Tagetes* spp.) as cover crop at least two months before planting carrots since these plants suppress nematodes. Grow them as solid planting for an entire season
- Leave the field fallow for 1-2 years to lower nematode populations. During this time, keep the soil moist but remove weeds. Nematode eggs will hatch but will not have anything to feed on so they will die

After harvest, solarize soil by ploughing fields, moistening the soil and covering using a plastic sheet for 4-6 weeks during the hottest part of the year

Alternatively, plough infested fields deeply to expose soil to sunshine for a month during the hot seasons before planting the next crop.

8.2 DISEASES

(i) *Damping off* (*Pythium* spp.)

- Carrots infected with the *Pythium* fungus fail to emerge, or they fall over and die soon after emerging. Stems usually have a dark, shriveled portion at the soil line.
- *Pythium* spp. may also cause root dieback of carrots by producing excessively branched or stubbed roots.
- The fungus kills young tap roots less than 2 weeks after seed germination, reducing root length and/or stimulating multiple root formation.



Damping off damage



Damping off damage

Management

- Avoid planting in very wet soils since *Pythium* spreads in water and soil. Very wet soil conditions favor the disease.
- Plant in light soils such as sandy loam. Maintain uniform soil moisture at seed depth until seedlings emerge.
- Avoid planting during high temperatures and keep soil as cool as possible when the weather is warm. Be sure seeds are not planted too deep.
- Protect soil surface from rain or sprinklers.
- Avoid over watering and provide good drainage.

9.0 HARVESTING

Carrots can be harvested when the roots are between 1.3cm-1.9cm in diameter (**63 – 70 days after sowing**) depending on the variety. Soil must be well irrigated prior to harvesting. Harvesting is done by lifting the crop with a fork and pulling the roots by hand. Care must be taken not to snap them since they break easily.



A farmer harvesting her carrots

9.1 Yield

Yields up to 30mt/Ha can be obtained depending on the variety and based on best agricultural practices.

9.2 Post-harvest handling

After harvesting, the carrots are placed in a shade at the field in crates before washing. Carrots should be washed carefully to cause as little damage as possible to the root surface.

9.3 Sorting and grading

Carrots are sorted by hand to remove broken or split roots.

9.4 Packing

‘Baby’ carrots and those with very fine roots are usually packed in pre-pack containers and leaves are normally removed. Perforated plastic bags, mesh pockets or cartons are other materials used for packaging. Uniformity of root size is very important when packing carrots because it enhances the presentation during marketing.

9.5 Storage

After harvesting, if necessary, carrots can be put in cold storage for 6 months with good results. The best results are obtained where the humidity is above 90 % and the temperature is approximately 0 °C.

9.6 Marketing

Carrots together with their leaves are still mostly sold in bunches of five to ten. When sent to distant markets, carrots are sold without their leaves and in small bags. In self-service shops, carrots are sold without leaves in transparent plastic bags. For processing, the leaves are cut off in the field and the carrots are placed in bags or plastic containers and sent unwashed to the factory.

10.0 Uses

Carrots are consumed fresh as a salad crop or cooked. They are also processed either alone or mixed with other vegetables. The juice is extracted and processed either alone or mixed with other vegetables. The juice is extracted and used as a drink. Tender roots are pickled or made into jams and sweetmeats in some countries. Carrot cake and carrot pudding can also be made. The aromatic seeds are used as a stimulant and to relieve flatulence. The whole plants can also be used as fodder for cattle and horses. Carrots are said to be rich in β -carotene, dietary fibre, antioxidants and minerals.

