RESOLUTION OIV-VITI 522-2016

OIV GOOD PRACTISES FOR DRIED GRAPE PRODUCTION SYSTEMS

THE GENERAL ASSEMBLY,

Having considered the works of the Commission I "Viticulture", the Sub-commission “Table grapes, raisins and unfermented vine products” and the ad hoc group RSEC,

CONSIDERING the OIV resolution OIV-VITI 493-2013 on OIV RECOMMENDATIONS FOR THE PRODUCTION OF DRIED GRAPES,

CONSIDERING the amount of scientific evidence, as discussed during the meetings of the SCRAISIN and the ad hoc group RSEC,

CONSIDERING there is an increase in the international market for products of high nutritional value which can travel long distances with little adverse impact on the product’s quality,

DECIDES to adopt the following OIV technical recommendations for DRIED GRAPE PRODUCTION SYSTEMS,

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OIV GOOD PRACTISES FOR DRIED GRAPE PRODUCTION SYSTEMS

1. INTRODUCTION

This document is considered as supplementary to the OIV Resolution OIV-VITI 493-2013 on "OIV recommendations for the production of dried grapes". Its goal is to provide the technical details for the production of dried grapes, as they could be recommended to producers, national and/or international organisations.

2. CLIMATE

Grapes for drying purposes preferably should be produced and dried in areas providing certain climatic requirements. These are in general:

- Biologically Effective Degree days (BEDD): >1926 during the growing season; this amount of BEDD is necessary in order to achieve the proper maturation.
- Low spring frost incidence;
- Hot, rainless summer

The possibility of rain during the drying season influences the choice of variety and the different drying methods: drying on ground, rack – type drying, dry-on-the-vine and dehydrator (cf. chapter 4).

3. VARIETIES

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- Dried grape varieties should have proper sugar accumulation capacity, skin characteristics and full flesh.
- The most common dried grape varieties are Sultanina (synonyms Sultana, Thompson Seedless) and Currants (Black Corinth and Zante currant).
- Other possible varieties suitable for drying appear in the OIV International list of varieties and their synonyms.

4. CULTURAL PRATICES AND HARVESTING

4.1. Training and trellis systems

There are several different trellis systems including the Vertical Bilateral, Head, T, Open Gable (Y), Pergola, Swinging arms. The choice for each trellis system depends on the type of harvest (by hand or mechanical).

Distances among rows and training systems should ensure a properly sun exposure of clusters.

4.2. Summer pruning

Summer pruning is a relevant practice during the growing season and depends on the variety and climate conditions of the region.

It plays a fundamental role in managing the quality of the dried grapes obtained, especially when the harvest is mechanical. For example, summer pruning is essential in order to manage the production yield and avoiding a humid environment within the cluster zone.

4.3. Harvest by hand

When the fresh fruit reaches the required sugar content, it is harvested by hand; avoiding any damage to berries or unhealthy ones, and then placing fruit on sheets or in boxes.

4.4. Mechanical harvest

Grapes are dried-on-vine, and then these dried berries are harvested mechanically or semi-mechanically, taking care not to damage the dried berries.

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5. DRIED GRAPE PRODUCTION TECHNIQUES

5.1. Drying principles

This is a physiological process. The grape berry is naturally very resistant to water loss, as it has a heavy, hydrophobic (water-repellent) 'bloom' consisting of over-lapping wax platelets. The cuticle, in particular the outer waxy layer, is the structure which limits the drying rate of the grape berry.

During drying, water is evaporated and moves outward through the cells of the flesh and skin, and then passes through the 'bloom' and into the air surrounding the berries. This air then becomes very humid and its removal is essential for rapid drying. Ideal drying conditions are provided by a light wind on a hot dry day, when heat is supplied rapidly to the berries and moist air around them is continually removed.

5.2. Pre-Drying

Pre-drying treatments originated in the Middle East. By the use of these treatments, drying times have been shortened, thus reducing the probability of rain damage and allowing more drying to be completed earlier in the season, while the average air temperature is higher. This technique is usually applied to varieties other than Corinth.

