

# Brussels sprout

*Brassica oleracea var. gemnifera*



## Best practice

Brussels sprouts are closely related to cabbages. The sprouts are young leaf buds, produced in a spiral up the main stalk. Good quality Brussels sprouts are small, sweet and tender with bright green leaflets and a clean, white cut where they have been trimmed from the stalk. The buds should be tight and firm; loose, split leaflets or elongation of the central stem indicate overmaturity.

Brussels sprouts are very ethylene sensitive so should be cooled below 5°C as soon as possible, especially if they have been harvested under warm conditions. Below 5°C ethylene sensitivity is reduced, whereas above 5°C outer leaves yellow more quickly.

Hydro-vacuum cooling, hydrocooling and forced air systems are all appropriate. Hydrocooling can cool sprouts from 20°C to 2°C within around 15 minutes.

Sprouts should not be stored wet as this increases rots and discolouration of the cutting scar.

Like broccoli, Brussels sprouts are sometimes packed in styrofoam cartons with top icing. If the ice melts this can increase rots and discolouration. Freezing of the top layers can also be an issue. Contact with the ice (which may be as low as -20°C when applied) can result in dark, water-soaked spots on the outer leaves followed by rapid breakdown during retail.

## Storage life

Storage life of Brussels sprouts is maximised at 0°C combined with high relative humidity. Under these conditions sprouts can remain in good condition for 3–5 weeks. Storage life is similar between 0–3°C but decreases markedly at 5°C due to yellowing of the outer leaflets (Figure 2).

Although there are reports that Brussels sprouts respond to modified atmosphere storage, the benefits appear to be relatively modest. It has been reported that CO<sub>2</sub> concentrations of around 10% combined with 2–5% oxygen can delay yellowing of the outer leaves. However, more extreme atmospheres can induce bitterness and off odours.

Re-trimming and stripping the outer leaves can improve appearance of Brussels sprouts that have been stored for an extended period.

## Weight loss

- ▶ Brussels sprouts can gain weight during hydrocooling or hydro-vacuum cooling.
- ▶ Brussels sprouts can lose up to 5% weight and still remain marketable.
- ▶ Brussels sprouts that have lost 5–9% weight will be soft and unacceptable.

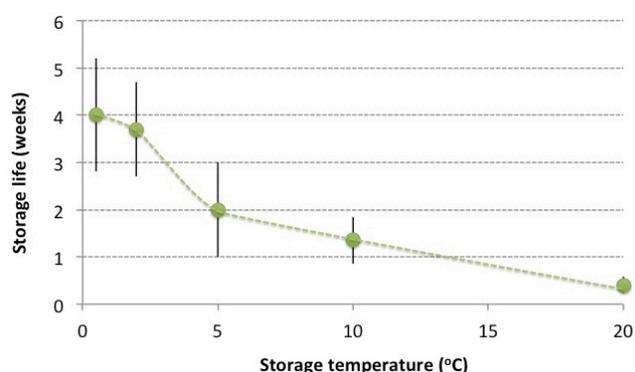


Figure 2. Storage life of Brussels sprouts at different temperatures. Bars indicate the likely range around each mean value.

## Key messages

- ▶ Brussels sprouts are young leaf buds. Good quality sprouts should be sweet and tender with bright green leaflets.
- ▶ Cooling below 5°C as soon as possible after harvest is essential to retain quality. Hydro-vacuum cooling is the best way to cool Brussels sprouts.
- ▶ Storage life is maximised at 0°C, but sprouts can remain in good condition for 3-5 weeks at 0–3°C.
- ▶ Exposure to ethylene accelerates yellowing of the outer leaflets, especially at temperatures over 5°C.
- ▶ Top icing can help keep sprouts cool. However, this practice increases costs and can cause freezing damage. If the ice melts then rots and discolouration are increased.
- ▶ Modified atmospheres can provide some slight benefit, but are not generally used.

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## Summary

Storage conditions	Optimum temperature	0°C
	Optimum RH	95–100%
	Storage life (best)	4 weeks
	Storage life at 5°C	1–3 weeks
Cooling	Cooling method	Hydro-vacuum is recommended. Hydrocooling or forced air systems are also suitable.
	Freezing point	-0.8°C
	Susceptibility to freezing	Low
	Chilling sensitive?	No
Physiology	Respiration rate	High
	Ethylene production	Moderate
	Ethylene sensitivity	High – results in yellowing of outer leaflets.
Packing	Cleaning	Harvest clean and pack. If necessary wash with a sanitiser.
	Rate of water loss	High, some benefits from POS packaging.
	Display	Can be displayed on ice, best displayed refrigerated.

## Diseases

**Bacterial rot** – *Erwinia* spp., *Pseudomonas* spp., *Pectobacterium carotovorum*.

Although rots are not a common issue with Brussels sprouts, they can occur with prolonged storage. Bacterial rots are mostly found in the base, but can also affect the outer leaflets. Rot is increased by prolonged wetness, as can occur if sprouts are packed in ice and the ice melts.



**Peppery leaf spot** – *Pseudomonas syringae* pv. *maculicola*

A pre-harvest disease, but symptoms can increase postharvest. Small black to purple spots and speckles develop on the leaves. Increased by cool, wet conditions during growth and sprouts remaining wet when packed.



Photo: QDAF

## Disorders

### Freezing injury

Usually caused by topping the carton with ice, which is well below minus 1°C. Where the flakes of ice contact the outer leaves, the tissue becomes water soaked and darkens. Damage may appear slight, but it will result in rapid deterioration and yellowing once sprouts are transferred to ambient temperatures for retail display.



### Internal browning

Internal browning is often due to calcium deficiency or tip burn. Tip burn is most common during warm, humid weather, when sprouts are developing rapidly but water movement, and therefore calcium uptake through the plant, is reduced. It can also be due to nutrient imbalances in the soil. The edges of the affected inner leaves become dry and papery, and can develop disease.



Photo: D Edwards, UC Davis