

Optimal Fresh

The fruit, vegetable and fresh produce expert system



Detailed Report

Printed on Tuesday, 18 December 2001

Crop apple, Jonathan

Maturity stage General

Category Fruit

Plant Part Fruit

Usage Cooked, Fresh/ Raw,
Pies, Salad,
Sauces



Picture source: Corel, 1998

Botanical name *Malus domestica* Borkh.

Botanical family Rosaceae

Cultivar notes Believed Esopus Spitzenburg seedling, 1826 Ulster County New York

Alternate names include

(E) Jonathan apple

(E) apple, Jonathan

Refrigerated Container/Coolroom Recommendations

Optimum product storage temperature

2.0 to 4.0°C

Temperature set point

2.0°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

2.0 to 7.0°C

Key Properties

Storage time (days)†	Humidity (% RH)	Freezing point (°C)	Storage time at ambient (~20°C)	Ventilation rate
120 - 210	90 - 95	-1.5	10 - 14*	Very Low

† at optimum storage temperature

* Values taken from apple.

Moderate scald; start with 6°C and lower in 4 week

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	-1.5	Yes	Yes	No	L (0.1)		
1#	Chilling sensitive	High	-1.5	Very High	High				
1#	Chilling tolerant	High	-1.5	Very High	High				
1#	General	High	-1.5	Very High	High	No	L (0.2)	84.1	High

Values taken from apple

* 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%

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Controlled Atmosphere

Ref	Maturity stage	% O ₂		% CO ₂		Temp°C		Benefit of controlled atmosphere
		min	max	min	max	min	max	
1	General	1	3	1	3	1	4	Excellent (+71 days)
1#	General	2	3	1	2	0	5	Excellent
1#	Fresh Cut	1	1			0	5	Moderate

Values taken from apple

Reference notes

1 District variation in chilling sensitivity

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	6	10	13	20			35	80	45	95			3.65
1#	General	7	12	15	21	41	59	53	91	59	121			

Values taken from apple

* 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)
Are sensitive to ethylene

Odours will be absorbed by:

Absorbs odours from: Onions, potatoes

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

(Medium ethylene production levels or greater.)

apple
banana
durian
jujube fruit
mango
nashi
peach
sapodilla

apricot
breadfruit
feijoa
kiwifruit
mangosteen
nectarine
pear
tomato

atemoya
cherimoya
fig
litchi
melon, cantaloupe
papaya
plum

avocado
custard apple
jackfruit
mamey sapote
melon, honeydew
passionfruit
rambutan

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

(High sensitivity.)

Chinese broccoli	Chinese cabbage	apple	apricot
asparagus	atemoya	avocado	banana
bean, French	bitter melon	bok choy	broccoli
brussels sprouts	cabbage	carrot	cauliflower
celery	cherimoya	chicory	collards
corn, sweet	cucumber	custard apple	eggplant
endive	fuzzy melon	globe artichoke	guava
kale	kiwifruit	kohlrabi	leafy greens
lemon	lettuce	litchi	long bean
mamey sapote	mandarin	mango	mangosteen
melon, cantaloupe	melon, honeydew	nashi	nectarine
okra	olive, fresh	onion, green	papaya
parsnip	passionfruit	pea, green	peach
pear	persimmon	plum	potato
pumpkin	quince	rambutan	rhubarb
sapodilla	silver beet	spinach	squash, soft rind
squash, zucchini	sweet potato	tamarillo	tomato
turnip greens	watermelon	yam	

Seasonal Availability

Ref	Country	Region (where given)	Start Season	End Season	Start Peak	End Peak
1	UK		November	March	-	-
1	Australia		February	November	March	September
1	USA		September	January	-	-
1#	Chile		February	October	-	-
1#	Australia		January	December	March	October

Values taken from apple

References for apple, Jonathan

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.