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Table grapes -- Guide to cold storage

Raisins de table -- Guide pour l'entreposage réfrigéré

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INTERNATIONAL STANDARD 2168

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Table grapes — Guide to cold storage

Raisins de table — Guide pour l'entreposage réfrigéré

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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 2168 was drawn up by Technical Committee ISO/TC 34, *Agricultural food products*, and circulated to the Member Bodies in October 1970.

It has been approved by the Member Bodies of the following countries :

Australia	Hungary	Portugal
Bulgaria	Iran	Romania
Chile	Ireland	Thailand
Czechoslovakia	Israel	Turkey
Egypt, Arab Rep. of	Netherlands	United Kingdom
France	Poland	U.S.S.R.

The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

Austria
South Africa, Rep. of

Printed in Switzerland

Table grapes – Guide to cold storage

1 SCOPE AND FIELD OF APPLICATION

This International Standard describes methods for obtaining conditions for the more or less prolonged keeping, by cold storage, of certain varieties of table grape, originating from *Vitis vinifera* Linnaeus.

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

2 REFERENCE

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

3 CONDITIONS OF HARVESTING AND COLD STORAGE

3.1 Varieties

A list containing some examples of varieties proposed for long-term storage in certain countries is given in annex B.

3.2 Harvesting

The grapes should be harvested ripe, since they do not develop during the storage period. When the grapes are harvested late, their storage life is short, with the exception of grapes cultivated under glass and harvested in dry weather. Nevertheless, if the harvesting has taken place at the end of a period of rain, a shorter storage life is to be expected.

The means most frequently used for checking the state of ripeness are as follows :

- organoleptic criteria peculiar to the varieties;
- refractive index of the pressed juice (as an indication, about 13 to 20 according to the variety and region of cultivation);
- ratio $\dfrac{\text{total sugars, expressed in grams of glucose per litre of juice}}{\text{acidity, expressed in grams of anhydrous tartaric acid per litre of juice}}$

(as an indication, this ratio is about 18).

The bunches should be picked with care, and should preferably be packed direct in their storage packaging.

3.3 Quality characteristics for storage

The bunches should be sound, free from any visible signs of fungal attack, clean and free from traces of water in the liquid state.

The grapes should be spaced as uniformly as possible on the stalk and practically covered with bloom. The stalk should be really green and turgid.

It is not advisable to store bunches with aborted fruit, or bunches having grapes which are too close together or abnormally arranged on the stalk ("clear stalk"). Pruning may be carried out, provided that it does not produce too great a cleared area.

3.4 Disinfection

The cold store and, where applicable, the packages should be disinfected beforehand by a suitable method.

It is often recommended that the grapes be given a treatment of antifungal agents immediately after harvesting, if their use is permitted (see clause 5).

3.5 Cold storage

The bunches shall be put into cold storage as soon as possible after harvesting.

If the location of the cold store makes immediate storage impossible, the grapes shall be stored in a cool place protected from sunlight for a maximum of 24 h. It is recommended that as effective a pre-refrigeration as possible be employed immediately after harvesting.

If this pre-refrigeration is carried out before the packaging of the grapes, it is necessary to do it in such a manner that the condensation of moisture *on the grapes* is avoided, so that the grapes will not be handled while wet.

3.6 Method of storage

It is recommended that the bunches be packed in a single layer. The contents of each package should be uniform, in order to facilitate checking during storage. The bunches should not be packed together too tightly in the packages. For separating them, fresh foils, made of plastics material which is not harmful to foodstuffs for human consumption, are recommended. In cases where these foils are used as a covering or as a package for sale to the consumer, or in

order to regulate the content of sulphur dioxide (see 5.2), it is desirable for the foils to have small perforations in order to allow metabolic gases to escape.

In a sealed package, the grapes rapidly acquire an unpleasant flavour characteristic of fermented products.

4 OPTIMUM STORAGE CONDITIONS[1)]

4.1 Temperature

The optimum temperature limits for keeping are from − 1,5 °C to 0 °C. (For grapes cultivated under glass : from 0 °C to + 1 °C.) The air temperature should be kept constant throughout the entire storage period.

4.2 Relative humidity

The relative humidity should be kept at 90 to 95 %.

