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Assessment of production and marketing practices for dried figs: Surveys of Moroccan fig producers and sellers

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Quality is a long-standing and recurring issue that is still at the top of consumer concerns. It is estimated that the dry fig sector in Morocco is far below the potential offered by this sector. This work focuses on identifying the strengths and weaknesses of this sector through a survey of dried fig producers and traders. The quality evaluation of dried figs marketed according to the trade standard covered 30 samples of dried figs of Moroccan origin and 5 samples of figs of Turkish origin. The main constraints hindering the development of this sector are the varieties of fig trees used for drying and the constraints of the various links in the value chain up to the point of sale. Dried figs of Moroccan origin had a level of commercial quality that is below international requirements. Indeed, the marketed dry fig is characterized by small size, heterogeneity and the presence of insects. In this work, recommendations are presented for upgrading the Moroccan dried fig sector.

Keywords: dried fig, Morocco, quality, survey, trade, production

Introduction

Figs, whose story begins with “Adam and Eve”, are recognized as sacred fruit and appear in all the holy books. The highest consumption of this fruit coincides with periods that are religiously important, such as Christmas, Easter or Ramadan. The cultivation of figs dates back to 3,000-2,000 B.C. and over time it spread across the Mediterranean. Native to Western Asia and the Mediterranean basin, the fig (Ficus carica) belongs to the family Moraceae (Aksoy, 1998).

After the 1970s and due to the increase in labour costs, there was a decline in fig production in many Mediterranean countries, which were the main producers of dried figs (Aksoy, 1998). In recent decades, the production and global marketing of figs has been limited to a few countries such as Turkey, Greece, the United States and Brazil. In other countries with a Mediterranean climate, such as Morocco, Egypt and Algeria, fig tree plantations exist everywhere but their development remains limited.

It should be noted that each year, more than one million tons of figs are produced in the world, with Turkey leading the way, with an average production of more than 280 thousand tons per year (FAOSTAT, 2015). Being the main producer of dried figs, with a quantity of 43,500 tons, Turkey provides more than half of the world’s exports. Greece (3,500 tons) and Iran (8,600 tons) are also considered major exporting countries (FAOSTAT, 2015). In addition, Spain, the USA, and Syria are also fig exporting countries.

At the national level, according to data from the Moroccan Ministry of Agriculture, the fig tree occupies an area of more than 46,000 ha, i.e. 5% of the national fruit trees plantations. Production is estimated at 57,000 tonnes, reaching an average yield of 1.2 tonnes/ha. Cultivation is mainly located in mountain areas, on poor, schisty-marly (Rif and Chefchaouen) or calcareous soils in often rugged terrain that receives very little care. The five main production areas are Taounate (22,230 ha), Chefchaouen (7,050 ha), Al Hoceima (5,000 ha), Ouazzane (3,150 ha), Tetouan (2,000 ha). The

other plantations are distributed between Taza, Nador, Essaouira, El Jadida, Safi. Fig cultivation is declining, often replaced by cereals or tobacco.

The national production of figs is intended mainly for the fresh market and for the production of dry figs. A small part of the production of fresh figs is intended for the jam processing industry. However, drying remains by far the most rewarding processing for this fruit.

Natural drying, which consists in exposing the product directly to the sun's rays, occupies a preponderant place particularly in rural Morocco. It is a high added-value preservation technique because it extends the shelf life of agricultural production while giving dried products new and often desirable characteristics. The advantage of this method of preservation lies in its simplicity and low cost. In some areas of Morocco, the production of dried figs is the main objective of farmers as it allows them to benefit from fig tree cultivation.

In other growing areas, especially landlocked areas, figs are destined for self-consumption rather than for sale due to poor road infrastructure and low selling prices. In this case, the excess production is dried.

The national heritage of the fig tree (Ficus carica L.) is characterized by a multitude of varieties with great genetic diversity (Oukabli, 2002). It should also be noted that an earlier varietal identification work carried out by Tayou (1985) who identified twenty-four commercially grown varieties in the three zones of the Rif: 'Beni Ahmed', 'Moukhrisset' and 'Zoumi'. Out of these varieties, six are grown in all three zones: El Messari or Homrane or Johri, Lembdar Labiad, Lembdar Lakhal, Rhouddane, El Koté and Aounq Hmam.

