IJSES *Uluslararası Sosyal ve Ekonomik Bilimler Dergisi*
International Journal of Social and Economic Sciences
E-ISSN: 2146-0078, 7 (1): 64-69, 2017

Economic Structure and the Problems of Thyme Producer Farms in Denizli

Osman ASLAN Mevlüt GÜL*
Department of Agricultural Economics, Faculty of Agriculture, Suleyman Demirel University, Isparta, TURKEY

*Corresponding Author:
E-mail:mevlutgul@sdu.edu.tr

Received: March 04, 2017
Accepted: May 30, 2017

Abstract

The aim of this study was to determine the marketing structure and problems of thyme producer farms in Denizli province, and to suggest some solutions for their problems. The SWOT (strengths, weaknesses, opportunities, and threats) analysis was performed in order to improve efforts and projects. Denizli province was chosen as our study area that produces 89.2% of total thyme in Turkey and has 93.6% of total planted lands. As a result of interviews with 100 thyme producer farms, it was determined that the average age in thyme producer was 48.01 years, their agricultural production experience was 28.1 years and their experience in thyme production was 8.79 years. The average land size of interviewed farms was 5.04 hectare. Of these lands, thyme production was executed on 2.44 ha which was 48.48% of the average land size of those farms consist of thyme-planted lands. The main problems in thyme production in the region were mainly insufficient technical information, problems in harvesting, and the fluctuations in thyme prices.

Keywords: Thyme, marketing, SWOT, Denizli, Turkey

INTRODUCTION

Historical Background

Turkey is one of the gene centers of many plant species[1]. However the performed uncontrolled and unconscious harvesting operations have led to medicinal and aromatic plants to decrease and be annihilated [2, 3]. Thymus (thyme, Lamiaceae) is a very big genus, to which more than 300 evergreen species belong. They are well-known aromatic and medical plants and their different species' oils are used against various diseases [4].

The genus origanumis represented in Turkey by 22 species and 21 of them are endemic to this country. Herbal parts of organum species is known as "kekik" (Thyme) in Turkey[5, 6].

Although the thyme was widely used as spice, it is also used in pharmacology and perfumery industries because it contains essential oils such as thymol and cavracrol. Additionally the thyme is one of raw materials of tooth paste, medicine, perfume, soap and sugar industries [7].

The world thyme production was 14000 ton in 2008 and most of which is produced by Mediterranean countries and Mexico. Turkey has the highest share of exporting (approximately 50% of world trade). Turkey exported thyme about 9.7 thousand tons and has provided $43 million revenue in 2008. Furthermore, thyme oil export revenues were approximately $1.6 million [8]. In 2010, this number was $1.2 million. Turkey's major export markets are USA, Canada, France, Hungary and Poland [9]. The size of thyme-planted lands in Turkey is 12112.7 ha as of the year of 2016. The province of Denizli with its 11115.2 ha of planted lands takes first place with share of 91.76%. The thyme production in Turkey in 2016 was 14724 ton. Denizli province with its 12624 ton of production takes first place with the share of 85.74%. Other important provinces of Turkey are Manisa, Kütahya, Uşak, Hatay, Aydın and Muğla (Table 1).

Table 1. Thyme Production and Planted Areas in Turkey (2016)

Cities	Harvested area (ha)	Share (%)	Production (ton)	Share (%)
Denizli	***11115,2***	***91,76***	***12624***	***85,74***
Manisa	232,0	1,92	828	5,62
Kütahya	202,9	1,68	475	3,23
Uşak	202,6	1,67	262	1,78
Hatay	163,7	1,35	187	1,27
Others	196,3	1,62	348	2,36
Turkey	12112,7	100,00	14724	100,00

Source: TÜİK [10]

The thyme production and the changes were given in Table 2 between 2004-2016 periods in Turkey. While the thyme production was 7000 ton in 2004, it increased by 110% to 14724 ton in 2016. It decreased in year 2007 by 23.6% and in year 2005 by 8.6%. All of other years in investigated period, the production was increased.

Table 2. The Thyme Production in Turkey (2004-2016)

Years	Production (ton)	Index (2004=100)
2004	7000	100
2005	6400	91
2010	11190	160
2013	13658	195
2014	11752	168
2015	12992	186
2016	14724	210

Source: TÜİK [10]

The highest amounts of thyme production in Denizli belong to Pamukkale and Güney districts. The thyme-planted land in Güney district was 3289 ha, and the amount of production was 3947 ton, while the thyme-planted area was 4872 ha in Pamukkale district and the amount of production was 4872 ton (Table 3).