5.2.1. Un-dipped grapes

Un-perforated buckets are used for the harvest and the un-dipped grapes can then be dried by simply placing them out in the direct sun, without any pre-drying treatment.

5.2.2. Dipped grapes

The grapes after harvest are treated with a dipping solution, which aims to increase the permeability of the wax layer of the berries to water and hasten drying. The fresh grapes may be either dipped in, or sprayed with dipping solution, an alkaline oil-in-water emulsion.

This is emulsified in a solution of potassium carbonate in water. The standard dipping solution should be made up of 2.4 - 5 kg of carbonate of potash (K_2CO_3) and 1.5 litres olive oil or dipping oil in 100 litres of water. The pH of the dipping solution should be between 11 and 12. The commercially produced 'grape dipping oil' used in the emulsion is a mixture of ethyl esters of fatty acids and free oleic acid of vegetable oil. Traditional methods may be used if they are not harmful for the workers and consumers.

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The major active components of the emulsion are the ethyl esters contained in the oil, but potassium carbonate is required to achieve proper emulsification and to maintain the alkalinity of the emulsion. The alkalinity contributes to the increase in drying rate and is necessary to prevent fermentation of the emulsion in a bulk dip under some conditions.

Formerly, it was believed that the emulsion treatment removed the waxy bloom, but is has since been shown that almost no wax is removed and that the effect is reversible by washing. The mode of action seems to be a physical or chemical modification of the structure of the outer wax layer so that its permeability to water is increased. Also, the skin of emulsion-treated berries appears to be more transparent to infrared rays, which would allow a better radiant heat energy uptake.

Drying times can be reduced from an average time of 3-5 weeks for untreated dried grapes, to 7-14 days for treated ones, dried on a rack. Such fast drying can lead to a rapid rise in sugar concentration, which inhibits the action of the enzyme (polyphenoloxidase) responsible for darkening in untreated fruit. The enzyme is localised in the skin of the berry where drying begins. However, when rain or high humidity interrupts fast drying, conditions could become suitable for the darkening reaction to proceed, and darker fruit is produced.

The emulsion could be applied to the berry surface in various ways, but the aim is always the same, to ensure complete wetting of the fruit until the 'bloom' is no longer visible. Parts of bunches not wetted will dry more slowly, resulting in 'blobs' of higher moisture content and darker colour in the final produce.

a. Bulk dipping

Bulk dipping is the total immersion of fruit in a large well dimensioned tank of dipping solution of a frame holding several perforated “dip tins” or “buckets” of fruit. The dip tank contains 500 -3000 l of dipping solution. Buckets are placed, winched off the trailer, and dipped into the dipping solution for several minutes. Longer dipping times cause berry splitting. After the dipping process, trailer frame winched off from dip tank and drained for 5-10 minutes. Composition and pH level of dipping solution should be regularly tested and maintained as noted above. Because of level of the dipping solution in the tank may decline, the required level should be restored by daily additions from a stock tank. If the pH falls below 9.5, the solution is likely to ferment, so a new dipping solution should be added into tank to raise the pH.

b. Rack spraying

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Another method for applying the dipping solution is the rack spraying method. Fresh grapes should be placed or hung on the rack, where they are sprayed with standard strength emulsion using a specifically designed multi-nozzle wand. Various wand designs are available and usage varies with local preference. Spraying should be better done at the end of each loading day, or when a rack is filled. The amount of spray applied should be around 55 litres per tonne of grape.

The fruit may be left for several days before spraying, but in the meantime, will dry very slowly. Unsprayed fruit is also liable to some sunburn damage in very hot weather. In rack spraying, it is particularly important that the fruit is hung evenly and all leaves are removed, so that total wetting of the berry surfaces is possible.

Treatment after rain: if the dipping solution applied by spray is washed off by rain, the fruit should be resprayed as soon as the weather improves. Only the affected areas should be resprayed.

