

Investigation of the Grapes' Traditional Drying in the Region of Tademait, Tizi Ouzou, Algeria

Lamia Zoubiri, Malika Barkat

Department de Biotechnologie, INATAA, Université Frères Mentouri Constantine, Algeria, E-mail:barkat.inataa@yahoo.fr

Abstract: *The objective of this study was to collect detailed data on grapes' traditional drying. A survey was conducted with 63 respondents after an orientation by the agricultural subdivision of Tademait. The survey questionnaire consisted of three components related to the interviewee's identity, the wineries' characterization on traditional drying of the grapes. The results show that 93% are winemakers with 33% and among them have 3001 to 6000 trees with diverse varietal profile and predominance in order of the following varieties: Cardinal, Debouki, Bayrouth and Alexandria. As for traditional drying, 62% produce grapes dried between 10- 50Kg, 58% with the aim of enhancing the grapes of low market value. According to 58%, late varieties are better suited for drying. From 95%, the major pretreatments before drying are sorting and washing with an addition of table salt; drying is done under the sun (56%), on reed mats (46%), at a temperature between 30-35°C (46%). 53% require the criteria for good drying. According to 87%, the end of the drying operation is done visually, after 20-24 days (41%), with a storage of finished product in paper bags (41%) and in cool, dry places (82%). The diagram of artisanal drying adopted is: grapes collection, sorting and washing, soaking in boiling salted water, drying under the sun, picking off of the dried grapes, conservation.*

Keywords: *Traditional drying, grapes, varieties, treatment, investigation*

1 Introduction

For a long time, drying in the sun of foodstuffs was the first conservation system. Today, it is a technique widely used in the world for a variety of fruits and vegetables [1]. In Algeria, the family drying of fruits and vegetables is especially figs (kabylie's region), apricot (Batna, Hodna-M'sila) and various legume plant seeds [2]. Beside the fig tree and apricot tree, the vine is one of the species of tree fruit, important for the economic and social plan of the country. During full production of table grapes, local markets are often saturated. This excess leads to significant losses for producers, especially for late varieties with high yield as Debouki whose price drops to 50Da/Kg. In the region of Tademait, families practicing viticulture prefer drying the clusters of late varieties and store them rather than sell them at low prices. The purpose of our study is to combine data on

the methods of artisanal drying of the grapes in the region of Tademait and establish a diagram of traditional drying, on the basis of a survey of families practicing viticulture.

2 Materials and Methods

2.1 Area of Study

This study was conducted in the municipality of Tademait. This region is known by a favorable climate for viticulture. In this region, a program of conversion of vegetable crops in arboriculture (vine) was applied by make it national development and agricultural adjustment (FNDRA) since 2000. According to the agricultural subdivision, the total area under vines is 197.26 Ha, with an annual production for 2012-2013 estimated at 39500 Qx with an average yield of 200Qx/Ha [3].

2.2 Sampling

A simple and random sampling was conducted. The study began with a direct contact with executives of agricultural subdivision of Tademait, which have directed us to families practicing viticulture and traditional drying of the grapes, residing mostly in the vicinity of Ichakalen village, municipality of Tademait. On land, the survey was conducted with families engaged in viticulture, winemakers and producers of dried grapes. After selection, the total number of respondents selected was 63.

2.3 Formulation of the Questionnaire of the Survey

A questionnaire consisting of three components was developed. A first part discusses the identification of respondents, a second part concerns the characterization of wineries based on the number of cultivated trees, varietal profile, the age and the use of vine plantation, etc., and finally a third component relates to the activity of the traditional drying. This component consists of 24 questions dealing with mainly the reasons and purpose of drying, the varieties used, the methods of drying, the area and the drying time, the problems encountered during drying, different pretreatments applied and the products added to the grapes to dry, the support and the criteria of good drying, the criteria of the end of drying, the quantities of annual dry grapes, the duration and the conditions for conservation of dried grapes, dry grapes storage containers and the destination of the dried grapes.

