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Review
(Derleme)

Hazelnut culture in Turkey

Ali İSLAM

Ordu University, Faculty of Agriculture, Department of Horticulture, ORDU

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Corresponding author: Ali İSLAM, e-posta:islamali@hotmail.com

Abstract

Turkey is a homeland of hazelnut culture. Hazelnuts are cultivated in the North of Anatolia, called the old and new region. The old region is in the Eastern Black Sea region and includes Ordu, Giresun, Trabzon, Rize and Artvin provinces. The new region is located in the central and western Black Sea region and includes mainly Samsun, Sinop, Düzce, Sakarya, Zonguldak, Kocaeli provinces. Tombul, Çakıldak and Foşa are the most cultivated varieties. Turkey is the most important hazelnut producer in the world with 705 thousand hectares of total area and average of 600 thousand tons. It meets 70% of hazelnut production in the world. Hazelnut constitutes approximately 20% of exports of agricultural products of Turkey. Again, hazelnut is the source of livelihood of 400 thousand families living in Eastern Black Sea Region. The Eastern Black sea region is extremely suitable for hazelnut culture due to its ecology. Hazelnut has been grown for many years and it is intertwined with the social, economic and cultural values of the people of the region. Traditional cultivation practices with intensively labor are common in production periods. In recent years, awareness of the application of agricultural techniques has increased and new orchards have been established.

Key words: *Corylus avellana*, filbert, Anatolia, Tombul, Blacksea region

Türkiye'de fındık kültürü

Öz

Türkiye fındık kültürünün anavatan bölgeleri arasındadır. Ülkemizde fındık eski ve yeni bölge olarak adlandırılan kuzeyde yetiştirilmektedir. Eski bölge Doğu Karadeniz bölgesi olup Ordu, Giresun, Trabzon, Rize, Artvin illerini kapsamaktadır. Yeni bölge ise orta ve batı Karadeniz bölgesi olup ağırlıklı olarak Samsun, Sinop, Düzce, Sakarya, Zonguldak, Kocaeli illerini içerir. Tombul, Çakıldak ve Foşa en fazla yetiştirilen çeşitlerdir. Türkiye dünyada en önemli fındık üreticisi olup ortalama 600 bin ton fındık üretmektedir. Bu durum dünya fındık üretiminin %70'ini karşılamaktadır. Türkiye tarım ürünleri ihracatının ise %20'sini oluşturmaktadır. Aynı zamanda fındık Doğu Karadeniz bölgesinde yaşayan 400 bin ailenin de geçim kaynağıdır. Doğu Karadeniz bölgesi sahip olduğu ekoloji dolayısı ile fındık üretimine en uygun bölgedir. Üretimde yoğun işçilik ile geleneksel yetiştirme uygulamaları yaygındır. Son yıllarda tarım tekniklerinin uygulanması konusunda farkındalık artmış ve yeni bahçe tesisleri başlamıştır.

Anahtarkelimeler: *Corylus avellana*, fındık, anadolu, tombul, Doğu Karadeniz

Introduction

Corylus is belonging to the birch family. The hazelnut (*Corylus avellana* L.) forms the basis for the more important commercial cultivars. *C. maxima* and *C. colurna* (Turkish hazel) are also common others.

Turkey is the largest producer with 600 thousand tonnes crops of the World hazelnut production. Total production area is 705 thousand hectares. An average of 60% of hazelnut production focused in the Eastern Blacksea Region, especially in the provinces of Ordu, Giresun and Trabzon. According to the hazelnut export reports constitute 12% of agricultural exports and 1.5% of general exports (TUİK, 2016).

Among the producer countries after Turkey, there are Italy, Azerbaijan, Georgia, USA and Spain. Italy is the second biggest producer country with 70 thousand

hectares of 120 thousand tons/year (FAO, 2016). In recent years, new hazelnut orchards have been set up in some countries such as Chile, Georgia, China and Romania. They show a more modern appearance in terms of cultural techniques and high yield.

