



**STARKE  
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# CARROT

## PRODUCTION GUIDELINE

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**SEEDS OF SUCCESS**

# CARROT

## 1. HISTORY AND BACKGROUND

The carrot (*Daucus carota* L.) belongs to the family Apiaceae. It is related to celery, celeriac, coriander, fennel, parsnip and parsley, which are all members of this family. The carrot originated in Asia and has developed into many shapes and colours of roots. The plant is a biennial, i.e. it grows vegetatively in the first season and produces seed in the second. For root production the plant is grown as an annual.

## 2. ADAPTABILITY

### 2.1 CLIMATIC REQUIREMENTS

Carrots do best under cool conditions (10° to 25°C), and their seeds also germinate quite well, though slowly, under cool conditions. Temperature and soil moisture influence the shape, colour and quality of carrots. The best quality carrots are obtained when weather conditions favour regular uninterrupted growth. Plant growth is optimal between temperatures of 15° to 20°C, and the roots also develop the best colour and flavour at such temperatures. At temperatures below or above the optimum, poorer colour develops.

### 2.2 SOIL REQUIREMENTS

The objective in growing carrots is a high yield of straight, smooth roots. Deep, well drained, sandy loam soils with a friable texture are most desirable. Heavy, stony, compacted and poorly drained soil is less desirable as it interferes with the development of the roots. Carrots do not grow well in acid soils below a pH of 5. A pH of 6.5 to 7.0 is ideal for carrot production. Carrots are also very sensitive to saline soils and brackish soils should be avoided.

### 2.3 PRODUCT TYPES

#### Imperator

Not a common type grown for the commercial fresh and "cut and peel" market making up approximately 5-10% of the SA carrot market. The roots are long (20 – 25 cm), tapered and slender. The roots have a small core and an overall, deep orange colour. The exterior is smooth.

#### Nantes

Commonly used for home or farmer market or roadside stands, although is mainly grown for commercial fresh market, cello-packing, bunching and processing. Roots are medium in length (15 – 18 cm), 2.5 – 5 cm in diameter, cylindrical, generally with a slight shoulder and an abrupt, blunt taper.

#### Amsterdam or Miniature

This is considered the true "baby carrot". Mostly used for the cello bag but also used in processed mixed vegetable packs. Roots are short (6 – 11cm long) and narrow (1 – 2 cm diameter at crown) with a slender, cylindrical shape. These carrots can be difficult and expensive to grow. Generally, these carrots should be harvested at an early stage of development or they become quite woody. Maturity is usually from 60 to 80 days.

#### Kuroda

This is a medium maturing variety approximately 110 days. It is also referred to as "Asian carrot". Generally thick-shouldered, short to medium length, tapered but with blunt tip, light orange to well-coloured, mild flavour. A considerable range of flavours, shapes, colours and uniformity is common.

## 3. CULTIVATION PRACTICES

### 3.1 SOIL PREPARATION

Carrot seeds are small and are sown directly in the field. It is therefore most important that the soil be thoroughly prepared, with a level, fine, soil surface. Deep ploughing or working to loosen the soil to a depth of at least 30 cm is important to allow good root development. A chisel plough is recommended to work the soils to this depth. Sub-soiling can be advantageous in breaking compacted soil layers. It is preferable that soil be raised and bedded in order to obtain optimum drainage and soil depth to maximise root length and smoothness.

### 3.2 PLANTING PERIODS

Sowing carrots in South Africa is heavily influenced by varietal differences and geographic location. However in general, sowing can be carried out according to the following table.

**Table 1: Generalized sowing dates for carrots in South Africa.**

Area	J	F	M	A	M	J	J	A	S	O	N	D
Cold areas (heavy frosts)												
Warm areas (light frosts)												
Hot areas (no frost)												

### 3.3 SOWING

#### 3.3.1 PLANT POPULATION

One of the major problems confronting most carrot growers is to achieve the correct plant population. Where the population is too low, roots tend to become large, are generally subject to more splitting/cracking, and marketable yields are detrimentally affected. On the other hand, where the population is excessive, roots tend to become smaller, are often twisted around one another, giving a poorer quality root, and marketable yields of good quality may also be lowered.

For larger, processing type carrots: 600 000 – 900 000 plants per hectare

For standard pre-pack sized carrots: 900 000 – 1 500 000 plants per hectare

For Imperators/baby carrots: 2 000 000 – 3 500 000 plants per hectare

#### 3.3.2 PLANTING DEPTH

The ideal planting depth depends on the environmental conditions but as a general rule of thumb any depth between 0.5 cm and 1.5 cm. It must be noted that at shallower depths the seed can be affected by the weather conditions on the surface (extreme heat or cold) and that when planted deeper the seed requires more food reserves to emerge and hence may emerge as a stressed seedling.