The production of dried figs is widespread in Morocco. It is an income-generating activity for farmers and therefore likely to play an important socio-economic role. This depends on the care given to this fruit both in the production and in its marketing. This study has two objectives:

• Diagnosis and analysis of the quality of the offer and the marketing practices of dried figs;

• Contribution to the improvement of these practices with a view of developing the fig sector for distant markets.

Materials and Methods

Survey of dried fig producers and traders

Upstream: interview with 10 producers in the Taounate region, the main production area for dried figs.

Downstream: interview with dried fig traders in Marrakech during the month of Moharam, which coincides with the religious festival of Ashoura. On the occasion of this festival, the consumption of dried fruit in general and of dried figs in particular is very high and the supply is abundant. The survey was conducted at:

• 7 wholesalers in the city of Marrakech: The survey covered all of these 7 wholesalers who market dried figs and their derivatives;

• Retailers, located at three main points of sale (Rahba, Almellah and Jamaa lefna): The survey was carried out at these three points of sale with some thirty traders;

• Cold storage Company for fruits and vegetables: the main cold storage facility in the Marrakech region where dried figs are stored was visited.

Sampling of dried figs at points of sale

35 samples of dried figs were collected from three major cities in Morocco: Rabat, Casablanca and Marrakech. In each city, several outlets were selected (Table 1) and samples were taken from retailers on the basis of one sample per retailer. Each sample consists of 500 g of dried figs.

Assessment of the commercial quality of Moroccan dried figs

The assessment of the quality of marketed Moroccan dried figs was carried out according to the quality criteria required by the European standard for the marketing and quality control of dried figs (CEE DF 14). The main criteria required by the standard, which were assessed in this work, are size of the fruit, uniformity of size and colour of the fruit, presence of defects and moisture content.

Identification of vermin infesting dried figs

Samples of dried figs taken directly from growers were packaged and incubated at room temperature to promote the exit of insects contained within the fruit. The taxonomic identification of the insects was carried out at the Department of Zoology at the Hassan II Agronomic and Veterinary Institute.

Results

Production practices for dried figs

The region of Taounate, where our survey took place, is located in the Rif of Morocco and covers an area of 5,585 Km². This region is marked by its rural character. The rate of urbanization does not exceed 8.9%. The area dedicated to fig tree plantations is estimated at 22,230 ha, which is about 52% of the national area devoted to figs. This places Taounate region in the first rank of dry fig production in Morocco.

On a total of 20 surveyed producers of dried figs, the fig orchards of all these farmers are made up of a multitude of varieties. During our survey, we were able to identify about ten varieties which are the most frequent: Nabout, Alghodan, Almessari, Lemtel, Fassia, Baida, Elkhobzi, Chaàri.

In the Taounate region, drying figs is a practice that is essentially still traditional. It generally relates to the surplus production of autumn figs. The traditional drying of figs is very common in regions where the fig tree is widespread. Figs of different varieties, having reached a sufficient degree of ripeness, are picked and transported to the place of drying, which may be the terrace of a house or a plot of land surrounded by a fence to prevent access by animals. These drying areas are generally exposed to maximum sunlight. After drying, the figs are picked and sorted. Then they are flattened and threaded through esparto threads to form rosaries. Then they are packed in bulk in cardboard boxes or plastic bags and finally marketed.

As for the other figs, which are not threaded, generally intended for self-consumption, they are piled up in plastic or fabric bags. In order to preserve them, some households add an additive, which is most often one of the following mixtures: dried and ground thyme, salt, dried and ground thyme and basil. It should also be noted that in some cases dried figs are sprinkled with flour to prevent possible rehydration.

The region is known for another method of drying. It consists of opening and exposing the fruit to the sun on a dry support. This method of drying is generally applied to flowering figs and large-sized varieties which are not well suited to drying.