Table 3. The distribution of thyme production and planted areas among Denizli's districts

Harvested Area (hectare)					
Districts	2005	2010	2016	Index (2004=100)	Share (%)
Pamukkale	2569	3320	4872	190	43,8
Güney	150	1800	3289	2193	29,6
Other	1465	2718,5	2954	202	26,6
Denizli	4184	7838,5	11115,2	266	100,0
Production (ton)					
Pamukkale	2864	4645	4872	170	38,6
Güney	150	1800	3947	2631	31,3
Other	1677	2864	3805	227	30,1
Denizli	4691	9309	12624	269	100,0
Yields (kg per hectare)					
Pamukkale	1115	1399	1000	90	
Güney	1000	1000	1200	120	
Other	1145	1054	1288	113	
Denizli	1121	1188	1136	101	

Source: TÜİK [10]

Thyme is a special plant for Turkey and many studies have been carried out to identify medical or technical aspect of thyme, and they were not sufficient from the economic point of view. For example, Uyanık Gungor et al. [11] carried out a study in the years of 1999 and 2000 to compare 8 improved lines of İzmir oregano (Origanum onites L.) for agronomic and quality aspects. Their study showed that İzmir oregano can be successfully cultivated with regard to yield and quality in Kula ecological conditions [11]. Sarıhan et al. [12] carried out a study in the experimental fields of the Ankara University in 2002, 2003 and 2004. They used Oregano (Origanum vulgare var. hirtum) as a material in the study. They determined that row spacing and in-row spacing for Origanum vulgare var. hirtum were as 30-50 cm for row spacing and 30 cm for in-row spacing [12]. Özkum [13] in her study investigated the micropropagation of Sideritis stricta Boiss. & Heldr. and Origanum minutiflorum .Schwarz & P.H. Davis. Uzun [14] in his study observed 4 basil accessions which were cultivated in different locations of Turkey and 9 thyme accessions which were collected from Black Sea Region to identify some phenological observations. Fakılı [15] aimed to research the literature about the plants called Thyme (Thymus, Origanum, Satureja, Thymbra, Coridothymus) in Turkey form past to the present. Bahtiyarca Bağdat [7] conducted a study to determine the yield and quality parameters of the different thyme species during the years of 2009 and 2010 in Ankara. He found that Carva species had the highest content of carvacrol with 79.03% and 70.39%. The proportions of geraniol were detected as 37.78% and 70.39% in the main components of T. citriodorus [7]. Hancıoğlu [16] conducted a pot experiment of oregano (Origanum onites L.) in a greenhouse and tried to identify the effects of irrigation water quality and irrigation regime on plants characteristics and other parameters. For this case, plants in the first experiment were irrigated with waters, which have different quality of salinity, while plants in the second experiment were irrigated with same quality waters but different quantity (irrigation level). During the experiment, water quality and water deficit effects on plants were monitored and at the end of the experiment, plants were analysed in regard to yield and quality including essential oil, total phenolic and flavonoid content, extract yield and antioxidant activity. According to study result, she found that the amount of irrigation water applied to oregano plants caused a reduction in yield, but it was observed that there was not a significant difference in plants' quality parameters. When irrigation water salinity increases, in contrast of a reduction in yield parameters, it was confirmed that there is an increase in some quality parameters such as extract yield, total phenolic and flavonoid content and antioxidant activity at a certain level, but above this level a decrease has occurred in this parameters[16]. Only two studies in recent years are related to economic value of thyme farming. Özdemir [17] in his study determined thyme inventory, marketing structure and problems in İzmir, Manisa and Muğla provinces. He conducted surveys with thyme collectors via purpose sampling methods. According to the research, it was observed that the people collecting thyme from nature and the cultural producer could not be effective in price establishment because of their insufficiency organization. Among the provinces within the scope of study, the only cooperative performing thyme processing and exportation was in Muğla. He observed that 32.62% of thyme exported and handler farms have profit mark-up varying depending on thyme type and quality, the shares of collectors and middlemen from sales price of high-quality thyme were 28.48% and 8.59%, respectively. In the same study, it was observed that the competition in production-processing and export and the insufficient knowledge lead to quality and gene losses in thyme and erosion in soil [17]. Another study was conducted in Isparta region by Gul et al. [18]. They tried to quantify the production inputs, costs and profitability of thyme farms [18].

