



Organic Farming: Carrot Production

Updated: November 2007

AG1091

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ISSN 1329-8062

Introduction

Commercial organic carrots are relatively difficult to grow compared to many other vegetables. Carrots require specialised machinery for sowing, weeding and harvesting, and usually need some hand weeding to avoid yield losses due to competition from weeds. All these elements add to their cost of production. They do, however, reward growers who overcome the difficulties and produce good, high quality crops.



Figure 1. Carrots – a challenging but rewarding crop for organic vegetable producers

Production regions

Carrots are best suited to deep, well-drained soils high in organic matter and they tolerate moderately acidic to alkaline conditions. While carrots grow under a range of climatic conditions, they perform best under moderate temperatures and can be grown all year round. Seed germination occurs between 7°C and 30°C. Root quality however, including colour, may be reduced by temperature extremes and high temperatures can cause burning of young seedlings.

Land suitability assessments have been performed in Victoria for a range of vegetable crops including carrots. These assessments are based on a range of climate and soil factors including mean temperatures and soil type, pH, salinity and stone content (Bluml et al 1999). They may be useful as a guide for growers considering carrot production.

A survey of commercial organic vegetable producers in Victoria found them to be distributed across four main regions (Jaeger unpublished). These were between 100 and

200 km west, north and east of Melbourne, and in the far north west of Victoria. Those growers who produce carrots regularly were represented in each of these regions. The same survey found that it tended to be the organic growers with properties larger than five hectares who grew carrots on a regular basis. These growers had enough productive land available to warrant the investment in specialised equipment.

Production requirements

Seed and varieties

A grower's choice of carrot variety should be driven by the combination of market requirements and local climatic and soil characteristics. Market preferences for carrot size, shape, colour and other quality parameters should be sought by growers from their buyers, eg. marketing agents and greengrocers. Information on the suitability of varieties to climate and soil types can be obtained from seed suppliers.

Carrot seed is usually sold pre-treated with chemical fungicide to protect the germinating seed against soil-borne diseases. Organic growers should use untreated seed and rely upon other approaches to disease management (see below). Most seed merchants can supply seed that has not been chemically treated.

Growers seeking untreated seed should request it well in advance of sowing time to increase the likelihood of obtaining their desired volume and variety.

International regulations may soon require certified organic growers to use organically-grown seed. These growers would be well advised to plan ahead regarding seed supplies, in an effort to satisfy this requirement. The few seed merchants in Australia who can supply certified organic carrot seed are listed below under 'Useful information sources'.

Soil management

To develop good root size and shape, carrots need to grow rapidly and without restriction. Soils that have not been deeply loosened recently, may need deep-ripping to disrupt any compact layers that will inhibit root growth. Carrots and other root crops benefit particularly well from the soil management practices promoted within organic farming. These methods, which include green manuring, crop rotation and cultivation techniques to avoid soil

compaction, are more effective in developing and maintaining a deep, friable soil than occasional deep ripping.

Seedbed preparation, usually as raised beds, should leave the soil surface free of undecomposed plant residues, eg. from green manure crops. Such residues can hinder seed sowing and seedling emergence.



Figure 2. Accurate sowing into a well prepared seedbed aids organic carrot growth and weed management

Planting

Precision seeding is necessary because thinning of carrots is unlikely to be a viable option for managing crop density. With precision seeding, growers can manipulate crop density accurately to suit variable seasonal conditions and varietal characteristics. Crop density and uniformity also deserve attention because of the important role they play in weed management in herbicide-free organic production systems.

Nutrition

Green manures have a very important role to play in building and maintaining soil fertility and structure, especially in organic cropping systems. They should be a major component of the nutrition and soil management program for most organic growers, including vegetable producers. See the Agriculture Note 'Organic Farming: Green manures for vegetable production' for information on green manuring.

In addition to on-farm nutrient sources such as green manures and compost, a growing range of organically-certified fertilisers is available to vegetable growers for the management of soil and crop nutrition. These include rock and guano-based products rich in phosphorus (P) - one of the main nutrient inputs required for carrot production in Australian soils. Care should be exercised in the use of animal manures or manure-based fertilisers, as young carrot roots are easily burnt, resulting in misshapen root growth such as forking.

Irrigation

Water requirements of the carrot crop are soil and climate dependent and should be determined by regular observation and, ideally, monitoring of soil moisture levels. In hot, dry districts, frequent watering is used after sowing to maintain moisture levels around the seeds and to

prevent crusting which would inhibit seedling emergence. After germination, water stress should be avoided to maintain rapid growth of the root.

Pest and disease management

A range of cultural practices are available to organic vegetable growers for the successful management of pest and disease problems. These include:

- monitoring for early pest or disease symptoms
- use of resistant carrot varieties
- crop rotations with non-host crops or pest and disease-resistant crops, green manures and fallow periods (eg. barley green manure where root knot nematode is a problem)
- hygiene (eg. disposal of infected crop residues, cleaning of equipment)
- green manures to improve soil biological activity
- encouraging biological control by minimising sprays, even of organically-acceptable pesticides
- supplementing biological control with beneficial insects (see 'The Good Bug Book')
- good crop nutrition and avoidance of water stress

In addition, an increasing number of organically-acceptable products are available for pest and disease management. Growers should however consider their pest and disease management options carefully, and rely wherever possible on cultural or biological management practices in preference to sprays.