3 Results and Discussion

3.1 Identification and Personal Information

3.1.1 Age of Respondents

The dominant age group is between 41-51 years. Table 1 summarizes the different age groups practicing agriculture. At the end of the survey responses, 77.26% are farmers basically and are owners of agricultural land; 9.09% are graduates in Agronomy and practice themselves agriculture, which is the heritage of their parents. According to these, this importance for agriculture is explained by different programs traced by the government for the promotion of this agricultural area; 4.54% are traders buying the vines orchards in harvest season.

Table 1
Age of the surveyed farmers

Age group (years)	Percentage (%)
[20-30]	9.09
[31-40]	27.27
[41-50]	36.36
[51-60]	16.66
[> 60]	10.6

3.1.2 Levels of Education

A significant percentage (25.75%) represents the respondents having a degree in agronomy. They are followed by the illiterate farmers who have never attended school (21.21%). The remaining percentage (53.01%) represents the respondents having a level of education ranging from the koranic school to high school.

3.1.3 Percentage of Growers

The farmers in the region of Tademait are mainly winemakers whose 93.93% have orchards with vineyards. This is explained by the large agricultural lands in this region and which are well suited to the cultivation of the vine and to the support of this sector by the government.

3.2 Importance of Viticulture in the Region of Tademait

3.2.1 Number of Feet of Vines

Figure 1 shows the number of feet of vines that possess the winegrowers of Tademait. According to respondent's winegrowers, the importance of the number of trees is explained by growing several varieties in orchards and the different modes of culture applied, knowing that a hectare has approximately 2800 in line and approximately 2000 feet in pergola.

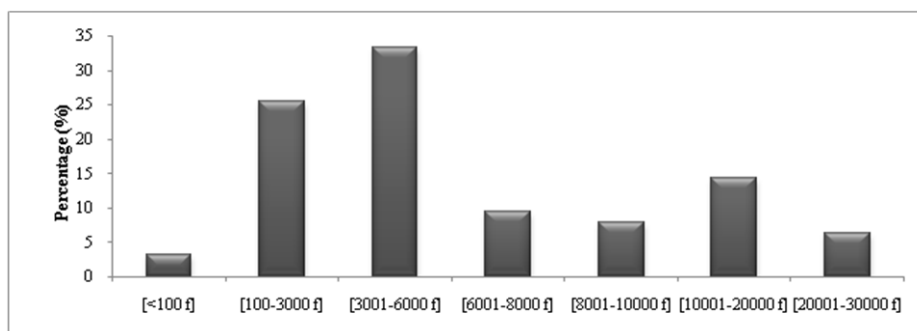


Figure 1
Number of feet of vines

3.2.2 Varietal Profile

Varietal profile represented in table 2 is very diverse. These cultivated varieties are known by high yield, resistance to diseases, a late harvest and a tonnage of harvest (case of Debouki) and a good sale (case of great Palm, Muscat and Cardinal).

Table 2
Varietal profile of grapes in the region of Tadmaït

<i>Varieties</i>	<i>Percentage (%)</i>
<i>Cardinal</i>	<i>57.14</i>
<i>Debouki «Sabène»</i>	<i>46.03</i>
<i>Date palm of Bayrouth</i>	<i>26.98</i>
<i>Muscat of Alexandria</i>	<i>23.8</i>
<i>Big black</i>	<i>17.46</i>
<i>Red globe</i>	<i>12.69</i>
<i>Italian</i>	<i>1.58</i>

The cardinal is the most cultivated (57.14%). According to agronomists of the agricultural subdivision of Tademait and surveyed winemakers, this is explained by its early harvest (month of July) and its good selling. Indeed, the late varieties necessitate intensive irrigation in August; have been replaced by early-maturing varieties. The large percentage of respondents winegrowers have a single variety, followed by those who own two varieties (figure 2).