In this study, the general structure of thyme producer farms in Pamukkale and Güney district of Denizli, their perspective on thyme production and their actual production capacities, and their marketing conditions were determined, and the opportunities for the future of this industry were evaluated. This study aimed to determine the technical and economic conditions of thyme production at farm level and their problems and to improve the production also aims to close the gap in literature to some extent. Therefore, determination of the economic structure and the problems of thyme producer farms in Turkey from production to marketing, evaluation of strengths and weaknesses of the thyme production and the opportunities and threats was realised by the execution of SWOT analysis.

MATERIALS and METHODS

Material

The material of this study consists of data obtained from thyme farmers (100), traders (5), handlers (2) and technical staff (3) in Denizli's Güney and Central districts because those districts were of great importance in thyme production. The data were collected via questionnaire and face-to-face interviews. Eymir, Haytabey, Gözler, Uzunpınar, Güzelpınar, Kurtluca, Akdere, Aydoğdu, Eziler, and Doğanlı villages in Central and Güney districts were chosen as the research area for interviews. The data contain the 2011 production season.

Method

The data obtained from thyme producers in study area through questionnaire were transferred into computer, and interpreted by tables. According to study objectives; the general structure of thyme-producer farms, technical and economic assessments from production to marketing, strengths and weaknesses of region's thyme production and the threats and opportunities were extensively evaluated by SWOT analysis.

SWOT analysis was one of the methods used for investigating the internal situation and the external factors surrounding an institution, organization, public institution or private sector company. In other words, SWOT analysis means the analysis of environmental factors [19][20][21], research on opportunities, understanding the threats, determining the strengths and weaknesses.

RESULTS and DISCUSSION

Thyme producers' average age was calculated as 48.01 years, and the average experience in agricultural production was 28.1 years, and the average experience in thyme production was 8.79 years (Table 4).

Differences among investigated farms were found in terms of age of farmers with agricultural land parcel, total land, legal form, non-irrigated land. The farmers which have older (over 40 years old) had less number of parcel units, less total agricultural land and less rented land. When farmer's age increases, share of thyme in total gross production value (GPV) was increased as well. This result were found statistically significant ($P<0.08$).

The 81% of the producers graduated from elementary school, 5% graduated from secondary school, 10% graduated from high school, and 4% graduated from vocational school.

Differences were found farmers' education levels with row of thyme planting distance. As farmers' education level increased above the elementary level, the row of thyme planting distance was increased. Only this indicator was statistically significant ($P <0.01$).

In 60% of investigated farms, animal breeding activities were also carried out besides planting activities. The cattle breeding activity was in the lead among farms performing animal husbandry.

In the interviewed enterprises, differences were found in terms of livestock activities with share of thyme in total GPV, total agricultural land, land parcel, family size, property land and rented land. Land parcels, the total agricultural land, own land, lease land, family size were increased among farms performing animal breeding. These indicators were statistically significant ($P <0.05$).

It was determined in research area that there was no educative effort about thyme production (98%). Only two farmers stated that they participated in training of processing factory. In the study area, records were not kept in 87% of farms, and 13% stated that they keep records irregularly in order to find the loss/profit situation and cost-revenue balance.

It was revealed that 15% of farms obtained non-farm income. The leading revenue source was to work as employee in other farms.

Non-farm income statuses with relationships between various indicators were concerned, in the farms with non-farm statue, the share of thyme in total GPV was found to be decreased. However, family size, cost, yield and GPV that obtained from livestock were increased. These findings were statistically significant ($P <0.08$).

It was determined that non-agricultural revenue was obtained in 35% of interviewed farms. The leading non-agricultural source was engaged in activities such as employee in other sectors. Besides, other income sources were occupations such as grocery, driver, iron work, and plumber.

It was fond that the costs of the thyme increased in the farms with non-agricultural revenue. In contrast, the land parcel, total agricultural land, rented lands were decreased. These parameters were statistically significant ($P <0.09$).

It was determined that 19% of farmers have computer. It was found that 17% of farms have also internet.