5.3. Types of drying systems

In general, drying methods foresee different technologies of intervention. Drying on ground and rack-type drying methods are more efficient than dry-on-the-vine (DOV), systems because the grapes are drying closer to the soil and the air temperature at tray level can exceed the environmental temperature, so the raisins can dry more rapidly. Another method uses paper trays placed in a smooth terrace prepared between vines. Normally in this drying process, the raisins dry in 10 to 20 days. The reason of that is the temperature at tray level exceeds the ambient temperatures in 15° to 20° C.

5.3.1. Dry-on-vine (DOV) system

DOV is an important practice related only to mechanical harvest in which the cane is separated by pruning in order to initiate the drying process, when the grape reaches the required solid soluble content.

There are three types Dry-on-vine trellis systems: Traditional (single-wire or T), Open gable (Y), and Overhead arbour (Parral or Pergola).

When grapes reach the necessary maturity level, the fruit-carrying cane is cut at the point where they would normally be pruned in winter and the grape bunches are left in order to keep on drying on the vines.

For speeding the drying, within 2 days after cane cutting, grapes can be sprayed with a solution oil-potassium carbonate in water (point 5.3.2).

The drying could last 2-3 weeks. Dried fruit can then be harvested with a mechanical grape harvester.

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5.3.2. Traditional drying system with drying sheets on ground

Drying on ground is the most common of all the drying methods. Grape bunches are laid on poly ethylene sheets or paper trays on the ground. Plastic under-sheets are necessary in order to prevent moisture rising from the ground into the bunch. The density of the grapes should not exceed 20kg per m2.

5.3.3. Rack-type drying system

This system evolved from initial wooden or steel drying trays. The drying sheds should be composed of covered iron (galvanised wire) racks. The number of vertical shelves is kept from six to twelve, spaced about 23 to 45 cm apart vertically. The drying shed should be preferably positioned on a rise, clear of any obstructions to free air flow and the rows of racks should be spaced apart from a distance of 60 to 150 cm. The length of the rack could be from 6 to 18 m, having South-North orientation and flow or dry air from West to East. The shelves could be covered by polyethylene (PE) films or netted either with mesh or with hessian of jute and the density of fresh grapes for drying should be 20 kg /m2on each rack. It is possible to hang grape bunches after dipping in to solution instead of rack spraying. To avoid the exposure of grapes to the sunlight during drying, curtains could be placed on the sun facing side.

5.3.4. Corinth grape drying system

Most of the Corinth grapes are dried by the traditional drying system (5.3.2). In an alternative method, Corinth grapes can be laid directly on the racks. Due to the small size of their berries, it is not necessary to apply a pre-drying treatment. Bunches with large berries and seeds ("bucks") are separated because they dry out more slowly and the presence of their seeds makes the grapes unsuitable for commercialization. It is possible to produce grapes with better quality by protecting them from direct sun exposure of the grapes during the drying process. Side curtains of burlap are hung on the racks however, they should be removed in case of deteriorating drying conditions.

5.3.5. Dried grapes mechanically dried and treated with sulphur (golden bleach raisins)

Although quite rare, this is a production method which consists of drying the grapes artificially, and is thus outside of the framework of the OIV resolution OIV-VITI 493-2013. Fresh grapes are dried continuously for about 35 hours in rooms with controlled temperature.

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6. MOULD CONTROL

In order to prevent the development of mould in the drying grapes:

- Damaged and/or disease-infected bunches should not be harvested,
- Grapes damaged should be removed if it is possible,
- The drying process should be done in suitable climate conditions and places (dry, hot and low humidity),
- Fresh grapes should be dried down to the appropriate moisture levels. Water activity of dried grape should be less than 0.6 Aw.

7. PROCESSING AND PACKING

Processing of dried grapes involves the separation of the good fruit from stems, cap-stems, poor fruit, grit and other foreign matter.

Every berry should be mechanical separated for the cap-stems.