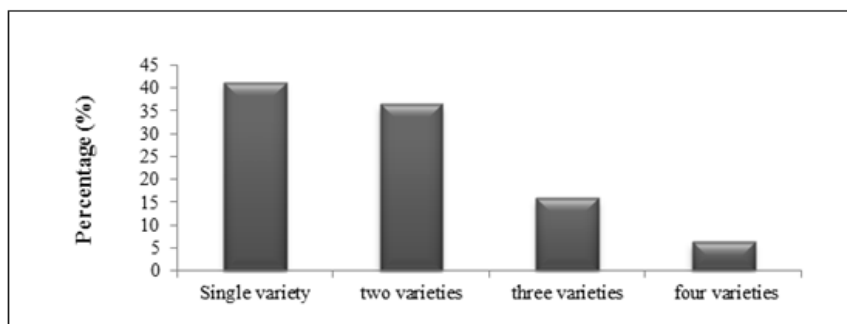


Figure 2
Number of cultivated vine varieties

3.2.3 Location of vine Orchards

The majority (38.09%) vine orchards is located in plateaus, 20.63% in mountainous areas, the same percentage of plains. According the survey, it has proved that a winemaker can have several orchards located in different geographical situations.

3.2.4 Age of Plantations

The major percentage (50.79%) concerns old plantations from 5 to 10 years. This is explained, according to growers, by recent agricultural support applied by the Algerian government for the development of this culture. Indeed, each farmer with a “fella card” allowing it to benefit from the vine plants, fertilizers and stalling since 2000.

3.2.5 Use of Plantations

59.09% of plantations are intended for sale and family consumption at the same time, knowing that farmer’s owners are even that concerned with production management and decide the sale of plots. On the other hand, 31.81% are those who sell orchards completely in harvest seasons to traders, without leaving any parcel for family consumption. As for family consumption, this last is 6.06% and concern families with less than 100 feet of vines.

3.2.6 Appreciation of the Ripening of the Grapes

95.45% of respondents appreciate the ripening of the grapes visually by referring to the harvest season known for each variety and the tour of the bees in the orchard. The sweet taste of berries also plays an important role in this determination to 54.54% of winemakers, unlike sensing which remains a low average (9.09%) for the assessment of the maturity of the grapes.

3.3 Productions of Dried Grapes

From the results obtained, accordingly to the producers of grapes, only 62.12% of respondents dry grapes after full maturity.

3.3.1 Purpose of Drying

The main purpose of the traditional drying of the grapes is to enhance the low market value of grapes that are, according to growers, clusters softened on the tree because of the climatic conditions and inadequate perfusion in the period of July-August for late varieties. In addition, the grapes are dried occasionally to keep the excess of production, improve the taste and to make gifts to neighbors' (Figure 3).

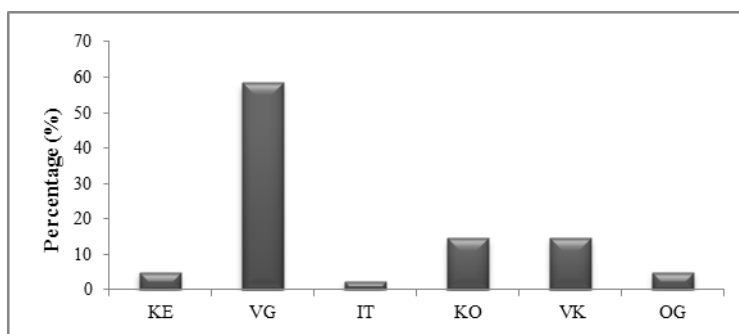


Figure 3

Goals of drying of the grapes

KE: Keep the excess of production; VG: Valuing the grapes of low-value market; IT: Improve the taste; KO: Keep the grapes for occasions, VK: valuing the grapes of low-value market and keep the excess of production; OG: Other goals.

3.3.2 Organization of the Drying Process

Type of Grapes used for Drying

58.53% of dried grapes' producers use varieties with late maturity such as Debouki "Sabel". This does not preclude other varieties, because 41.46% of producers report that all varieties grown in the region lend themselves to traditional drying.

Pretreatment Applied to Grapes for Drying

All respondents who dry grapes report that washing, sorting and adding some products such as table salt, boiling water, olive oil, oak ashes and certain aromatic plants are often applied as major pretreatments and aimed to facilitate water evaporation from the grapes and a guarantee of an efficient drying avoiding moisture and insects. On the other hand, the calibration has no significance (2.41%). This is explained by the destination of the dried grapes, which is not for sale (Figure 4).