While 22% of interviewed farmers regularly read newspapers, 78% do not read. About 85% of farm owners have social security, but 15% do not have any social security.

According to surveys, only 4% of lands in research region can be irrigated and the irrigation opportunities are very low. Hence, producers produce thyme in infertile and limy soils. The average agriculture land was found as 5.04 hectare, and 48.48% of farm lands allocate the thyme farming area which is calculated 2.44 hectare. Other important products grown in the region are wheat (0.85 ha) and barley (0.7 ha) (Table 5)

Table 4. Average ages and experience durations of thyme producers

Age (year)	Experience (year)	Thyme production period in enterprises(year)
48.01	28.1	8.79

Table 5. The average land size of grown products

Crops	Average (ha)
Thyme	2.44
Wheat	0.85
Barley	0.70
Aniseed	0.24
Grape	0.21
Pea	0.14
Apple	0.13
Tobacco	0.12
Other	0.20
Total	5.04

Although the suitable area for farming is limited, the importance of land possession and utilization gradually increases. For determining the scale of farms in study, the land

area was taken as base. The land of farms consists of the sum of farms' own land, rented land, and sharecropping land. The land possession of farmers and their usage styles were investigated. While the average land area of farms was found to be 5.04 ha, it was determined that 74% of this area was own land, 24% was rented land, and 2% was sharecropping land.

In the interviewed farms with thyme cultivated area greater than 2 ha, the yield per unit area and the cost was reduced. However, land parcels, total agricultural land, own land, lease land, thyme experience, workforce utilization and share of thyme in the total GPV were increased. These findings were also statistically significant (P <0.05).

The average number of family size among interviewed farms was 4.26 persons, and it was determined that 54% of family size was female while 46% was male. It was found that 7% of the family population was 0-6 year-old, 23% was 7-14 year-old, 22% was 15-30 year-old, 18% was 31-40 year-old, 21% was 41-50 year-old, and 9% was older than 51 year-old.

As farmers' family size was increased the share of thyme in the total GPV were declined. However, the total agricultural land, own land and the total GPV were increased. These indicators were statistically significant (P <0.05).

The average GPV was determined as €1532.47 per hectare among farms, of which 42% was tantamount to thyme, 30% was amounted to animal husbandry, 17% was for field crops, while 10% and 1% were accounted for fruit and vegetable production respectively (Figure 1).

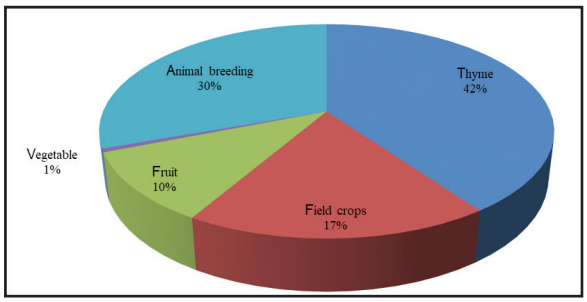

Figure 1. GPV of farms

The thyme is produced in non-irrigated, infertile, and limy soils. It was determined that thyme reached to economic productivity 2-3 years after establishment of plantations. The economic life of thyme plantations in the region was determined to be 10 years.

The average thyme plantation densities among the farms were found to be 32.9 cm between lines and 19.9 cm within lines.

The amount of harvested thyme in Denizli province was 1187.6 kg per hectare according to the data of TUIK (Turkish Statistics Institution). But the thyme productivity in farms in study region was 1500.3 kg/ha.

In thyme production, main operations are soil preparation, fertilization, weed control and separation-drying. 11% of the farms hire machinery power. It was determined that the average machinery power usage among the farms was 13.2 h/ha. 11% of equipment is hired by the farms in the study area. In general, the producers use their own equipment.

Farmers who use more labour, the cost were also increased. In the farms which use more labour, cultivated thyme area, thyme production, experience in thyme, the share of thyme in total GPV were decreased. These findings were also statistically significant (P <0.05).

The number of weed control varied among producers between 1 and 2 times a year in March-April. Thyme are harvested with a harvester hook in July. The separation-drying process was executed in July or August depending on harvesting duration. The harvested thyme is taken to threshing floor, and separated from stems by being crushed. Then they are dried under sunlight.

The soil preparation is realized between the months November and March and farmers generally utilize equipment's such as plough, disc harrow and sweep.