From the stemmer the fruit should goes through to various shaking riddles of different calibre, which together with blowers separate out the cap-stems, undersized or empty berries, any remaining clumps of berries, and very large or very small particles of foreign matter. Some heavy particles are also removed, and iron and steel objects picked up by magnets. The fruit next falls onto a broad slow-moving belt for hand-picking of any undesirable parts of fruit or foreign matter not removed by the machinery. Hand-picking is followed by washing, often in the recently introduced riffle washers. The fruit passes through a large, slowly revolving mesh drum where it is heavily sprayed with water, then flows in a stream of water over a series of riffles which separate the heavier foreign material.

At the end of the riffle is a de-watering screen. Further de-watering takes place in a spinner and finally, 0.2-0.3% by weight of a stabilised vegetable oil is sprayed onto the fruit as a dressing, to impart an attractive gloss and to prevent stickiness.

At this stage the seedless varieties are packed for sale to wholesalers or retailers or abroad and the final pack is inspected for compliance with the OIV resolution OIV 493-2013, and the specific regulations of each state.

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8. PEST CONTROL IN STORED DRIED FRUIT. STORAGE, SAFETY AND SANITY OF DRIED GRAPES

If necessary, for the insect control in grape local processing, pesticides or alternative control methods by means of physical and / or chemical control alternatives must be used according to the country and international pesticide regulation for protecting the dried fruit.

Necessary measurements during and after drying process should be taken to ensure the quality and phytosanitary of grapes as well as consumer's safety.

9. QUALITY OF RAISIN

Depending on the drying process, the quality specifications of raisins might differ. Dried grape berries should be defined by their attributes, such as adequate sugar accumulation, appearance, colour, thin skin, succulent and elastic fruit flesh, typical natural flavour and texture. They also should be free from foreign matter, immature berries, damaged berries, sugared berries and mouldy berries. Grapes treated with processing aid ethyl oleate – potassium carbonate forms dried grapes with finer wrinkles than those from untreated grapes.

Raisins that dried rapidly are lighter coloured than raisins made from grapes that were dried more slowly because enzymatic browning is inhibited by low water activity. For that reason, dipped dried grapes have golden yellow to brown colour, whereas undipped dried grape have dark brown colour.

Grading of dipped dried grapes is based on colour, size and other quality parameters of berries. Lighter colour and bigger berry raise quality number. Colour is not important for grading undipped dried grapes, due to their dark brown colour. On the other hand, the defects should be measured according to immature, mouldy, sugared and discoloured berries.

REFERENCES

1. Adsule, P.G. Sharma, A.K. Banerjee, K., Karibasappa, G.S. (2012). "Raisin industry in India: adoption of good drying practices for safe raisins". Bulletin de l'OIV nº85 (nº974-975-976) 209-216.
2. Altindisli, A. F. O. Altindisli, N. M. Celiker, F. Ozsemerci and O. K. Caner (2011)."Handbook of Dried Sultani Cekirdeksiz grape growing (Kurutmaya yönelik

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Sultani Cekirdeksiz Uzum yetistiriciligi el kitabı)", 68-4, 104 p. ISBN: 978-9944-172.

3. Christensen, L. P. (2000). Raisin Production Manual. "Chapter 27: The Raisin Drying Process". UCANR Publications. University of California. Agriculture and Natural Resources. Publication 3393, pages 207-216.
4. Esmaiili, M. Sotudeh-Gharebacgh, R. Cronin, K. Mousavi, M.A.E. and G. Rezazadeh (2007). "Grape Drying: A Review". Journal of Food Reviews International, Volume 23, Issue 3, pages 257-280.
5. Fidelibus, M and S. Vasques "Trellises for Dried-on-the-vine (DOV) raisin production". http://ucce.ucdavis.edu/files/datastore/391-326.pdf
6. Fidelibus, M and S. Vasques. "Dried on vine raisin cultivars".
7. http://ucce.ucdavis.edu/files/datastore/391-317.pdf
8. "Grape drying in Australia". https://artserve.anu.edu.au/raid1/student_projects/wine/gda.html.

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