### 3.4 FERTILIZATION

It is always recommended that a soil and water analysis be done prior to planting carrots. This will ensure that all factors, including pH are taken into account thereby reducing fertiliser waste and eliminating the risk of oversupply and possible risk of fertiliser burn of the crop.

#### 3.4.1 FERTILIZATION GUIDELINE

##### 3.4.1.1 NITROGEN

On mineral/sandy/light soils, apply up to 110 kg N/ha.. Apply two-thirds of the nitrogen before planting and the balance side-dressed when plants are 10 cm tall. The purpose of side-dressing is to supply additional nutrients during the growth of the crop. On heavier soils apply up to 60 kg N/ha, broadcast, prior to planting.

### **3.4.1.2 PHOSPHORUS**

Phosphate fertilizers are usually low in toxicity because a large portion of the phosphate is precipitated in the soil before it can reach the plant roots.. As a guideline 80 – 150 kg/ha are applied.

### **3.4.1.3 POTASSIUM**

200 – 300 kg of Potassium should be applied, 50% before planting and the remainder can be worked in with nitrogen applications.

### **3.4.1.4 CALCIUM**

An application of 30 kg per hectare of CaO (calcium oxide) applied pre-plant can reduce the symptoms of calcium deficiency.

### **3.4.2.5 MAGNESIUM**

If Magnesium is deficient, 30 kg/ha of actual soluble magnesium can be applied. If the soil pH is below 6.0, the application of dolomitic lime can help.

### **3.4.2.6 BORON**

Visual symptoms and plant analysis are useful to predict boron requirements in plants. A boron deficiency can cause necrosis in the growing tip or internal breakdown in carrot roots. Boron is recommended on new organic soils at a rate of 2.6 kg actual boron/ha with the fertilizer.

## **3.5 IRRIGATION REQUIREMENTS**

Carrots are most sensitive to moisture stress during root enlargement and seed germination. In general, carrots require approximately 900 mm of water per crop cycle (140 days). Since small carrot seeds are unable to emerge when surface crusting occurs and can be burnt off if surface temperatures are too high, irrigation during the pre-emergence period revolves around maintaining a moist, cool, loose soil surface. For the remainder of the season, the available soil moisture should not be depleted by more than 50%.

## **3.6 OTHER CULTIVATION PRACTICES**

### **3.6.1 WEED CONTROL**

Carrots are small, rather vulnerable plants during the early stages of growth. Many weeds, on the other hand, grow rapidly and vigorously, and are efficient competitors for available nutrients, water and sunlight. It is very important that weeds be controlled in the early stages of crop development, because early competition can adversely affect plant growth and result in the lowering of crop yields.

## **4. HARVESTING AND MARKETING**

Carrots are usually harvested when they are immature, once the roots have achieved sufficient size to fill the tip and develop a uniform taper. Length may also be used as a maturity index for harvest timing. Fresh Market carrots must be over 13 cm long and between 20 and 40 mm in diameter. In summer this usually occurs at about 90 to 110 days after sowing and in winter between 110 and 180 days after sowing.

Carrots are usually harvested mechanically using belt pick-up harvesters or in some instances with modified potato harvesters. Belt pick-up harvesters can be configured for single or multiple row harvesting. Harvesting by hand is an option but due to the high population numbers this can be very labour intensive. The carrots are then gathered, washed, graded and packaged.

Average yields of fresh market and processing carrots combined reported to be about 50 to 70 t/ha for hybrid varieties, with yields of up to 100 t/ha having been achieved by some successful growers. Open pollinated varieties on the other hand yield on average 30 to 40 t/ha.

A small proportion of carrots are marketed by being bunched, with leaves attached. Bunches vary in size from about 5 to 10 or more roots. They are then packed in crates or even mesh pockets. The use of pre-packs without leaves is most popular, particularly for very fine roots or baby carrots. Pack sizes range from 1kg, 2kg, 5kg and the bulk 10kg plastic bag.

#### INDEMNITY

All technical advice and/or production guidelines given by STARKE AYRES or any of its personnel with reference to the use of its products, is based on the company's best judgement. However, it must be expressly understood that STARKE AYRES does not assume responsibility for any advice given or for the results obtained.

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