Weed management

Good early weed management in carrot crops is critical as young carrot seedlings cannot compete with rapidly-growing weeds. The first ten weeks after carrot germination is the most important period for weed control, if yield loss from weed competition is to be avoided.



Figure 3. Specialised equipment minimises the need for expensive hand weeding of organic carrots

Because organic growers cannot use herbicides, their weed management program is based upon sowing into weed-free seed beds, followed by precision cultivation or thermal weeding and a limited amount of hand weeding. See the Agriculture Note 'Organic Farming: Weed control in

organic carrots – implements' for details of the equipment commonly used for non-chemical weed management in carrots.

The density, uniformity and growth rate of the carrot crop are important factors in weed management because they determine how much of the soil will become shaded by carrot tops and how rapidly that cover will develop. The more carrot foliage there is, and the sooner it develops, the more competitive the crop will be against newly germinating weeds. For this reason, growers should pay attention to detail when sowing and managing the carrot crop.

Harvesting

Timing of carrot harvests will vary with seasonal conditions, variety and district. It is important that the harvest is timed correctly. Carrot growth during warm to hot weather can be rapid and a substantial yield penalty may be incurred if the crop is harvested too early. Growers may judge their crop maturity by harvesting samples of the crop regularly, starting several weeks before the expected harvest date. By comparing the samples with the market requirements for root size, the grower can develop a good picture of how the crop is progressing. The crop can then be harvested when the majority of the roots are at a premium size for the specific market.

Product quality

As a general rule, high quality of fresh produce is required to obtain a good price. The quality requirements for organic carrots are largely the same as for conventional produce and are achieved without major problems by organic growers. Processing is a useful way to dispose of broken or misshapen carrots but returns are lower than for whole fresh carrots.

Price

A price premium of 100% above the return for conventional carrots is commonly obtained from sales through health food stores and dedicated organic outlets. Currently, supermarket chains tend to seek organic carrots at a reduced premium price (eg 30%). It is up to organic carrot producers to negotiate satisfactory deals within the market of their choice.

Organic certification

Certification by an accredited organic certification organisation is required if the crop is to be exported. Current information on organic exports, certification organisations and the Australian National Standard for organic and biodynamic produce is available from the Australian Quarantine Inspection Service (AQIS, see 'Useful information sources' below).

Each certification organisation produces its own standards which must be met by producers registered with that organisation. The standards are a good guide to the principles and practices of organic farming, and are a valuable starting point for growers considering a move to organic crop production.

The certification organisations also provide growers with up-to-date information on a wide range of products

permitted in organic farming, including fertilisers and pesticides.

Organic carrot seed suppliers

- Bejo Seeds
Phone: (03) 97822811
460 Hall Rd Skye, VIC, 3977,
<http://www.bejo.com.au>
- Charlcon Seeds
Phone: (03) 97466622
2145 Melton Hwy Melton 3337
<http://charlconseeds.com.au/>
- Greenpatch Organic Seeds
Phone: (02) 65514240
Box 1285, Taree, NSW, 2430
<http://www.greenpatchseeds.com.au>
- Rijk Zwaan
Phone: (03) 5348 9002
Box 284, Daylesford VIC 3460
<http://www.rijkszwaan.com.au/rzz/au/siteau.nsf>

References

- Bluml, M.R.¹, Williamson, J.R.¹, Feuerherdt, C.N.¹ and Morey, D.R.² (1999). Land Suitability for selected Horticultural Crops in Victoria. Centre for Land Protection Research, Bendigo¹, Institute for Horticultural Development, Knoxfield². Technical Report No. 55. ISBN 07311 4278 0; ISSN 1038-216X.

Useful information sources

- Llewellyn, Richard (ed) (2002). *The Good Bug Book*. Australasian Biological Control. ISBN 0 9580589 0 3
- *Organic Farming: Weed control in organic carrots – implements*. DPI Agriculture Note AG1083
- *Organic Farming: Green manures for vegetable production*. DPI Agriculture Note AG1084
- *Root knot nematode on vegetables*. DPI Agriculture Note AG0573

Contacts

- Australian Quarantine and Inspection Service (AQIS) Organic Program
For information on certification organisations, the 'National Standard for Organic and Biodynamic Produce' and export requirements for organic produce.
Tel: (02) 6272 3928
Email: organic@aqis.gov.au
Internet: <http://www.daff.gov.au/aqis/export/organic-bio-dynamic>
- Organic Federation of Australia (OFA)
Australia's peak organic industry organisation.
P.O.Box 369, Bellingen NSW 2454
Tel: 1300 657435
Email: info@ofa.org.au
Internet: <http://www.ofa.org.au/>

Acknowledgments

We acknowledge funding for this research provided by the Naturally Victorian Initiative and the support provided by the organic industry. Aspects of this publication were drawn from the Agnote 'Carrot production' by Jim Nancarrow (Agdex 267/11, 1987)

This Information Note was originally developed by David Madge, Christiane Jaeger and Stuart Clarke and was previously published in February 2003

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