The history of hazelnut culture dates back to very old years. The earliest known source told us about hazelnuts in the Uighur epics in 2838 BC. It was reported that hazelnut is one of the five holy fruits, God has best owed on people. The origin of hazelnut trees is Asia. Anatolia is also known as the homeland of the hazelnut and the place of cultural history. The hazelnut culture and varieties were taken from Anatolia to Greece and Italy, and in the following years (Özkurt, 1950). The Romans gave a spiritual value to the hazelnut trees. Evliya Çelebi, in his travelogue (1650), stated ''The province of Trabzon (from Giresun to Trabzon) was covered with hazelnuts and it was called as the peace tree'' (Peker, 1960). The cultivated hazelnut (*Corylus avellana* L.) is native to the Black Sea coast of northern Turkey. And it is one of the few countries in the world with a suitable climate for its production. Hazelnut is found as the main product (monoculture) along the coastline, between 0 m and 750 m altitude. The most important cultivar is Tombul. Traditional production techniques prevail and orchards are far from standardization (Bostan et al. 1997; İslam and Turan, 2013). The hazelnut is been cultivating in a big diversity of ecological situations and socioeconomic factors (Tous et all, 1994).

Hazelnut is grown in the northern regions of Turkey. The cultivation area is examined in two parts, as old and new. The old region includes the provinces of Ordu, Giresun, Trabzon, Rize and Artvin. It includes the region from Georgia border to Samsun. It covers 60% of the production area. This region is important in terms of quality. The use of conventional methods is common. The new region includes Samsun, Düzce, Sakarya, Zonguldak, Sinop and Kocaeli provinces. It covers the region from Samsun to Istanbul. Hazelnut orchards are newer and higher yield. 40% of the total hazelnut area is located in this region. In the last 30 years, the production area has increased rapidly in this region (İslam, 1997). Hazelnut production area according to provinces was showed in Figure 1, and changes in hazelnut production area and production quantity in Figure 2. The biggest production is in Ordu province with 213572 tonnes. The others (Samsun, Giresun, Sakarya, Düzce, Trabzon etc) are following it.

Hazelnuts are a rich source of numerous essential nutrients, in fat (64%), corbohydrate (16%) and protein (14%). Raw hazelnuts supply 2630 kilojoules (628 kcal) in a 100-gram reference amount. They are also an excellent source of heart-healthy monounsaturated fatty acids, vitamin E, magnesium, fiber, iron, potassium and vitamin B-6 and numerous other essential nutrients. Mineral compositions of the hazelnut include K, Mn, Mg, Ca, Fe, Zn, Na and Cu. The fat components are monounsaturated fat as oleic acid (75% of total), polyunsaturated fat mainly as linoleic acid (13% of total), and saturated fat, mainly as palmitic acid and stearic acid (together, 7% of total) (İslam, 2000; Koyuncu et al, 2005; Köksal et al, 2006; Oliveira et al, 2008).

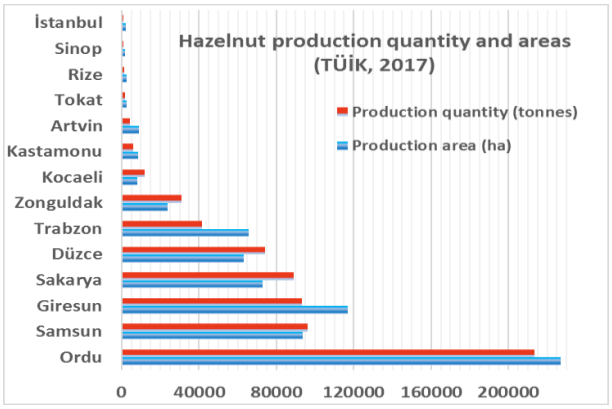

Figure 1. Hazelnut production quantity and area according to provinces in Turkey (TÜİK, 2017)