During the survey, it was observed that the majority of the harvest is reserved for sale as fresh

products. The destination of the product depends essentially on the market opportunities available to the production. Official figures on the production and marketing of dried figs are not available.

In any case, in some areas, the production of dried figs is the main objective of farmers, as it allows them to benefit from fig tree cultivation. In other areas, especially landlocked areas, figs are destined for self-consumption rather than for sale due to the lack of road infrastructure and low selling prices. In this case, the drying is done on the excess production and the drying techniques adopted are rudimentary and generally result in a low quality product.

On the hygienic aspect, it was noted that the conditions of the drying and storage areas are inadequate and often negatively affect the quality of the fruit (dusty fruit and vulnerable to attack by insects and mould).

In general, the surveyed producers say that production yields and fruit size are declining from year to year. The main causes are due to lack of water, the non-practice of caprification of fig trees by most farmers and, above all, the substitution of fig trees by other high-income crops such as cannabis.

Marketing practices for dried figs

In the city of Marrakesh, the supply of dried figs is ensured by seven wholesalers, whereas in the city of Casablanca the number of wholesalers was more difficult to count. All wholesalers in the city of Marrakech and five wholesalers in the city of Casablanca were investigated (Figure 1).

According to these respondents, the marketing circuit for dried figs begins with farmers going to the markets and offering their products to traders. If they are interested, price negotiations begin. After agreement on the price, the buyer checks the quality of the goods and pays the producer. In landlocked areas, dried figs are sold at the place of production to middlemen who, in turn, sell them to wholesalers. The dried fig is then transported to the big cities of the kingdom. The cities of Casablanca and Marrakech are the main destinations for dried figs at the national level.

To do this, wholesalers carry out a rough sorting of fig batches before sale. This sorting based on the appearance of the fruit (colour, size, etc.) allows them to set the selling price and also to define the destination of the goods. Indeed, batches of good quality dried figs are destined for towns and regions with relatively high purchasing power. However, Wholesalers ensure the market supply of dried figs throughout the year by means of preservation. Indeed, storage is a very important link in the marketing chain. According to the survey, the storage of this fruit depends on the means available to the wholesaler. Generally, it is carried out either in warehouses whose storage conditions are often considered inadequate, or in cold stores whose storage temperature is generally between 0 and 4°C and relative humidity between 80 and 90%. It should be pointed out that these cold stores are used in most cases for the storage of fresh fruit and vegetables.

In addition, retailers of dried figs obtain their supplies from wholesalers, a total of 50 retailers (30 in the city of Marrakech and 20 in Casablanca) were located and surveyed. The places where dried figs are sold are often shops selling spices, aromatic plants and dried fruits. It was noted that at the retailers located in the various sales points prospected, the dried figs most often threaded in loops are exposed to the open air and are neither conditioned nor packed.

In order to ensure better sales, other retailers proceed to bleaching followed by air drying of dried figs to soften the texture of the finished product. Other practices involve oiling the surface of the dried fruit to give it a shiny appearance.

Except that, it should be specified that dried figs sold on the market are in the form of a mixture of varieties and origins. Usually, the trader mentions 2 or 3 origins of the batches of dried figs he receives, whereas the names of the fig tree varieties are not well known.

Characteristics of the commercial dried fig

At the visited points of sale in Casablanca and Marrakech, Moroccan dried figs are observed in abundance. They come unpackaged and are strung in loops. Information on their provenance, the variety or varieties that make up the batches, the production and expiry dates are not available and labelling is missing. On the other hand, the selling price of dried figs fluctuates widely, ranging from 18 MAD to 45 MAD per kilogram.

As for the quality of commercial dried figs, it is considered unsatisfactory. Indeed, dried figs from about 50 samples observed are generally characterized by a dusty appearance, heterogeneous size and colour (white to brown) of the fruits and also by the presence of live insects inside the fruits.

It has also been found that the quality of dried figs evolves negatively over time. Indeed, the quality of the supply is better at the time of production of these fruits (from mid-August) and it starts to deteriorate more and more during the year. Thus, dried figs that have deteriorated and become unfit for consumption are intended for artisanal processing.