It was determined that 8% of thyme producers use pesticide. In general, pesticides are not used in thyme production.

It was observed that farmers do not irrigate their thyme lands. According to the data obtained, 17% of interviewed farms use manure besides the chemical fertilizer. Those farms procure the manure from their own animals. 20% of thyme producers also cultivate other medical and aromatic plant.

The average labour force duration among the thyme production in the region was 777.14 hours and 46% of the total labour duration was used in weed control, 42% in harvesting, 5% was used in fertilization, 3% used in separation, 2% was used in carrying, and 2% for soil preparation (Figure 2). There were differences between cost and duration percentages because of operation wages. On the average fertilization labour was the most expensive operation followed by weeding, separation-drying, carrying, soil processing operation and the harvesting operation according to interviews.

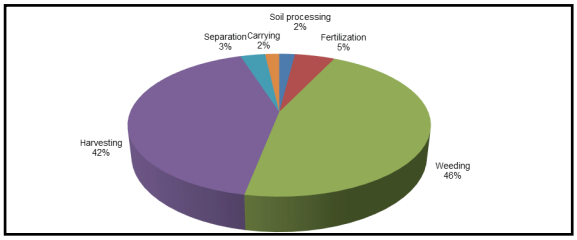

Figure 2. The distribution of labour in thyme farming

It was determined that the main fertilizers used in thyme farming were Ammonium Nitrate (%26), 20:20:0 composed, urea, and Di-Ammonium phosphate (18-46). The average chemical fertilizer usage was 282 kg per hectare of thyme plantation land. In general thyme farmers spread fertilizer on their fields once in March to replace the nutrient loss.

As fertilizer use by farmers was increased, the cost of production and thyme row planting distance was increased. The amount of own land and labour utilization were decreased. These indicators were statistically significant (P <0.05).

As a result of researches in the region, it was determined that, the main reason for preferring the thyme farming was its low costs (40% of farms). The other reasons stated by farms were the high quality (9%), the quote applied on tobacco (9%), higher profit rate than other products (9%), absence of alternatives (8%), suitableness of the climate (8%), easiness of workmanship (7%), providing additional income (6%), that thyme was a perennial plant (2%), and its high productivity (2%) (Figure 3).

Although the region is strong in terms of production, there is also a lack of cooperatives. Because the producers were small-scaled ones, they stated that they do not have any chance to negotiate with tradesman and it was their most pressing problem. For this reason, they have to sell their

products with the price given by tradesman.

Although the topography and climate conditions are suitable for thyme farming, there may be productivity losses up to 35% due to weather conditions changes. In some locations, the rough land conditions may lead to problems for machinery power usage. There is also lack of technical knowledge among producers.

SWOT analysis is used to evaluate the Strengths, Weakness, Opportunities and Threats involved in a project, or any other situation requiring a decision. Strengths are helpful to the achievement of the objective, but Weaknesses are harmful to the achievement of the objective. Both of them are internal attributes of the organisation. Opportunities are helpful to the achievement of the objective, but Threats are harmful to the achievement of the objective. And both of them are external conditions of the organisation. [22]. In this study, the starting point of the SWOT analysis was the opinions of shareholders in thyme production. Within this scope, in parallel with information obtained from producers, middlemen, tradesmen, technical staffs and handlers, it was obtained that the strengths, weaknesses, opportunities, and threats of thyme production.

It was emphasised that the strengths of centre of thyme production such as ecologically suitableness, low production costs, very low level of pests and diseases, the always-ready market, and high quality.

The farmers stated that the weaknesses of the region as unconscious fertilizer usage, low plant concentration per hectare, unconscious pesticide, unconsciousness in separation-drying operation, and insufficient threshing. From this point, it is very important for production of high-quality thyme and to increase the production amount to provide technical education for producers in region.