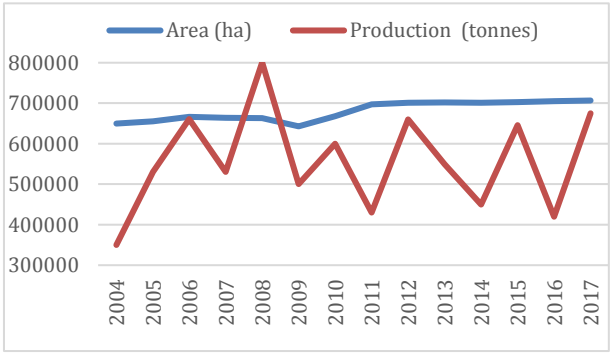

Figure 2. Changes in hazelnut area and production quantity in Turkey (TÜİK, 2017)

Hazelnut cultivars

Hazelnut production areas are mixed with cultivars (Bostan et al., 1997; İslam, 2000). There are 18 standard varieties of hazelnuts in Turkey. 15 of these varieties are old registered varieties. 3 varieties are new registered, which 1 is selected by selection and the other two were obtained by hybridization. The most important Turkish hazelnut variety is Tombul. Turkish hazelnut varieties are collected in 3 pomological groups (Ayfer et al, 1986). These groups and standard varieties are listed below. Round group:

Allahverdi, Cavcava, Çakıldak, Foşa, Giresun melezi, Kalınkara, Kan, Kara, Kargalak, Mincane, Okay 28, Palaz, Tombul, Uzunmusa,

Pointed group: Sivri, İncekara,

Long Group: Yuvarlak badem, Yassı badem

The Turkish hazelnut varieties are characterized by their high quality, including high kernel percentage, high fat content and high pellicle removal, if it is compared with the other varieties grown in the world (Thompson, 1982). This highest quality has at Tombul variety. Çakıldak, Foşa, Mincane, Palaz are other important cultivars used extensively in culture. Some important hazelnut varieties and their characteristics are presented below (Okay et all, 1986; İslam, 2000).

Tombul: It was reported that the cultivar is the most important hazelnut for quality and known in Turkey and World (Thompson, 1982; Ayfer et all, 1986; İslam, 2000). Thin-shelled, high fat content and almost full whitening rate (close to 100%) is noteworthy. it is cultivated in Giresun, Trabzon and Ordu. The nut is full and round in shape. The average size is 17-18 mm, the weight is 1.5-2.0 g and the shell thickness is about 1 mm. Kernel percentage is 52-54%. The oil content is 70%. Generally, the husk forms in 3-4 pieces and its length is 2.5 times longer than the nut (Okay et all, 1986; İslam, 2000).

Çakıldak: Widely grown in middle and high altitude of Ordu and wakes up later than the Tombul. Larger and lighter than Tombul. 1.8-2.2 mm in size, 2 g in weight (Okay et all, 1986).

Foşa: It is a large and glamorous variety mostly grown in Trabzon and Samsun provinces. It wakes up later than the Tombul. It has 18-20 mm in size and weighing as 1.8-2.0 g. The kernel percentage is 50%, fat content is 65% (Köksal, 2002).

Uzunmusa: It is the thinnest shell among Turkish hazelnut varieties. The shell thickness is 0.9 mm, the fruit size is 1.8 mm and it is round shape, the kernel fills full the shell. The kernel percentage is high, 56% and the oil ratio is 70%. Its husk is 1.5 times of the nut size and the number of nut per cluster is higher than the other varieties (İslam, 2003).

Yuvarlak badem and **Yassı badem:** These nuts are long (1.5-2 times the width of the fruit), pointed and thin-shell. It is suitable for fresh consumption.

In addition, Turkish hazelnut varieties are categorized in two different ways in terms of their commercial nut characteristics.

Giresun quality: This include Tombul cultivar, grown in the region between Piraziz and Çarşıbaşı are called Giresun quality. It has high fat ratio, thin shell and high pellicle removal.

Levant quality: All varieties grown in province includes. This is out of Giresun quality, mixed cultivars. For example, it is called Levant Ordu, grown in Ordu; Levant Samsun, Levant Sakarya, etc., and is lower quality than Giresun quality (Turan and İslam, 2018)

Orchard site and plantation

The factors affecting the choice of place in the hazelnut are many. The most important of these are the location and direction, soil and climate factors.

