



Cold Storage of Fruits and Vegetables

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Supporting Sustainable Horticulture



Storage of fresh fruit and vegetables – Use of refrigeration

- Temperature is the single most important factor governing maintenance of post-harvest quality
- Greatest reduction in deterioration by holding produce just above its freezing point or chilling threshold temperature
- Specific recommendations for each product type
- Pre-cooling for highly perishable or rapidly developing products

Heat production due to respiration in air (W/tonne)

Temp.	0°C	10°C	20°C
Apples	10	30	46
Pears	11	73	156
Strawberries	43	147	374
Raspberries	69	92	576
Plums	18	63	165
Potato	18	12	18
Onions	9	21	24
Asparagus	80	180	363
Carrots	39	57	98
White Cabb.	9	24	60
Cauliflower	60	134	375
Red beet	12	33	57

Storage temperatures for selected cultivars of apple grown in the UK

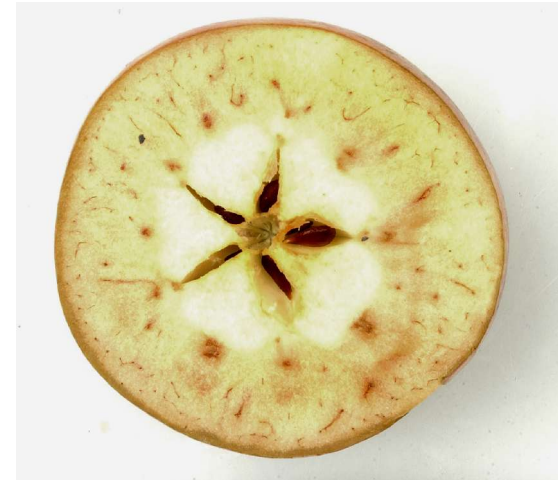
Cultivar	Air		Controlled atmosphere	
	Temp. °C	Terminate (month)	Temp. °C	Terminate (month)
Bramley's Seedling	3-3.5	November	4-4.5	July
Cox's Orange Pippin	3-3.5	October	3.5-4.0	Late March
Braeburn and clones	0-0.5	December	1.5-2.0	March
Gala and clones	0-0.5	December	1.5-2.0	Early April
Jonagold and clones	0-0.5	January	1.5-2.0	July

Storage temperatures for selected cultivars of pear grown in the UK

Cultivar	Air		Controlled Atmosphere	
	Temp. °C	Terminate (month)	Temp. °C	Terminate (month)
Beurre Hardy	-1.0 to -0.5	December	-	-
Concorde	-1.0 to -0.5	January	1.0 to -0.5	April
Conference	-1.0 to -0.5	April	-1.0 to -0.5	May
Doyenne du Comice	-1.0 to -0.5	February	-	-
Williams' Bon Chretien	-1.0 to -0.5	November	-	-

Consequences of using higher storage temperatures for top fruit

- Loss of eating (nutritional) quality particularly texture
- Reduced storage life
- Premature ripening (pears) difficulties with mechanical grading
- Increased wastage from fungal rots
- Marked reduction in orchard area to stabilise prices



Storage temperatures for fruits other than apples and pears grown in the UK

Fruit type	Temp. °C	Duration
Raspberries	0	2-3 days
Strawberries	0	5-7 days
Cherries	0	2-3 weeks
Plums	1	2-5 weeks

Consequences of using higher storage temperatures for stone and soft fruit

- General loss of visual (nutritional) quality
- Raspberries and strawberries – Insufficient time for marketing with rots the major consideration
- Cherries – shorter storage and loss of quality particularly weight (water) loss (strigs) and rotting
- Plums – shorter storage due to softening ('bladdery' fruit) and rotting. Inevitable gluts.



Storage temperatures for some types of vegetables grown in the UK

Commodity	Temp. °C	Duration
Potato	3.5-4.5	5-10 months
Dry onions	0	6-8 months
Salad onions	0	3 days
Asparagus	0-2	10 days
Carrots	0-1	6-7 months
White cabbage	0	8 months
Cauliflower	1	3 weeks
Red beet	3	6-8 months

Consequences of using higher storage temperatures for vegetables

- Restricted availability – implications for a healthy diet and for food security
- Potato – sprout growth, shrinkage
- Onions (dry) – sprouting and rotting
- Onions (salad) – rotting
- Asparagus – spear growth lignification, flavour loss
- Carrots – rotting and weight loss
- White cabbage – rotting
- Cauliflower – Curd discoloration and rotting
- Red beet – rotting?

Alternatives to cold storage / reducing energy use

- Continued use of refrigeration is necessary
- Use of genetic resources – select for reduced respiration, retarded ripening, improved rot resistance
- Chemical intervention to counteract effects of higher temperatures
- Greater use of CA/MA (not an alternative)
- Improve energy efficiency of cold stores
- Lower consumer quality and availability expectations
- Accept higher wastage in production
- Store commodities that provide low heat loads