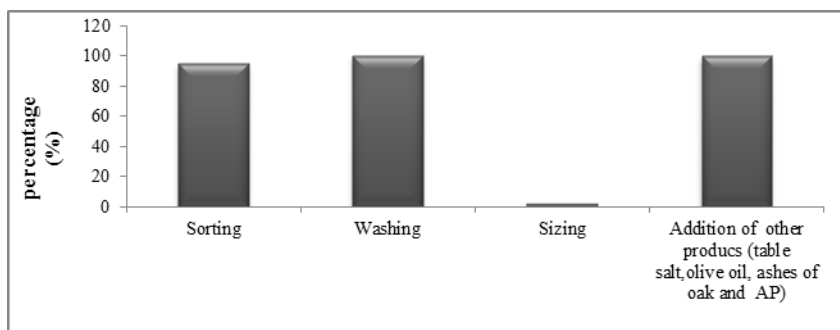


Figure 4
Different pretreatments applied to grapes before drying

Products Added to Grapes before Drying

Figure 5 shows the various products added to the grapes to dry. According to dried grapes' producers, the addition of table salt has the role to promote and accelerate the evaporation of water from the grapes, olive oil gives the gloss to dried grapes and allows them to proper conservation, the oak ashes allow them to keep insects and odors caused by moulds and the aromatic plants (thyme and mint) used to combat wasps and ants.

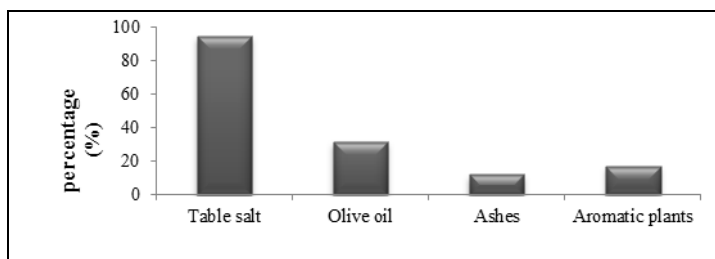


Figure 5
Various products added to the grapes to dry

Drying Rack

46.34% of respondents producing dried grapes (Figure 6) use reed mats for the exposure of the grapes to the sun. According to them, this is explained by a proper air circulation around the berries and grapes during drying, preventing the development of moulds and avoiding the problem of gluing caused by moisture. Plastic sheeting and carpet fabrics are also used, but from the respondents, these racks are used for pre dried cluster on the shaft and those don't need a long period of drying. Other rack such as linen yarn and paper are used for small quantities.

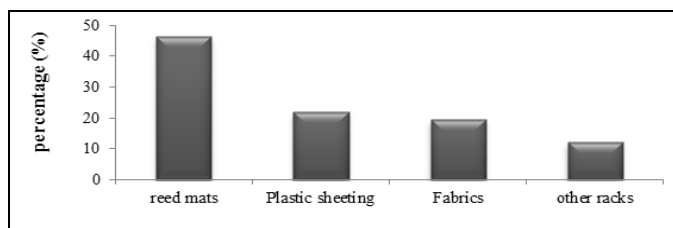


Figure 6
Racks used to dry grapes at Tademait

Drying Temperature Range

The drying of the grapes occurs especially in hot periods with the most recorded temperature range is [30-35°C]. This is explained by the direct exposure of grapes of late varieties to the sun. For temperature intervals of [20–25°C] reported by 4.87% of respondents, they relate to the berries of early-maturing varieties which are often dried in the shade in rooms well-ventilated to prevent their hardening.

Drying Area

According to 56.09% of vine growers, the drying of the grapes occurs in full exposure to the sun, on the terraces and in the courtyard of the house (open Haouch) to accelerate the drying operation. Furthermore, 43.9% of respondents from the same region prefer dry grapes in the shade, in rooms or covered Haouch. According to them, this method allows to avoid the hardening of berries.

Drying Time

The duration of drying of the grapes is [15-19] days to 41.46% of respondents. A time of [20-24] days was reported by 41.46% of the wineries. Other respondents (17.05%) report that the drying of the grapes time depends on several parameters including weather conditions (temperature, wind), the drying air, and the dry condition of the grapes (the initial moisture).

