



Carrots

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The Organic Alternative

Few vegetables highlight the profound differences between organic and conventional agricultural production more than the humble carrot. Next time you grate, chop, julienne or juice a few carrots, consider the production regime your purchase has helped support.



Organic Carrot Production

Growing carrots organically is not in itself particularly difficult, but production is labour intensive. The laborious hand weeding required to keep the carrots free of competing weeds is enough to defeat even the most enthusiastic grower.

Preparing to Sow

Carrots require open friable soil. Use of fresh manures or over-rich compost causes excessive forking of carrots as the root tip is burnt and responds by branching. For this reason carrots are typically grown in rotation with crops demanding high levels of nutrients. Soil that has received a liberal dressing of organic material for a previous crop is ideally suited to follow-up crop of carrots. Such sound nutritional practices also assist organic growers avoid disease outbreaks.

Sourcing Seed

Control of many seed-borne fungal diseases affecting carrots can be obtained simply by soaking seeds in hot water (50 degrees Celsius) for 20 minutes. However, most standard commercial sources of carrot seed have fungicide or insecticide treatments applied to them prior to sale. Organic growers often find it difficult to obtain commercial supplies of untreated seeds and have no choice but to use treated seed, taking care to thoroughly wash the seed to remove any chemicals prior to sowing. The grower must seek permission for this practice from their organic certifying body.

Precision Planting

Precision vacuum planters are commonly used to ensure that seed is planted at the correct rate. Once the seed is sown, only a small window of opportunity exists to control weeds. Weed seeds generally germinate more quickly than the carrot seed, but often as little as one day differentiates the undesirable weeds from the carrot crop. Using the flame weeder at the optimum time allows emerging weeds to be burnt off without damaging the carrot seed.

Weeding

Once the carrot crop has germinated, laborious hand weeding must be carried out. Weeds compete with the carrot crop for water, nutrients and sunlight. Weeds may also harbour pest and disease organisms. Mechanical weeding is not an option. Organic growers weed crops by hand using a variety of small hand tools.



Pest and Disease Control

While conventional growers completely sterilise the soil before they plant to deal with weeds and nematodes, organic growers rely on crop rotation to control pest and disease outbreaks. By rotating carrot crops with other vegetables organic growers avoid the build up of destructive soil nematodes and fungal diseases. Use of nitrogen fixing legumes and growing of crops unaffected by soil nematodes effectively breaks the pest/disease cycle.

Off To Market

Freshly harvested carrots are washed in clean water to remove excess soil and packed ready for transport to organic outlets. Supplies of organic carrots vary in availability, depending on proximity to markets of suitable growing districts, time of year and weather conditions affecting growth and harvesting operations.



Grower Profile

The Corbett family of Kingaroy are BFA certified organic vegetable growers. They have been growing organic carrots for six years. Last year they produced 48 tonnes of organic carrots, a small harvest when compared with conventional carrot production. Planting begins in February and continues through until August or September. Harvesting takes place from May through until Christmas. High summer temperatures and increased rainfall and humidity are not conducive to carrot production during the summer months. The Corbetts also produce organically grown zucchini, squash, pumpkins and melons.

Mainstream Carrot Production

Commercial carrot production is fully mechanised, with every stage of production from seed sowing, through to herbicide applications for weed control, fertilising, pest control and harvesting requiring expensive investments in machinery. In what seems like a vicious circle, the production needed to repay the cost of this investment necessitates continuous cropping and increased use of fertiliser on the part of the conventional grower.

Fertiliser Applications

Application of nitrogen based fertilisers can be as high as 280kg per hectare. Other fertilisers used to maximise production include phosphorous (145kg/ha), potassium (182kg/ha), magnesium (50kg/ha), manganese (25kg/ha), boron (11kg/ha), copper sulphate (18kg/ha), iron (18kg/ha), molybdenum (2kg/ha) and zinc (16kg/ha).

Weed Control

Controlling weeds by hand or mechanical means in carrot crops is not considered practical or economically viable. Herbicides are generally applied a number of weeks prior to planting to clear the land of major weeds, then again as a pre-emergent and post-emergent treatments. Soil fumigation is also used to control weeds.

Herbicide permitted for use in conventional carrot production

Trifluralin	Within 6 weeks before planting carrot crop
Prometryne	As a pre-emergent application – within 2-3 days of planting
Chlorthal	Immediately after seeding
Prometryne	When crop has at least one true leaf
Kerosene	When crop has 2- 4 true leaf leaves
Linuron	Crop has more that 4 true leaves
Fluasifop	Post-emergent application to control grass weeds.

Controlling Nematodes and Diseases

Soil fumigation is routinely used by commercial carrot growers to control nematodes and soil fungus diseases. *Metham sodium* is the most commonly used soil fumigant. Soil fumigants are designed to sterilise the soil, killing all soil organisms and weed seeds. Diseases such as pythium which cause lesions on the carrot root are resistant to sterilants such as *metham sodium*.

Fungal leaf diseases of carrots are controlled through dusting with or soaking seeds in thiram. Applications of protectant fungicides to maturing carrot crops follow on throughout the growing season. Alternating applications of chlorothalonil and mancozeb applied every seven days are commonly undertaken at the first sign of disease.