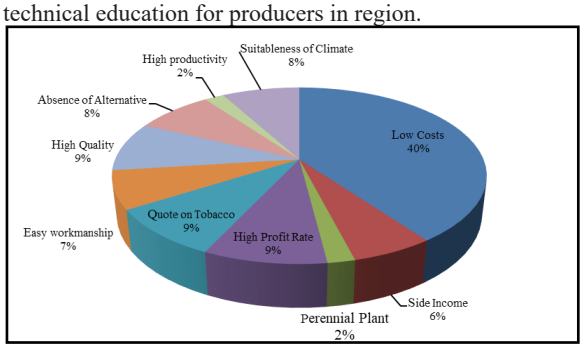

Figure 3. The reasons for preferring the thyme farming

It was pointed out that the opportunities in the region can be as follows: better organization of thyme sector, increasing the number of processing facilities, and more utilization of combine-harvester in harvesting. It was determined that the producer organization was insufficient in the region. The improvement of organization may bring advantages in terms of input, product prices and the market conditions. There is increasing consumer demand for thyme and thyme oil especially in European markets. Turkey can fulfil this demand and this is an important opportunity for farmers to become supreme in world market.

It was stated that the threats in thyme sector were primarily climate change, the monopolization risk in market and the price uncertainty (Figure 4).

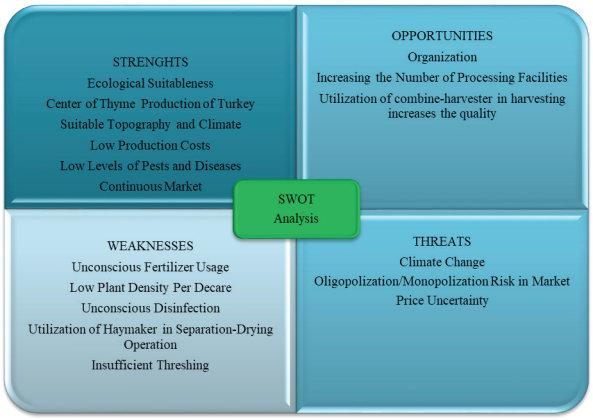

Figure 4. SWOT analysis results of thyme industry

CONCLUSION

In this study, it was aimed to determine the socio-economic situations of thyme producer farms in Denizli, and the problems they face from thyme production to marketing phase. Also the SWOT analysis was performed in order to determine the strengths and weaknesses for thyme sector.

Because 90% of thyme production of Turkey is in Denizli, this region is chosen as the study area. Within this frame, the interviews were carried out with thyme producers, middlemen, extensions and handlers in region. According to the data obtained, the thyme is a very important product in thyme-producer farms. The most important cost component in thyme farming is the labour costs.

The main problems experienced in thyme production in the region were determined to be insufficiency in technical know-how, the problems in harvesting, and the price inconsistency. Starting from those problems, additional efforts should be carried out for improving the sector. By raising the consciousness about having strong organization at the producer level, the producers can have more voice in market. By improving the production techniques in thyme production, the quality can be improved.

The production of thyme was an alternative product for Turkey's exportation and for increasing the income of producers in the research area. From this aspect, the production of thyme has great importance for improving the individual income in rural area of the region, consequently for the rural development.

In the worldwide, demand for herbal medicine and aromatic plants have been increasing substantially. Therefore, due to high potential of production possibility of herbal and aromatic plant production, Turkey can hold an upper hand in the world medical and aromatic plant demand market such as thyme, lavender and oil rose by good strategic plans and goals. Decision makers should carefully analyse world demand and guide farmers about the market request in thyme and thyme products.

ACKNOWLEDGMENT

We would like to thank to TÜBİTAK (2209-A) for their financial support.

REFERENCES

[1] F. Faydalıoğlu and M.S. Sürücüoğlu, History of the Use of Medical and Aromatic Plants and their Economic Importance (in Turkish). Kastamonu Univ., Journal of Forestry Faculty, 11 1 (2011), pp. 52 – 67.

[2] N. Özhatay and S. Atay, "Kekik" in trade in Turkey. Proceedings of the XI. World Forestry Congress, Antalya, (1997), pp. 234–237.

[3] N. Sadıkoğlu, Pharmaceutical botanical investigations on the species used as kekik (in Turkish). Istanbul University, Faculty of Pharmacy, PhD thesis, Istanbul (2005), 113p.

[4] G. Buchbauer, Biological Activities of Essential Oils. in: K.H.C. Baser and G. Buchbauer (Ed.), Handbook of Essential Oils Science, Technology, and Applications, CRC Press, Taylor & Francis Group, (2009), pp. 235-280.

[5] T. Baytop and K.H.C. Baser, On essential oils and aromatic waters used as medicine in Istanbul between 17th and 19th centuries. In: K.H.C. Baser (Ed.), Proceedings of the 13th International Congress of Flavours, Fragrances and Essential Oils, Istanbul, Turkey (1995), vol. 2, pp. 15–19.