A suitable climate and reliable rainfall or irrigation are important for good tree growth and the production of high quality nuts. The preferred climate is characterised by a mild summer and cool winter. Exposed sites subject to the drying effects of summer wind should be avoided.

Hazelnut needs a temperate climate for good development and productivity. Temperatures below -8 °C and above +36 °C adversely affect cultivation. More than 700 mm annual rainfall is required for good production and distributed over all months and especially the rainfall in June and July. And supplementary irrigation is useful during the establishment stage.

The annual average humidity of 60% in the Black Sea Region, 800-1000 mm in the rain, and the temperature between 8-21 °C in the region has revealed the hazelnut climate. Therefore, it can be said that hazelnuts are in harmony with the region's climate. However, especially in June and July, there is a need for irrigation due to insufficient rainfall. Long periods of chilling are required to ensure fruitfulness and reliable hazelnut yields. Chilling requirements vary for male catkins, female flowers and leaf buds but about 1200 hours between 5°C and 7°C is suitable.

Hazelnuts do not tolerate windy conditions combined with high summer temperatures and low humidity. Hazelnuts require a well-drained soil about 1 m deep. The tree has a mainly fibrous root system, but deeper soils allow for greater exploitation of soil resources and heavier production in the mature orchard. In areas of shallow soils, trees have initially grown but then declined. Heavy clays and very sandy soils should be avoided and a deep loam is preferred and also high organic matter. Fertile soils are considered essential for profitable commercial production. A

neutral to slightly acid soil (pH of about 6) is suitable. Lime should be applied below pH 5.5.

In sloping land, terrace is recommended to perform cultural operations, ease of mechanization, prevention of soil erosion, keeping water in the soil and increasing the usefulness of fertilizer. Pocket terraces, narrow terraces and large terraces can be built. The terrace application in the region is not common. In recent years, the awareness on this issue is increasing.

Hazelnut planting spacings is an efficient ways of increasing yields and making better use of land area. The vigour of variety, the soil type, climate and the width of implements available for use in the orchard should take into account for tree planting distances. Close plantings may be thinned at maturity but the higher return in the first 10 years may be crucial to the economic survival of a new planting. Planting at 6m between rows and 3m between trees is also an option for one rooted system.

The natural form of hazelnut is a deciduous, monoecious, multi-stemmed bush (called "ocak") in commercial orchards. Hazelnut is planted in "Ocak" system. The ocak system is a multi-rooted planting system, specific to Turkey (İslam et al., 2004). Generally, the ocak are installed at intervals of 4-6 m. In order to create a ocak in the orchard, 4 plants are planted on 1 m diameter circle edges. After starting the grow, 6-8 plants are left on the ocak circle. In old planted gardens, the distance between the rows is less than normal and there are 3-5 plants on each ocak. It is also possible to see more than 8 plants in the ocak. Every plant in the ocak is renewed in 10-15 years. In the recent years, hazelnut is planted in row as single plant. These orchards is common in flat areas such as Samsun.

Reproduction system of hazelnuts

There are traditional methods in hazelnut culture in Turkey. Hazelnut species have a tendency to genetically suckers. Sucker is the bottom shoot of hazelnut plant, sapling using cultivation. Use sucker (rooted plant) is easy vegetative reproduction method. The conventional reproduction is made by own-rooted suckers. It is used as a seedling, taken from the hazelnut orchards, with abundant rooted stools. The number of hazelnut nursery company is low.

The disadvantage of the traditional replication technique (with suckers) are the difficulty of collecting sucker from the ocak, insufficient root status of suckers, different diameter and length, non-testing disease and pest. But, it is preferred by the producers to obtain the seedlings because of the lower of labor or costs.

In Turkey, the correct name and producing healthy seedlings (certified seedlings) has not been studied in enough. Micro-replication methods are a faster replication method as an alternative to traditional replication. Single-bodied, non-suckered breeding, rootstock and grafting are important in hazelnuts. There are rootstock, grafting in modern cultivation. It is preferred replicated tissue culture in mass production. The plants being unique-one are marketed as certified. As a result, it is important to switch to the production of certified seedlings in hazelnut seedlings as all fruit species.