Maximum Residue Limits (MRL) Permitted in Carrots

The National Registration Authority for Agricultural and Veterinary Chemicals permits the following level of pesticides/herbicides in carrots under regulations relating to maximum residue limits (MRL) of agricultural and veterinary chemicals and associated substances in food commodities.

<u>Chemical</u>		<u>(mg/kg)</u>
Aldrin and Dieldrin	E	0.1
Alloxydim	T	0.1
Chlorfenvinphos		0.4
Chlorothalonil		7



<u>Chemical</u>		<u>(mg/kg)</u>
Dicloran		15
Difenconazole		0.2
Dithiocarbamates		1
Endosulfan		0.2
Fentin	*	0.1
Fluasifop-butyl		0.1
Heptachlor	E	0.2
Parathion	T	0.5
Parathion-methyl	T	0.5
2-Phenylphenol		20
Quizalofop-ethyl	*	0.02
Trifluralin		0.5

Source: National Registration Authority for Agricultural and Veterinary Chemicals

E - denotes an extraneous residue limit resulting from pesticide residue arising from environmental sources including former agricultural use.

T – denotes temporary status.

* denotes 'at or about' the limits of analytical quantitation.

Mechanical harvesting of carrots can result in increased damage and therefore susceptibility of the harvested crop to fungal diseases. Prior to packing and transport, commercial carrots are routinely washed with chlorine solutions as a means of guarding against post harvest fungal diseases.

Growing Your Own

Like most vegetables, carrots need an open sunny position. They can be grown almost all year round in temperate regions, and in all except the wettest and hottest months in subtropics. They are less well adapted to tropical zones, but can be grown successfully during the drier, cooler months. Regular watering is critical for a sweet, juicy carrot crop.

Preparing the Soil

To grow long straight carrots, you need deep, friable, moderately fertile soil. Growing carrots in stony ground can result in twisted and distorted roots, while shallow compacted soil tends to force carrots skyward, turning the top portion of the carrot root green through exposure to the sun.

Avoid using fresh manures or overly rich compost when preparing your soil as this results in forking and/or excess production of fine root hairs. A better option is to prepare beds with well-decomposed material or grow carrots in soil that has previously been well manured for a greedy leaf crop such as lettuce, cabbage or broccoli. In the latter case, simply remove the spent crop and fork the soil over well before planting.

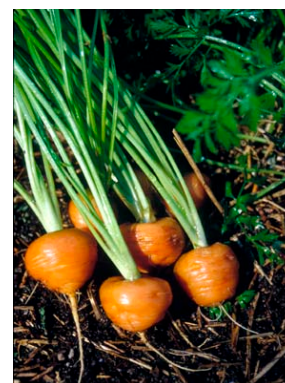
Sow Simple with Seeds

Carrots resent transplanting, so while you will find punnets of carrot seedlings at your local nursery, sowing your own seed directly into the soil where the carrots are to be grown is a better option. Prepare the soil to a fine tilth in preparation for sowing.

Top Weight, Western Red and All Seasons are popular commercial varieties of carrots but shorter, thicker or more rounded varieties such as Early Chantenay and Easy Grow are often favoured by home gardeners as less depth of soil is required to grow these varieties successfully.

Get this Straight

Carrots are traditionally sown in rows 30cm apart, but it is quite acceptable to scatter the seeds in a random pattern. The main advantage of sowing in rows is that you will clearly be able to see which are the carrots and which are the weeds when the seeds begin to germinate! You can also weed and mulch more easily if your carrots are planted in rows.





Room to Move

Carrot seeds are too small to be planted out individually. As a result it is often difficult for gardeners to sprinkle seeds along a row or drill at the required 2-5cm spacing. Carrot seeds generally require thinning or removal of some of the germinated seedlings to allow each carrot room to develop.

You can avoid much of the waste and extra work involved in thinning by mixing the carrot seed with some washed river sand. Mixing the seed and the sand provides more bulk making sowing much easier. Another alternative is to mix radish and carrot seed together. Once again this mix provides bulk and therefore is easier to sow. The radish crop will mature earlier than the carrots and thinning is carried out automatically as the radishes are harvested.

Quick Coverup

Sprinkle a small amount of sieved sand, compost or seed raising mixture over the seed and press down lightly. Carrot seeds need light to germinate, so avoid planting seed too deeply. After sowing keep the seeds moist through regular watering. Germination can be expected within 10-14 days. For a continuous harvest, be sure to sow a new row of carrots every month.

Ready When You Are

Carrots can be harvested whenever they are deemed large enough. Immature, 'baby' carrots should be ready in around 10 weeks, their selective harvest leaving more room for the remaining carrots to develop to a mature size over the next 6-10 weeks.

Clever Companions

Potential pest and disease problems can be avoided by practicing crop rotation and growing hardy varieties suitable for your local climatic conditions. Carrots and onions are said to make good companions because the smell of the onions helps to discourage pests such as the carrot fly.

Did You Know?

In very cold regions, carrots can be stored in the ground for a prolonged winter harvest, providing they are protected with frost cloth or a thick layer of straw.

Carrots are biennials, which means they may take two years to flower and form seed. Flowers are insect pollinated and different varieties freely cross-pollinate making it essential to isolate different varieties flowering at the same time to maintain seed purity.