[6] S. Kokkini, Taxonomy, Diversity and Distribution of Origanum Species, Oregano. In: S. Padulosi (Ed.), IPGRI, Rome, (1997), pp.2–12.

[7] R. Bahtiyarca Bağdat, Comparison of the Yield and Quality Parameters of Certain Species Which Are Used As 'Kekik' in Turkey (in Turkish). Ankara University, Graduate School of Applied and Natural Sciences, Department of Field Crops, PhD thesis, Ankara (2011), 94p.

[8] BAKA, Medicinal and aromatic plants sector reports. West Mediterranean Development Agency Report, Isparta (2012), 30p.

[9] N. Yılmaz, Essential Oils (in Turkish). TR Prime Ministry Undersecretaries of Foreign Trade Export Promotion Centre publications, Ankara, (2011), 8p.

[10] TUİK, TÜİK (Turkish Statistical Institute) Statistical Data, Ankara (2014).

[11] F. Uyanık Güngör, N. Bayraktar and M.D. Kaya, Comparison of Improved Clones of İzmir Oregano (Origanum onites L.) for Agronomic and Quality Characteristics under Kula Conditions. Tarım Bilimleri Dergisi, 11 2 (2005), pp. 196-200.

[12] E.O. Sarıhan, A. İpek, N. Arslan and B. Gürbüz, The Effects of Different Row Spacing and Intra-row Spacing on Yield and Yield Components of Oregano (Origanum vulgare var. hirtum). Tarım Bilimleri Dergisi, 12 3 (2006), pp. 246-251.

[13] D. Özkum, Investigation on Propagation of Oregano (Origanum minutiflorum) and Ironwork (Sideritis sricta) Through Tissue Culture (in Turkish). Hacettepe University, Graduate School of Applied and Natural Sciences, PhD thesis, Ankara (2006), 95p.

[14] A. Uzun, An investigation on determination of some traits of basil (Ocimum basilicum L.) and thyme (Origanum vulgare L.) species to be able to use as medicine and aromatic (in Turkish). Ondokuz Mayıs University, Graduate School of Applied and Natural Sciences, MSc Thesis, Samsun (2007), 115p.

[15] O. Fakılı, Inventory of researches on the plants named as with the thyme in Turkey (in Turkish). Çukurova University, Graduate School of Applied and Natural Sciences, MSc. thesis, Adana (2010), 435p.

[16] N.E. Hancıoğlu, 2012. Effect of different irrigation water quality and irrigation levels on yield and quality parameters of oregano (Origanum onites l.) (In Turkish). Akdeniz University, Graduate School of Applied and Natural Sciences, MSc. thesis, Antalya (2012), 128p.

[17] F.F. Özdemir, A study on harvesting, production, processing, national and international marketing of thyme in the Aegean region (in Turkish). Ankara University, Graduate School of Applied and Natural Sciences, Department of Agricultural Economy, MSc. thesis, Ankara (1998), 207p.

[18] M. Gul, O. Aslan and B.S. Sirikci, Determining the Costs, Production Inputs and Profit of Thyme Production Enterprises in Denizli province of Turkey. Journal of Essential Oil Bearing Plants, 7 4 (2014), pp. 562-569.

[19] G.K. Houben, K. Lenie and K. Vanhoof, A knowledge-based SWOT analysis as an instrument for strategic planning in small and medium sized farms. Decision Support System, 26 (1999), pp. 125-135.

[20] G. Yumuk and İ.H. İnan, An Evaluation of Quality Costs of Manufacturing Industry Firms in Trakya Region by SWOT Analysis (in Turkish). Journal of Tekirdag Agricultural Faculty, 2 2 (2005), pp. 177-188.

[21] C. Zoller and C. Bruynis, Conducting a SWOT analysis of your agricultural business. Ohio State University Extension Fact Sheet Series (2007), pp. 1-3. https://www.agweb.com/assets/import/files/3611.pdf

[22] G.J. Hay and G. Castilla, Object-based image analysis: Strengths, weaknesses, opportunities and threats (SWOT). The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences Proceedings Book, In: Proc. 1st Int. Conf. OBIA. (2006), pp. 4-5.