

Optimal Fresh

The fruit, vegetable and fresh produce expert system



Reference Report Printed on Wednesday, 19 December 2001

Crop carrot

Maturity stage General

Category Vegetable

Plant Part Root

Usage Cooked, Fresh/ Raw,
Juice/ Drink, Salad,
Stir fry

Botanical name *Daucus carota* subsp. *sativus*

Botanical family Apiaceae (Umbelliferae)

Class and order Angiospermopsida Araliales



Picture source: Dept. Agriculture, NSW, 1980

Alternate names include

(C) hong luo bo	(G) Karotte	(J-R) ninjin
(E) carrot	(G) Mohrrübe	(S) zanahoria
(F) carotte	(G) Möhre	
(G) Gelbe Rübe	(J-K) [F] < ^]	

Refrigerated Container/Coolroom Recommendations

Optimum product storage temperature

0.0 to 0.0°C

Temperature set point

0.0°C

Add a margin for uncertainty in equipment performance if necessary.
For return air control set point add 1°C to delivery set point.

Ventilation (air exchange) settings for containers:

6 m (20') = 10 m³/h = 5 cfm

12 m (40') = 15 m³/h = 10 cfm

Acceptable product temperature at loading into container

-0.5 to 4.5°C

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Cold Storage Properties

Ref	Maturity stage	Temp °C min		Humidity (% RH)		Storage days		Days at room temp	
		min	max	min	max	min	max	min	max
1	General	0	0	95	100	120	180	8	8
1	Immature	0	0	98	100	28	42		
1500	Immature	0	0	90	100	28	42		
1500	General	0	0	90	100	112	140		
1700	General	0	0	95	100	30	150		
1800	General	0	0			84	140		
1900	Immature	0	0	98	100	28	42		
2200	Immature	0	0	90	100	28	42		
2208	Immature	0	1	95	95	10	10		
2212	General	0	0	95		150	240		
2300	General	0	1.1	90	95	120	180		
2500	General	0	0	90	95	180	180	8	8
2800	General	0	0			30	150		
2900	General	0	1	95	98	180	210		
3200	General	0	0	95					
12600	Immature	0	0	98	100	28	56		
12700	General	0	1.7	95	100	28	180		
12800	General	0	0	95	100	14	14		
12800	Immature	0	0	98	100	28	42		
12900	General	0	0			70	70		
13400	Immature	0	0	98	100	28	42		
14500	Immature	0	1	95	100	28	42		
15300	General	0	0	98	100	180	240		
1	Mature	0	0	98	100	120	270		
1900	Mature	0	0	98	100	150	270		
12600	Mature	0	0	98	100	210	270		
12800	Mature	0	0	98	100	210	270		
13400	Mature	0	0	98	100	120	150		
14500	Mature	0	1	95	100	120	240		
1	Fresh Cut	0	5						
20251	Fresh Cut	0	5						

Reference notes

- 1 Wash before storage; ethylene causes bitterness
- 1900 Prepackage in polyethylene bags
- 2212 Recommended: wash before storage; perforate poly-bags. CO2 sens.
- 1 Condensation on carrots should be avoided, develops decay
- 1900 Condensation on carrots should be avoided, develops decay
- 1 Shredded, sticks or sliced
- 20251 Shredded, sticks or sliced

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Other Properties

Ref	Maturity stage	Air exchange *	Freezing Point (°C)	Ethylene production **	Ethylene sensitivity	Ice compatibility	Water loss ***	% Water content	Bruising susceptibility			
1	General	Very Low	-1.4	Very Low	High	Yes	M (1.3)	87.8				
1	Immature		-1.4	No	Yes	Yes						
1000	Immature		-1.4	No	Yes	Yes						
1500	Immature		0		Yes							
1500	General		0		Yes							
1700	General		0		Yes							
1900	General		0		Yes	Yes						
2000	General		Medium	0								
2200	General			-1.4		Yes						
2300	General			-1.3								
2400	General	-1.4										
2600	General	-1										
2800	General	-1.4										
12600	Immature	Very Low	-1.4	Very Low	Low	Yes	M	87.8				
12700	General		-1.4								Yes	
12800	General		0									
12900	General		-1.4									
14200	General		0									
14800	General		0									
15300	General		-1.4							Very Low	High	
15400	General		0									H (4.3)

* Air exchange rates: Nil = 0%; Very low = 25%; Low = 50%; Medium = 100%; High = 200%; Very high = 400% fresh air/hour.