Criteria for Judgment of Drying

87.8% of respondents decide to stop traditional drying of the grapes visually by observing the state of the berries of the grapes that retract and become wrinkled due to water loss. For 4.87% of respondents, the drying off indicator of the grapes is sensing and 7.31% decide to stop drying visually and by the very sweet taste of the dried berries.

Problems Encountered during Drying

56.12% of respondents don't have problem during craft drying of the grapes. However, 43.88% of them have various problems, which the most important (14.63%) is the onslaughts of grapes during drying operation by insects such as bees, wasps, ants that damage the grapes berries. 12.19% of respondents declare alteration of clusters by moulds as a very annoying problem. Hardening of the berries and their bonding are two problems reported respectively from 7.31% and 9.75% of respondents.

Criteria for Good Drying

46.34% do not require any criteria to ensure proper drying. On the other hand, 53.65% require different criteria for good drying which 68.18% of respondents refer these criteria closely to the grape variety (variety, state of the fruit and maturity degree) and drying (area of drying, drying temperature, drying rack and pretreatments applied). The only grape variety is a criterion required for a good drying to 18.18% of respondents. The operation of drying with its parameters (area of drying, drying temperature, drying rack and pretreatments) is a criterion required for a good drying to 13.63% of respondents.

3.3.3 Dry Grapes

Annual Quantity of Dried Grapes

The most of respondents (36.58%) produce from [10-50 Kg [of the grapes dry annually. This quantity is not really important, this is explained by these respondents by the fact that these dried grapes are not intended for marketing and their use is limited to family consumption. Furthermore, 34.14% of the surveyed produce [100-150 Kg [of dried grapes. This is explained according to these subjects to the distribution of these dried grapes in their families, neighbors' and poor families. 9.65% of surveyed subjects only produce more than 150 Kg.

According to these respondents, this large quantity of dried grapes is produced only when softening problems of the clusters of the variety Debouki on the shaft occur when prices fall in the market. It is noticed that, according to the respondents the quantity of dried grapes annually depends on families practicing viticulture, vine-growing area, production and late dry varieties.

Duration of Storage of Dried Grapes

According to 51.21% of respondents, the duration of storage of the grapes dried traditionally is from [1-2 [years. According to them, this period is not long and avoids alteration of dried grapes and the deterioration of their taste. 26.82% of subjects store the dried grapes during [2-3 years [without encountering problems during these years. Others (14.63%), store the dried grapes during [3-4 years[and indicate that the duration of storage depends on two very important parameters including the quality of drying and storage conditions .

Storage of Dried Grapes Place

In the studied area, 41.46% of respondents store dried grapes in bags and indicate that it is the best mean of conservation provided that it is protected from moisture. 26.82% 17.07% and 14.63% subjects prefer to store dried grapes, respectively in linen bags, plastic jars and wood jars. According to these respondents, the choice of packaging jars is very important, because they influence the duration of conservation and preserve the organoleptic quality of dried grapes.

Storage Conditions for Dried Grapes

82.92% of respondents report that the best conditions of storage of dried grapes are fresh and dry places. According to them, the major problem of the dried grapes is the development of moulds caused by heat and moisture. Also, 14.63% of the respondents retain the grapes dried in well ventilated areas. This is explained by the fact that ventilation prevents gluing of dried grape berries. According to 2.43 % of respondents, the absence of moisture is the only condition of conservation of dried grapes and they explained this by the fact that moisture promotes the development of moulds and the attack of dried grapes by insects.

Development of the Mould after Drying and its Causes

70.73% of farmers reported that no development of moulds is observed, during drying or after. However 29.26% of respondents observe alterations due to the development of the moulds during storage. The causes of these alterations, according to these respondents, are summarized in figure 17.91. 66% of respondents report that these alterations are caused by the unfavorable conditions of conservation that promote the moulds' development. 25% of subjects reported that these alterations are due to poor drying and especially the use of drying racks that hold moisture such as plastic sheeting. Poor sorting of the grapes before drying is one of the causes of the alterations by moulds, this fact is indicated by 16.66% of respondents.