Figure 3. The appearance of ocak system in hazelnut

Orchard management

Pruning

Compared to other deciduous fruit trees, hazelnuts require a minimal amount of pruning but sucker control can be time-consuming. Pruning in the next 2–5 years is used to produce a modified leader tree with 3–5 main branches. Pruning in the following years is not required until vigour declines. With mature trees insufficient pruning can reduce shoot vigour and diminish cropping potential. Excessive shading will reduce flower bud formation, fruit set, yield and nut size (Me et al, 2004).

Pruning in hazelnuts generally consists of extracting plant and suckers cleaning in Turkey. Also, in the other country, pruning hazelnut trees is a common practice. In fact, most hazelnut farmers are used to remove of old branches and suckers. The suckers is usually cut by hand or used chemical control. One or two times per year are taken it.

Hazelnut pruning operations are made in different times such as planting pruning, shape pruning, yield

pruning; winter and summer pruning two times per year (Roversi et all, 2009).

Planting pruning: The most powerful stools after planting are left and others are cut. Thus, this stool constitutes the main plant.

Shape pruning: The main body and side branches are formed later from planting year for long-term efficiency and ease of cultural transactions. In our country, hazelnut orchard have been formed with a multiple rooted ocak system. In this case, the plants look like a high shrub. Due to the need for intensive labor, some producers do not care about the shape pruning.

In the new gardens established in recent years, the planting system has shifted to the fence system. The new plants are cut off from the soil level, and the strong growing plants are maintained. Some producers prune on these plants in later years. A vertical axis or vase system can be created for the form.

Yield pruning: Yield pruning is done as winter and summer pruning. The large workforce belongs to the winter pruning. sucker cutting can be mentioned as a summer pruning.

Winter pruning: winter pruning is made between about 1 mount later from harvesting and the begining of vegetation period. The winter pruning is initiated as on November-December in Turkey. During this period, the plant began to rest and the active growing period was over. In the winter pruning, the ones which have aging, drying, weakened plants are cut off from the bottom by a saw considering each plant in the ocak. Then the suckers are cleaned. The substitute plant should be made during this period if the plant is left. Also if there is undersized development on the plant, weakness of the branch and nudity, they are deeply pruned. It is tried to create a strong new stool on the plant. If you have severe winter period, pruning can be shifted to early spring.

Summer pruning: It is done in the spring-summer period. It is also called green pruning. Small cuts are made to complete the lack of winter pruning. The most intense process in this period is the struggle with suckers. They are not given the opportunity to grow. 2 or 3 times per year are made to fight with suckers.

Rejuvenation pruning: The plant weakened due to the yield load or older one were cut off and rereplaced substitute sucker. In this case, the new plant will develop on the root system of the extracted plant in the first years.

Irrigation

Hazelnut is traditionally grown especially in the eastern Black Sea region based on precipitation due to the favorable climatic conditions in Turkey. Hazelnut plants, depending on the evapotranspiration, approximately required 800-100 mm annual rainfall (Okay et all, 1986; Tous and Rovira, 2004). However, due to changes in various climate parameters and global climate change in recent years, ''irrigation'' or ''support irrigation'' has become mandatory in hazelnuts. Hazelnut orchards in the south-facing slopes are often exposed to drought with low water-holding capacity, low soil depth, and yield and quality components are adversely affected (Tonkaz et al., 2017).

Hazelnut plants have root hairs and lateral root structure and effective root depth is around 60 cm. Soils in East Blacksea region are shallow, slopy and some of these have low water holding capacity. This soil does not be able to benefit from the rainfall enough. Therefore, rainfall-based culture is easily unaffected by the irregularities of the rainfall regime. Watering must be done before reaching the wilting point.

Fertilization

Good nutrition for hazelnut plant is important for both stool development and nut set and growth. The basic nutrients N, P, K, but the other elements of the soil must be at a sufficient level. Nitrogen is a nutrient that should be added to the soil every year. In case of insufficient nitrogen fertilizer applications, the development of branches and stools weakens. As a result of the stool development formed short and thin, nut development and yield decreases.