After a more or less prolonged period of time, relative humidities lower than 90 % give rise to desiccation of the stalks and pedicels.

4.3 Storage life

The storage life varies with the variety and the conditions of harvesting and of storage. A period of 6 months is biologically possible, but when it is desired to keep the stalks green and turgid it is difficult to exceed a storage life of 4 months.

4.4 Air circulation

Efforts should be made to obtain suitable mixing of the air (an air-circulation ratio of between 30 and 40 for example), in order to render the temperature and relative humidity as uniform as possible. There should be a device for renewing the atmosphere, by the introduction of outside air.

4.5 Operations at the end of cold storage

Care should be taken to avoid condensation forming on the surface of the grapes on leaving the cold store. Under no circumstances should the grapes be handled while wet; they should, if necessary, be subjected to preliminary drying by a suitable method.

In many cases it will be necessary to carry out a pruning operation intended to remove grapes which have rotted, burst, dried out, etc.

5 ADJUNCTS TO STORAGE

To inhibit the development of fungal growths, particularly Botrytis, it is possible to use antifungal agents, if their use is permitted. Sulphur dioxide is generally used for pretreatment (see 3.4), and when used in the course of storage either of the following techniques may be applied :

5.1 Treatment by fumigation processes of short duration

By way of an example, it is possible to use the following method :

5.1.1 On the introduction of the grapes into the cold store the first sulphur dioxide treatment is applied, either at a concentration of 1 % of the volume of the empty store, with the gas mixture maintaining contact with the grapes for 20 min, or at a concentration of 0,25 %, with the gas mixture maintaining contact with the grapes for 30 min.

The sulphur dioxide is then removed by the introduction of fresh air.

5.1.2 Then, in the course of storage, a sulphur dioxide treatment is applied every 10 or 15 days for a period of 20 min at a concentration of 0,25 %, after which the gas is removed by ventilation or by passing the air of the room over water atomizers.

NOTE – Fumigation presents a number of disadvantages : it is very difficult to mix uniformly the atmosphere of the store in a suitable manner, and the use of this technique often gives rise to discoloration of the grapes or to a foreign taste.

Furthermore, the renewal of the atmosphere necessary to remove the sulphur dioxide after each treatment often has the effect of disturbing the temperature and relative humidity conditions in the cold store.

5.2 Treatment by the emission of sulphur dioxide originating from chemical compounds placed in the package containing the grapes

In order to avoid all the disadvantages of fumigation, it is possible to introduce into the packages containing the grapes sulphur dioxide-generating compounds, the best known of which is potassium metabisulphite.

Studies have shown that the limiting values of the sulphur dioxide concentration, between which it is necessary to keep in order effectively to inhibit the development of mould without affecting the organoleptic characteristics of the grapes, are fairly narrow. Thus, under continuous conditions, the concentration of sulphur dioxide in the atmosphere should be kept between 80 and 300 parts per million.

For the proper distribution of the generating agent within the packages, different techniques are possible; by way of an example :

5.2.1 The spraying, onto wood fibre placed in the package, of a solution of potassium metabisulphite (for example, the spraying of 20 ml of a 40 % potassium metabisulphite solution per case containing about 5 kg of grapes).

5.2.2 Distribution of potassium metabisulphite in granulated cork or sawdust in contact with the grapes in the packing (for example, 1,4 g per 1 kg of grapes).

1) For the definitions and measurement of the physical dimensions concerning storage, see ISO 2169.

5.2.3 The operations described in 5.2.1 and 5.2.2 are suitable only for short and medium keeping periods, as metabisulphite is used up very quickly, at first producing quantities of sulphur dioxide which often prove toxic to the grapes, only to cease to give off anything at all after a few weeks.

In order to regularize and slow down the emission of sulphur dioxide from the metabisulphite, it is possible, for example, to wrap the metabisulphite in porous paper, or to place the grapes and doses of metabisulphite in packages of plastics material; however, conditions only permit a limited retardation of the emission of sulphur dioxide.