Difference between Traditional and Industrial Drying

All the respondents reported that there is a difference between industrial dried grapes and artisanal dried grapes. 58% of respondents report that the variety, the appearance and the quality of the finished products of the dried grapes produced industrially are different from the traditional dried grapes. According these respondents, industrial dried grapes have a bright color and are produced from seedless varieties. 16.5% of respondents report that the difference is due to the use of various industrial dryers producing dry grapes. 14.5% of farmers reported that taste makes the difference between two dry grapes. This is explained by the addition of industrial powdered sugar on dry grapes. 11% of respondents think that the addition of the chemical products in industry is the difference between traditional and industrial dry grapes.

Destination of Dried Grapes

From 100% of respondents, the dried grapes traditionally are not intended for sale. 53.65% of respondents report that these dried grapes are intended for family consumption and to make donations to the neighbours and to poor families. This is explained by the good neighbourhood relationships in this village with strong vine-growing area.

Diagram of Traditional Drying of the Grapes in the Region of Tademait

The most used craft drying diagram by 43.90% of respondents producing dried grapes is as follows: picking of grapes after full maturity, sorting, washing, soaking in boiling salted water for 20 to 60 seconds, draining of clusters in plastic crates, exhibition of the clusters to the sun until the berries become wrinkled destemming, storage of dried berries. According to subjects, boiling salted water accelerates the loss of water and therefore leads to the proper drying of the grapes. On the other hand, 26.82% of farmers follow the same diagram, but they prefer grease salted boiling water with a glass of olive oil before soaking of the clusters. This is explained according to them, by the fact that this grease avoids clusters by wasps and bees attack and gives glossy dry berries. 12.19% subjects dip clusters in infusions salted herbs such as the viscous elecampane, thyme and mint. For them, these plants are a mean of preserving the grapes during and after drying against various insect predators of the berries. Nevertheless, 7.31% of farmers cook clusters to water vapor containing oak ashes, which according to them, the smell of these ashes fight against insects and fungal alterations. The step of manual removal of dried berries is applied by 7.31% of farmers.

Conclusion

Since the failure of the development program of production of seedless dry grapes for the Sultana variety (1st quadrennial plan, 1970/1973), Algeria provides its domestic consumption in grapes by importing [4]. However, some local areas prefer to practice the craft drying of the grapes for their occasional needs in this dried fruit instead of buying at prices ranging up to 50 Da / Kg. A technique of traditional drying applied relies on a simple exposure to the sun, clusters of grapes mature. This practice of drying, conditioning and conservation of final product do not guarantee good microbiological and physico-chemical quality. From the perspective of developing the activity of traditional drying of the grapes in the region of Tademait and to circulate in the vine regions of the country, we propose to encourage the family activity that both requesting the intervention of the women and men for a good complementary work; the village group which is a form of union and interesting organization; the organization of the vine industry by creating professional organizations in direct relation to subdivisions farm, able to develop this field, production of fresh and dried grapes and ensure good control craft drying and the conditions of storage of the dried grapes; creation of the markets or souks weekly for the sale of such products of traditional land.

References

- [1] Dudez P., Thémelin A. and M. Reynes, Le séchage solaire à petite échelle des fruits et légume, expérience et procédés. *Guide pratique*.1995, ISBN 2-86844-073-8.
- [2] F. Bahlouli, A. Tiaiba and A. Slamani, Etude des différentes méthodes de séchage d'abricot, point sur les méthodes de séchage traditionnelles dans la région de Hodna, Wilaya de Msila. *Revue des énergies renouvelables*, 2008, *SMSTS 08 Alger*. P 61-66.

- [3] Subdivision Agricole de Draa Ben Khedda, Tizi-Ouzou., Bilan récoltes viticole (raisins de table), Evaluation de la production annuelle de raisins de table de la région de Tademaït, Rapport de l'année 2013.
- [4] M. T. Belhout, le secteur viticole et vinicole en Algérie : Marché interne et commerce international. *Medit* 1990, N 1/90.