Base fertilization is recommended in November-February. These fertilizers are mixed to a depth of 10-15 cm of soil. As a result of soil analysis, half of the nitrogen proposed by the expert or official institutions is applied in the last week of March (with the formation of leaves) and the other half in the last week of May (Özenc and Caliskan, 2000; Tous at all, 2005; Özkutlu et all, 2016)

There are some deficiencies in terms of nutrients such as phosphorus (P), potassium (K), magnesium (Mg), boron (B) and zinc (Zn) elements. The deficiency of these elements causes a decrease in bud formation, shoot development and the hazelnut yield (Özkutlu et all, 2016). A commercial soil test should be used to identify any deficiencies if they are suspected. For established orchards, leaf tissue analysis is also made standard.

Diseases and pests

There are some hazelnut pests that cause significant damage in Turkey (Anonim, 2011).

Hazelnut weevil, *Balaninus nucum* (*Curculio nucum*): it damages in almost all regions. The mature insects are 6-7 mm long and have a thin long hose. The larvae are white and without legs and their head is brown. Pupae is in the form of free pupae. The matures are active and have a temperature above 16 ^{o}C depending on the climate. A female lays an average of 42 eggs. It leaves eggs in a nest below the fruit crust. Larvae feeds on the inside of the nuts. It leaves nutritional waste in the shell. After completing its development, larvae drill a hole of 1.5-2.0 mm into the soil. They stay mature for 1-3 years. Its mature life is 3 months.

Hazelnut weevil does damage by feeding and laying eggs. Feeding the beetle with a soft flesh inside the shell causes the fleshy part to become yellow. Then this color appears on the shell. Since the fruit cannot be fed, collapses appear in the shell and this is called ''yellow karamuk. If the fruit is damaged when it reaches normal size, the fruit becomes dark. The leaked liquid contaminates the husk and shell. This is called ''black karamuk. It can damage 80 fruits by feeding.

Ambrosia beetle, *Xyleborus dispar* is a common pest in the Black Sea region. It is seen more in maintenance-free gardens. Females are 3-3.5 mm in length and males are 2 mm in length. Larvae and pupae are dirty white colored 4-5 mm in length. *Xyleborus dispar* spends the winter in the galleries that they open. When the temperature reaches 18-20 ^{o}C, it starts to open new galleries in healthy branches.

A female lays an average of 50 eggs. It spends the winter in galleries. It enters by opening 2 mm of holes on the branch. Since the entrance hole cannot be closed to the branch, it constantly infiltrates the plant water and leaves a dark black color on the body. The damaged branch dries soon.

Other important pests and diseases that damage the hazelnuts in Turkey are listed below.

- May beetle: *Melolontha melolontha*
- Hazelnut sprout moth: *Gypsonoma dealbana*
- Green Skunk: *Palemona prasina*
- American White Butterfly: *Hyphantria cunea*
- Hazelnut races: *Parthenolecanium corni, P. rufulum*
- Leaf pigeon: *Anoplus roboris*
- Hazelnut cones (Hazel Big-bud Gall-mite*)*: *Phytopus avellanae*
- Bacterial hazelnut blight: *Xathomanas coryline*
- Powdery mildew: *Erysiphe corylacearum, Phyllactinia guttata*
- *Obera linearis*
- *Mikomyia coryli*
- *Lepidosaphe sulmi*
- *Nectria galligena*
- *Ro*ot rot: *Armillaria* sp, *Rosellinia* sp
- *Apple mosaic ilarvirus, ApMV*

Weed control

Weed management in hazelnut is a major production challenge. The relatively high rainfall and fertile soils of hazelnut orchards in the Black Sea region favour establishment of a wide range of annual and perennial weed species. Weed management is necessary to eliminate competition, conserve nutrients for the trees, and improve hand harvesting efficiency (Mennan et all, 2006).

Many single and perennial weeds, narrow and broad-leaved weeds are damaged in hazelnut orchards. The common weeds in hazelnut orchards are fern, nettle, wild blackberries, wild wormwood and 33 different species. In addition, some woody species such as wild rose and many different fruit trees are found in the orchards.

