
International Standard



6665

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Strawberries — Guide to cold storage

Fraises — Guide pour l'entreposage réfrigéré

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6665 was developed by Technical Committee ISO/TC 34, *Agricultural food products*, and was circulated to the member bodies in May 1981.

It has been approved by the member bodies of the following countries :

Australia	Kenya	Romania
Brazil	Korea, Rep. of	South Africa, Rep. of
Canada	Malaysia	Spain
Czechoslovakia	Netherlands	Tanzania
Egypt, Arab Rep. of	New Zealand	Turkey
Ethiopia	Peru	USA
Hungary	Philippines	USSR
India	Poland	Yugoslavia
Israel	Portugal	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

France
Ireland

Strawberries — Guide to cold storage

1 Scope and field of application

This International Standard describes the optimum conditions for the cold storage of varieties (cultivars) of fresh strawberries (genus *Fragaria*) intended for marketing in the fresh condition or for processing.

The limits of application are given in annex A.

2 Conditions of harvesting and putting into store

2.1 Harvesting

Strawberries should be harvested in the coolest part of the day, the best time for picking being early morning in dry weather. The proper stage of maturity for picking is determined by the area and intensity of the red colour. Most varieties should be harvested when three-quarters of the surface possesses the colour specific to the variety. The fruit should be picked by pinching off the stem of each berry between the thumb and forefinger. A portion of stem, about 1 cm long, should be left on each berry.

Strawberries intended for the market should be picked with their calyxes and stems intact. Strawberries intended for processing may be harvested without calyxes.

No more than one fruit should be gathered in one hand.

During picking, the fruit should be sorted immediately into containers by quality groups, without any transfer to other containers. They should be placed directly in baskets, trays, punnets or other containers to avoid further handling and should be packed in a manner that avoids damage (degradation) of the fruits during handling and storage.

Containers for strawberries intended for consumption in the fresh condition should be robust and should not be completely filled. They should protect the fruits from dust.

The airspace between the upper layer of fruits and the bottom of the superimposed container should be at least 2 cm to allow free circulation of air.

To avoid damaging the fruits, they should be handled with care during picking and storage.

If, during picking, the atmospheric conditions are wet and cold, the fruit is more susceptible to grey mould.

2.2 Qualitative characteristics for storage

Strawberries intended for cold storage should be whole, sound, fresh, clean (but unwashed) and free from rot, insect attack, external humidity and foreign odour or taste.

2.3 Various treatments

Because of their perishability, the strawberries should be pre-cooled for several hours after picking to remove natural heat. Pre-cooling by means of a jet of cold air is preferred.

2.4 Putting into store

Strawberries should be put into the cold store immediately after harvesting and pre-cooling.

2.5 Method of storage

The containers should be handled with care. They may be stacked, provided this is done in such a way as to ensure good circulation of air across the fruit, and so as to avoid crushing the containers underneath.

Units of containers should be placed on pallets or on a slatted floor.

To ensure the strength of the containers and to make the most economic use of the store, the containers should be stacked on post pallets which should then be stacked to the height permitted by the store.

3 Optimum storage conditions

3.1 Temperature

The optimum temperature is from 0 to 2,5 °C. The temperature may rise to 6 °C, but under conditions such that variations are minimized. The permitted variation is ± 1 °C.

At 0 °C, the heat produced by respiration corresponds to 700 to 960 kcal/t/h; at 5 °C, this rises to 900 to 1 900 kcal/t/h.

3.2 Relative humidity

The optimum relative humidity of the air is from 85 to 90 %.

3.3 Air circulation

Intense air circulation is desirable during the period of cooling to accelerate and homogenize the cooling of the bulk.

3.4 Storage life

Strawberries may be stored at the recommended optimum storage temperature for 3 to 8 days, according to the quality of the fruit, its destination, the rate of cooling and the storage conditions.

The maximum periods at 0 °C may be :

- a) for strawberries with calyxes and stems :
 - 1) intended for the fresh fruit market : 3 to 6 days,
 - 2) intended for processing : 8 days;
- b) for strawberries with neither calyxes nor stems : 3 days.

At the higher temperature, the period of keeping will be accordingly shorter; for example, at 6 °C, the period would be for one day only. After these periods of storage, the fruits begin to lose their freshness, their bright colour, and show some shrivelling; there are also losses due to decay and deterioration in flavour.

Throughout the period of storage, the strawberries should be examined every day to assess their degree of maturity and to detect the development of any diseases (see annex B).

3.5 Operations at the end of storage

When removed from the cold store, strawberries intended for the market should be gradually warmed (to avoid condensation); once the strawberries have been made commercially available, cooling should be discontinued. The fruit should be sent for marketing or processing as soon as possible after removal from the store.

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Annex A

Limits of application

This International Standard provides guidance of a very general nature only. Because of the variability of the fruit according to horticultural factors, local circumstances may make it necessary to specify different conditions of harvesting or other physical conditions in the store.

The recommendations in this International Standard do not apply unreservedly, therefore, and it will remain for each specialist to be the judge of any modifications to be made.

Strawberries belong to the class of perishable fruits, which are susceptible to deterioration. They breathe intensely and ripen rapidly. Thus, strawberries are not stored for a long period of time and their storage life is very short. However, they sometimes have to be stored for a few days and, in this case, cold storage is recommended.

Annex B

Disinfection and cryptogamic disorders

B.1 Disinfection

To prevent cryptogamic disorders, the following measures are recommended :

- preliminary disinfection of the cold store and of the packages;
- the use of packages impregnated with authorized antiseptics.

B.2 Cryptogamic disorders

The two most important diseases that develop on strawberries during the period of storage originate from the micro-organisms *Botrytis cinerea* (grey mould) and *Rhizopus sp.* The former is a particular cause of loss of strawberries in the field, but it is also serious during storage. *Rhizopus* causes very soft rot of strawberries, which develops mostly during transit, storage and marketing, when the temperatures are above 10 °C.

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