Optimal Fresh

The fruit, vegetable and fresh produce expert system

Crop   carrot

Maturity stage	Immature
Category	Vegetable
Plant Part	Root
Usage	Cooked, Fresh/ Raw, Juice/ Drink, Salad, Stir fry
Botanical name	*Daucus carota* subsp.*sativus*
Botanical family	Apiaceae (Umbelliferae)

Picture source: Dept. Agriculture, NSW, 1980

Alternate names include

(C) hong luo bo	(G) Karotte	(J-R) ninjin
(E) carrot	(G) Möhre	(S) zanahoria
(F) carotte	(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@**

                                                -0.5 to 4.5°C

Acceptable product temperature at loading into container
@   Values taken from carrot.

Key Properties

Storage time (days)†	**Humidity (% RH)**	Freezing point (°C)	Storage time at ambient (~20°C)	Ventilation rate
28 - 42	**98 - 100**	-1.4	8 - 8@	Very Low@

† at optimum storage temperature
@   Values taken from carrot.
Wash before storage; ethylene causes bitterness

Other Properties

Ref	Maturity stage	Air exchange *	Freezing Point (°C)	Ethylene production **	Ethylene sensitivity	Ice compat-ibility	Water loss ***	% Water content	Bruising suscept-ibility
1	Immature		-1.4	No	Yes	Yes			
1	General	Very Low	-1.4	Very Low	High	Yes	M (1.3)	87.8	

*   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%

Optimal Fresh
The fruit, vegetable and fresh produce expert system

Controlled Atmosphere

Ref	Maturity stage	% O2		% CO2		Temp°C		Benefit of controlled atmosphere
		min	max	min	max	min	max	
1	General					0	0	None
1	Fresh Cut	2	5	15	20	0	5	Good

Reference notes

1   CA not advantageous; use perforated plastic films

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
1	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 CO_2/kg/h = 7.0 umol CO_2/kg/h = 0.308 mg CO_2/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

Humidity compatibility group

Dry 60-80%	Moderate 80-90%	High 90-95%	Very high 95-100%

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	-	-

Optimal Fresh
The fruit, vegetable and fresh produce expert system

References for carrot

Values quoted in Detailed Report are taken from a compilation of the best set of figures from all references. This best set of figures is always referred to as Reference 1.

See Reference Report for full listing of all values, original references and alternate names.