Craft uses of the dried fig

It is known that dried figs are generally intended for direct consumption. The other uses of dried figs mainly concern low quality fig varieties (hard textured fruit, varieties unfit for drying, etc.) which have a low market value (Figure 2).

The same path also concerns dried figs whose marketable quality has declined as a result of poor storage and sales conditions (rotten, fermented, damaged figs, etc.). These are ground and used by some traders (grocer, pastry chef,...) as an ingredient in ground coffee, fruit juices and also in cakes (Figure 3). However, the greatest use of these so-called dried figs is in the artisanal and illegal production of eau de vie.

Quality of the Moroccan dried fig according to the standard

The quality of Moroccan dried fig samples was evaluated according to an international standard (European standard UNECE DF 14). The main criteria required by the standard are of a commercial nature (size, uniformity of appearance of the fruit, freedom from defects and foreign matter, total absence of insects and moisture content). Table 2 shows the different size classes of the samples analysed.

Seven size classes have been identified:

Class 1 and Class 2, to which the five samples of figs of Turkish origin belong exclusively, while the samples of Moroccan figs belong to Classes 6, 8, 9, 10 and 11.

According to the Duncan test, the effect of origin on size is highly significant (Table 3).

Figure 4 shows the frequency of the studied defects in all the analyzed samples of dried figs.

About 62.9 % of the samples are infested with insects. These samples are made up entirely of dried figs of Moroccan origin whereas there was a total absence of insects in the samples of imported figs. This can be explained by the lack of effective insect control treatment at the time of production and storage and also by inadequate storage conditions. It should be recalled that the presence of live insects in figs is not tolerated by the UNECE standard.

The second major defect is the presence of damaged fruit. We found during visual analysis of the fruits in each sample that the damage was mainly caused by insects (presence of perforation on the surface of the fruit and at the level of the ostiole). Other defects are also detected and are in order

of importance: sunburnt fruit, dried fruit and fruit with abnormal external moisture. This last defect was observed in four samples taken from the city of Marrakech. This explains the presence of some fermented fruits in these samples. Indeed, we also noted the presence of fermented fruits in some samples of Moroccan figs, this phenomenon was observed in fig samples taken from Marrakech and which, according to the traders, underwent rehydration to improve their presentation. In figs from Turkey, this phenomenon was also observed, which could be due to storage conditions.

Concerning the presence of foreign matter, we found that there is a presence of dust on the surface of the fruits in 62.9 % of the samples analyzed contrary to the imported dried figs. Lack of packaging (sale in bulk) and inappropriate production conditions would be the main causes of this problem.

It should be noted that the moisture content of dried fig samples does not exceed the 26%, the limit set by standards CEE DF 14 (Figure 5).

For the samples of Moroccan dried figs, the moisture contents vary from 12.8% to 24.7% with an average of 18.5% while the samples of imported figs have contents varying from 19% to 23% with an average of 21%. We can then notice that the range of variation of figs of Moroccan origin is much more important than imported figs.

The low moisture contents can be explained by the drying method which is prolonged in the case of figs of Moroccan origin since very low moisture contents are reached (about 13 to 14%) and by inappropriate handling undergone by the product before arriving at the points of sale (often uncontrolled transport and storage conditions). This can lead to a recovery or loss of moisture of the product.

Low water content in a dried product can be synonymous with good stability, but it leads to hardening of the texture and also to economic losses due to loss of product weight.

Dried fig moth

On samples of dried figs, a study was carried out to identify the main insects infesting this fruit. These samples were largely damaged by worms. The taxonomic identification stated that it is Ephestia cautella.

Ephestia cautella is a moth of the order Lepidoptera (butterflies) very harmful, lives mainly on dried or drying fruits (figs, apricots, plums, grapes ...), but also on grains (rice), flour, cocoa, chocolate, peanuts and shelled nuts. It’s a serious pest for high-value products. Damage is produced by the caterpillar, the stocks are soiled with larval excrement (brown excrement), silk threads, cocoons and pupal remains. The products are rendered unfit for consumption and marketing (Appert, 1985).