There is also a different method which makes it possible to produce, and maintain at a constant rate, a given quantity of sulphur dioxide within the atmosphere of a plastics package. In this method, the metabisulphite in aqueous solution is sealed in a polyethylene sachet; the whole arrangement is called a *generator sachet*. The particular permeability characteristics of the polyethylene film to sulphur dioxide ensure the regular release of the gas.

It is possible to adjust at will, to a given level, the rate of sulphur dioxide release, by varying the thickness of the film, the surface area of the sachet and the quantity of metabisulphite. The generator sachets are placed in contact with the bunches, between the latter and the upper face of the packaging (a polyethylene wrapping with small perforations).

A relationship is established between the quantities of sulphur dioxide released continuously by the generator sachet and those which diffuse towards the outside through the walls and perforations of the package, as a result of which it is possible to maintain, throughout the preservation period, a sulphur dioxide content inside the package ranging between the limits of 80 and 300 mg per kg.

5.2.4 A new device, which is very similar to the previous one, is also recommended; it contains :

— a sheet of kraft-paper impregnated with metabisulphite; in contact with the humidity of the atmosphere in the package, the metabisulphite will immediately start emitting sulphur dioxide for a very short time;

— a second sheet of kraft-paper having pores which contain metabisulphite; the sulphur dioxide will diffuse through the kraft-paper, giving rise to a second sulphur dioxide emission for a longer period.

This device is placed together with the grapes in a package of plastics material.

This procedure does not always make it possible to avoid a higher sulphur dioxide content, and thereby a foreign flavour.

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 the time and place of cultivation, local circumstances may make it necessary to specify other conditions of harvesting or other physical conditions in the store.

This International Standard does not apply unreservedly, therefore, to all varieties 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 horticultural factors, and wastage during storage is not dealt with. The importance of these two subjects has not been forgotten, but the influential factors, i.e. ecological or agrotechnical factors, are not very well known. Moreover, the origin of several of the most common physiological disorders is still uncertain, as are often the appropriate means of combating them. It has therefore seemed difficult to attempt to prepare international standards on these two points.

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

ANNEX B

LIST OF VARIETIES

This list gives some examples of varieties of grapes for which storage is recommended according to the conditions of this guide.

B.1 GRAPES CULTIVATED IN THE OPEN FIELD

B.1.1 Varieties with large fruits

AHMEUR BOU AHMEUR	(syn. : Angelino, Flame Tokay, Uva de Ragol)
ALEDO	
ALPHONSE LAVALLÉE[1]	(syn. : Ribier, Royal)
BARESANA	(syn. : Turchesca, Lattuario bianco, Uva di Bisceglie, Uva Turca, Doraca)
BARLINKA	
CARDINAL	
CHAOUCH	(syn. : Tschautsch, Ciacuss)
CHELVA	(syn. : Guareña, Montuo, Villanueva)
CIMINNITA	(syn. : Cipro bianco)
DABOUKI	(syn. : Malaga)
DATTIER DE BEYROUTH	(syn. : Afuz Ali, Aleppo, Bolgar, Karabournou, Mennavacca Bianca, Pergolone, Rasaki, Regina, Rosaki, Waltham Cross)
EMPEROR	(syn. : Red Emperor)
GROS VERT[2]	(syn. : Saint-Jeannet)
ITALIA	(syn. : 65 Pirovano, Ideal, Italian Muscat)
MENNAVACCA NERA	(syn. : Lattuario nero, Regina nera)
MUSCAT D'ALEXANDRIE[1]	(syn. : M. d'Espagne, M. de España, M. Gordo blanco, M. de grano gordo, M. Romano, Moscatel de Setubal, Moscatellone, Moscato di Pantelleria, White Hanepoot, Zibibbo)
OHANEZ[1]	(syn. : Almeria, Ohanes, Uva de Embargo)
OLIVETTE BLANCHE	
OLIVETTE NOIRE	(syn. : Olivella vibonese, Cornichon)
REINE DES VIGNES	(syn. : Königin der Weingarten, Rasaki Ougarias, Muscat Reine des vignes, Regina dei Vigneti, Szólóskertek Királynője, Regina Villor)

1) These varieties can be cultivated under glass as well.

2) The conditions of cultivation of these varieties may result in variations in the size of fruits, which makes classification difficult, and they are sometimes classified as small-fruited varieties.