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**INTERNATIONAL STANDARD****1673**

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## **Onions – Guide to storage**

*Oignons – Guide pour l'entreposage*

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## FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

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 1673 was developed by Technical Committee ISO/TC 34, *Agricultural food products*, and was circulated to the member bodies in February 1977.

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

Austria	Ireland	Romania
Czechoslovakia	Israel	South Africa, Rep. of
Egypt, Arab Rep. of	Korea, Rep. of	Thailand
France	Mexico	Turkey
Ghana	Netherlands	U.S.A.
Hungary	Poland	Yugoslavia
India	Portugal	

The member body of the following country expressed disapproval of the document on technical grounds :

Australia

# Onions – Guide to storage

## 1 SCOPE AND FIELD OF APPLICATION

This International Standard describes methods for obtaining conditions for the successful keeping, with or without the use of artificial refrigeration, of onions of the species *Allium cepa* Linnaeus, intended for direct consumption.

The limits of application of this guide are given in the annex.

Attention is also drawn to the document AGRI/WP.1/EUR.STAN.4 (see clause 2).

## 2 REFERENCES

ISO 2169, *Fruits and vegetables – Physical conditions in cold stores – Definitions and measurement.*

AGRI/WP.1/EUR.STAN.4, *Onions* – European Standard recommended by the Working Group "Standardization of perishable products" of the United Nations Economic Commission for Europe.

## 3 CONDITIONS OF HARVESTING AND PUTTING INTO STORE

### 3.1 Cultivars

For storage it is necessary to choose onions of cultivars recognized as well suited for keeping.

NOTE – Onions of late cultivars are generally chosen.

### 3.2 Harvesting

The moment of harvesting is decided on the basis of the degree of drying out of the green leaves (approximately 50 %). The onions should be harvested in such a way that they are neither bruised nor otherwise damaged.

### 3.3 Quality characteristics for storage

The onions should be sound, whole, with closed necks, firm, mature, and undamaged by frost. The first two outer scales, the neck, base plate and rootlets should be

sufficiently dry (see 3.4). The onions shall be free from foreign odour and flavour.

Double or triple bulbs are not desirable for storage.

### 3.4 Various treatments before storage

Before storage, irrespective of the technique which is to be employed (natural cooling or artificial refrigeration), it is necessary to dry out the bulbs, to rid them not only of their excess moisture on the outside but also of the moisture of the inner scales, of the rootlets, etc.

If natural drying is not possible, a suitable method of artificial drying should be used, for example exposure to a current of air for a period of two days up to a maximum of seven days, depending on the moisture level. The air temperature may be from 25 °C up to a maximum of 38 °C, and the relative humidity, if possible, shall be 60 %. The rate of air flow may be from 2 to 8 m<sup>3</sup>/min per cubic metre. The relative humidity depends mainly on outside conditions. The drying has been satisfactorily carried out when the moisture level of the scales reaches 12 to 14 %.

To avoid risk of damage to the onions in transport, it is recommended that drying be carried out at the place where they are to be stored, in a room specially equipped to carry out this treatment.

### 3.5 Putting into store

The onions should be put into store as soon as possible after drying, if this has not been carried out in the store.

### 3.6 Method of storage

The onions may be stored in bulk, in box pallets, in crates or sacks, or in containers.

In the case of storage in bulk, if no way of avoiding the crushing of the bottom layers by the top ones is used, and in the case of storage in sacks, when these are stacked without using box pallets, the maximum storage level should be 2,5 to 4 m (depending on the resistance of the bulbs to crushing).

Storage of onions with other agricultural food products which readily absorb odours is not recommended.

## 4 OPTIMUM STORAGE CONDITIONS<sup>1)</sup>

### 4.1 Temperature

#### 4.1.1 Optimum temperature

Long-term storage of onions may be achieved at different temperatures, according to the storage system used and the resistance of the cultivars to low temperatures :

- a) storage at the temperature that can be achieved, depending on the ambient temperature, in stores without artificial refrigeration (with natural or forced ventilation);
- b) storage at a temperature of  $0 \pm 1$  °C for cultivars with moderate resistance to cold;
- c) storage at a temperature of  $-1$  to  $-2,5$  °C (i.e. almost frozen) for cultivars with good resistance to cold.

The air temperature should be kept constant throughout the storage period.

#### 4.1.2 Control of temperature conditions

Depending on the climatic conditions, the recommended temperatures may be obtained using naturally cold air or artificial refrigeration.

##### 4.1.2.1 USING NATURALLY COLD AIR

Fresh air from outside should be introduced whenever the outside temperature is lower than the inside temperature and when there is no risk of frost damage to the onions.

The ventilation and insulation system should be such that the required temperature may be maintained for as long as outside conditions allow.

##### 4.1.2.2 USING ARTIFICIAL REFRIGERATION

In this case, air circulation takes place in a closed circuit. It is recommended that the air be changed at regular intervals throughout the storage period.

### 4.2 Relative humidity

To help prevent the development of mould and the appearance of roots, a constant relative humidity of 70 % is recommended. In certain countries, however, higher or lower relative humidities have not hindered successful storage over a long period.

### 4.3 Air circulation

To help keep the temperature and relative humidity uniform, and to keep the product at the required temperature and not lower, very high requirements must be set for the air-circulation system.

The packaging and method of stacking should allow free air circulation.

Two methods of air circulation may be distinguished :

#### 4.3.1 Closed-circuit circulation

The objective of this method is to promote cooling of the onions, to keep their temperature uniform, and to remove from the packages gases and volatile compounds resulting from the metabolic processes of the onions.

An air-circulation ratio of 20 to 30 is recommended both for systems using naturally cold air and for systems using artificial refrigeration.

#### 4.3.2 Air change

The effect of the tightly packed storage of onions is to produce an accumulation of carbon dioxide, caused by respiration. It is necessary to control this by introducing fresh air at regular intervals throughout the storage period.

The air-circulation system should provide a rate of air change of 20 to 30 per hour.

### 4.4 Storage life

When using natural cooling, the storage life may vary from 3 to 6 months according to the cultivar and the climatic conditions in the country or region in which the onions are stored.

When using artificial refrigeration, the expected storage life may be up to 8 months.

### 4.5 Operations during and at the end of storage

The onions should not be handled if they exhibit crystals of ice. Precautions should also be taken to avoid any risk of freezing of supercooled onions during handling.

When the onions are taken out of storage, the temperature of the room to which they are transferred should be raised gradually so as to avoid any condensation of moisture on the product.

## 5 ADJUNCTS AND OTHER KEEPING PROCESSES

Chemical sprouting inhibitors may be used in countries where their use is not restricted. In the case of onions destined for export after storage, the restrictions on the use of chemical inhibitors in force in the importing country have also to be observed.

Interesting results have also been obtained from the use of ionizing radiation (of the order of 10 000 rad). This conservation technique may, however, be subject to restrictions in certain countries.

1) For the definitions and measurement of the physical quantities affecting storage, see ISO 2169.

## ANNEX

## LIMITS OF APPLICATION

This International Standard provides guidance of a very general nature only. Because of the variability of the product according to the time and place of cultivation, local conditions may make it necessary to define other conditions for harvesting or other physical conditions in the store.

This International Standard does not apply unreservedly, therefore, to all cultivars in all climates, and it will remain for each specialist to be the judge of any modifications to be made.

Moreover, this International Standard does not take into account the role played by ecological factors, and wastage during storage is not dealt with.

Subject to all restrictions arising from the fact that onions are living material, the application of the guidance contained in this International Standard should enable much wastage in storage to be avoided and long-term storage to be achieved in most cases.

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