** Ethylene production rates at 20°C: Nil = 0 nM; Very low = <4 nM; Low = 4 - 40 nM; Medium = 40 - 400 nM; High = 400 - 4000 nM; Very high =>4000 nM ethylene/kg/hour.

*** Where % weight loss/week is given this is converted as: Low <= 1%; Medium = 1.1 - 3.4%; High = >3.5%

Controlled Atmosphere

Ref	Maturity stage	% O ₂		% CO ₂		Temp°C		Benefit of controlled atmosphere
		min	max	min	max	min	max	
1	General					0	0	None
3200	General					0	0	None
12700	General					0	0	None
15300	General					0	0	None
1	Fresh Cut	2	5	15	20	0	5	Good
20251	Fresh Cut	2	5	15	20	0	5	Good

Reference notes

- 1 CA not advantageous; use perforated plastic films
 3200 CA not advantageous; use perforated plastic films

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Respiration* and Heat Transfer

Ref	Maturity stage	0°C		5°C		10°C		15°C		20°C		25°C		Specific heat kJ/kg/EC **
		min	max	min	max	min	max	min	max	min	max	min	max	
1	General	29	59	38	76	59	124	76	159	135	279			3.78
1900	General	46	46	58	58	93	93	117	117					
2400	General	10	20	18	36	29	46			87	196			
2400	General	46	46	58	58	93	93	117	117	209	209			
2500	General	21	31	34	48	55	79	86	121	131	166			
2600	General	10	28	28	39	32	44	73	97	90	136			
12600	General	29	59	38	76	59	124	76	159	135	279			
1	Mature	25	55	35	70			70	140	120	250			
1000	Mature	25	55	35	70			70	140	120	250			

* Respiration values given are in Watts per tonne. 1 W/t = 20.4 kCal/t/d = 82.1 Btu/tn./d = 73.3 Btu/2000 lbs/d
= 0.167 mL CO₂/kg/h = 7.0 umol CO₂/kg/h = 0.308 mg CO₂/kg/h

** Specific heat (kJ/kg/°C) = 0.0335 x % water content + 0.8374; Specific heat in Btu/lb/°F = 0.08 x % water content + 0.2

Compatibility in Mixed Storage

Temperature compatibility group

0	7	13	20
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Humidity compatibility group

Dry 60-80%	Moderate 80-90%	High 90-95%	Very high 95-100%
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Not compatible with crops that: Produce ethylene (especially when they are ripe or ripening)

Odours will be absorbed by: Celery

Absorbs odours from:

Ethylene-producing fruits and vegetables from *Optimal Fresh* database

(Medium ethylene production levels or greater.)

apple	apricot	atemoya	avocado
banana	breadfruit	cherimoya	custard apple
durian	feijoa	fig	jackfruit
jujube fruit	kiwifruit	litchi	mamey sapote
mango	mangosteen	melon, cantaloupe	melon, honeydew
nashi	nectarine	papaya	passionfruit
peach	pear	plum	rambutan
sapodilla	tomato		

Seasonal Availability

Ref	Country	Region (where given)	Start Season	End Season	Start Peak	End Peak
1	Canada		January	December	September	October
1	Netherlands		January	December	-	-
1	Australia		January	December	June	August
1	USA		January	December	-	-
12800	USA		January	December	-	-
13300	Australia		January	December	-	-
15200	Australia		January	December	June	August
16500	Australia		January	December	May	December
17900	Australia		January	December	-	-
20207	Netherlands		January	December	-	-
20211	Canada		January	December	September	October



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