The number and density of the weed is increasing due to the wet and humid climate and the use of fresh manure. Rapidly growing weeds have a competition to water and nutrients in hazelnut plants. Especially perennial, semi-woody plants compete stronger. On the other hand, weeds that develop in hazelnut orchards are host to diseases. Harvest and other cultural progress are difficult due to lots of weeds. Therefore, regular weed cleaning is recommended.

It is well known that fresh animal manure should not be used in hazelnut orchards. In this case, germination of weed seeds is possible. Therefore, it is recommended to use burnt animal manure.

Weed control in hazelnut is normally achieved with two glyphosate applications in the spring, and hand cutting. The common method used in the fight against weeds is the mechanical struggle.

Wire motor for weeds have been used for this purpose in recent years. herbicides are also partly used. In addition, harrow is also effective.

Harvest and postharvest

The harvest time in Turkey is in August, generally. It may vary due to varieties and ecology. Harvest is usually picked up by hand in the old region. But it is generally harvested mechanically in new region. It can be harvested from the ground or branch. In recent years, harvest has become mechanically widespread on the ground in flat areas. A mechanized harvester depends on the area under the trees being free from weeds, reasonably level firm.

Hazelnut is collected with husk and poured into the blend. And then the nut is given the haymaker to separate from the husk. Separated nuts are laid in the blend to be dried. Usually, grass or concrete blend is used. In recent years, drying machines have been used. Nuts are dried the humidity drops until 7% (Turan and İslam, 2018). Dried fruits are stored in jute sacks that can take air. Storage is done in jute bags or as bulk.

Hazelnuts dried an average of 7% moisture level are stored in open or jute bags. Kernel separated from inshells for industrial use is processed in a short time. It is not kept as a kernel hazelnut.

The main use of hazelnuts is for industry. Natural use is not common. The major markets are for round kernels of 11–13 mm. Kernels for confectionery should be plump, free from shriveled or mould kernels.

Long-shaped hazelnuts 'Yuvarlak Badem' and 'Yassı badem' cultivars are not dried and they are freshly consumed. Besides the widespread use of dried fruits (whitened, roasted), it is mainly used processed foods in oil industry, in chocolate, confectionery, pastry, dessert, cakes, etc. And kernels can be eaten also raw.

Conclusion

Hazelnut has been grown in Turkey for many years and it is intertwined with the social, economic and cultural values of the people of the region. Hazelnut income is the wedding money, debt closure. Hazelnut harvest is a holiday time, entertainment, festivity. Hazelnut harvest and other operations are planned according to the work. It is always the main product for the Blacksea region. It is the only one agricultural product for many producers. The hazelnut has been cultivating in socioeconomic factors as monoculture. It has been the subject of folk songs and literature. Wedding and similar affairs are made with hazelnut income. The underside of hazelnut plants is like a cooling place. The smooth trunk is a walking stick for the elderly people. The young sprout is a collection container (basket), knitted as a loop.

The average of Turkey's hazelnut production is 600 thousand tons for recent years. The next target is 1 million tons of production (shelled hazelnuts). There may be an increase in production areas. However, the main thing is to increase efficiency in unit area. Some hazelnut producing regions are prone to traditional production. These regions should be supported by systems such as natural agriculture or organic agriculture (Turan et al, 2010).

The majority of hazelnut production (85%) is export. Domestic consumption is about to 15% of production. The value of hazelnut is not reflected in domestic consumption enough. However, domestic consumption has started to increase in recent years. The next target for domestic consumption is considered as 30% of production. Processed hazelnuts should reach 200 thousand tons at least.

In new and newly established areas, modern techniques should be applied fully and consciously, single-rooted planting systems should be considered. Thus, yield and quality will be increased. On the other hand, one of the biggest handicaps in production is labor costs. The way to reduce labor costs is towards mechanization.

Producer unions and cooperatives are another issues. That are very important for producer organization. It has benefits in terms of ensuring unity in production, solving problems easily, and supporting price stability and improving producer income.

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