Discussion

Moroccan fig tree orchards are characterized by their multi-varietal character. The choice of variety plays a crucial role in obtaining a quality end product (vidaud, 1997). High quality dried fruit is obtained by drying fruit from a variety that has good drying properties. In order to be competitive, it would be necessary to determine the most suitable varieties and the drying conditions that give a high quality production. In Turkey, the world’s main producer and exporter of dried figs, more than 75% of the national production is expected to come from Sarilop trees planted in the Meander Basin in western Turkey, and all the production is destined for the dried fig market (Kutlu et al, 2000). Since the 1970s, this country has carried out several research projects on the selection of fig clones for drying (Kutlu et al., 2000; Kutlu and Aksoy, 1998) and for figs for the fresh market (Nalbant et al., 1998).

Solar drying was used and still is. In several cases, it is this economic drying possibility that has led to the development of dried fruit production (Albagnac et al., 2002).

In Morocco, the climatic conditions are favourable for natural drying. This type of drying is widespread in the production regions. The villagers have enormous potential for processing this fruit, but they are not sufficiently trained, supervised and made aware of Good Production Practices (GPP) and Good Hygiene Practices (GHP). In fact, certain practices such as the lack of well-equipped drying areas, the mixing of several varieties, the elimination of ostiol from the fruit after drying and the use of thread, often of non-food quality, for threading dried figs, are still very common. Inadequate drying and storage conditions could be the cause of fruit spoilage and promote fruit attack by toxin-producing insects and moulds. Indeed, the factor of greatest concern in the trade of dried figs is the presence of aflatoxins. The literature reports a number of works mentioning the vulnerability of this fruit to attacks by moulds and their mycotoxins, particularly aflatoxins. Juan et al. (2007) reported the presence of aflatoxin B1 in dried figs of Moroccan origin.

Insect attacks on figs at the place of production are also a major handicap, especially in the absence of appropriate control measures. Indeed, the main vermin infesting the dried fig is Ephestia cautella. This insect damages dried figs by forming a web of cocoons inside and on the surface of the fruit, resulting in loss of quality (Damarh et al., 1998).

During the survey in the Taounate region, the traditional empirical methods used by farmers for the conservation and protection of their dry fig production against insects were investigated. These processes consist in adding to the dried figs substances such as salts, vegetable plants (thyme, basil,), vaporization using a liquid mixture called liana whose composition is as follows (filtrate of the ashes of the branches of lantisque mixed with olive oil). The figs treated in this way are packed in sachets and used for self-consumption.

The processes used by growers generally have certain advantages: simplicity, low cost, safety... Their effectiveness is, in the context of storage in the village for self-consumption, generally sufficient, but they cannot be applied to the preservation of crops once they have entered the commercial channels.

The national commercialization circuit is handicapped in many ways. Indeed, the absence of collection, processing and packaging units is the dark spot in this sector. The dried figs produced by the farmers are sold to intermediaries and wholesalers who ensure its distribution in the different regions of the country. In most cases, these traders are unaware of good storage and warehousing practices and even negatively affect the quality of the fruit by certain practices such as oiling the surface of the fruit and bleaching.

The storage of figs is also a weak link in the marketing chain. Indeed, retailers often store in stores where hygiene, temperature and relative humidity conditions are not controlled. Storage at low temperatures (0 to 4°C) and high relative humidity, as practised by some traders, adversely affects the appearance of the fruit. According to the Codex Alimentarius guidelines (CX/FAC, 2006), Dried figs should be stored at temperatures between 5 and 10°C and a relative humidity below 65% (CX/FAC, 2006).

Unwrapped figs sold on the markets are vulnerable to insect attack, to the accumulation of dust on their surface and are thus rendered unfit for marketing. As a result, packaging is a critical point in this sector.

Thus, the economic losses in this commodity, on a national scale, are significant. The dried fig is transformed into a raw material that feeds other artisanal processes such as the illegal production of alcohol, use in pastries and coffee. These can also have an impact on the health of the consumer, as these figs destined for this kind of processing are usually rotten, mouldy and infested figs.

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