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Araştırma Makalesi
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Determination of Quality Criteria of Wheat Purchased in Commodity Exchanges (Eskişehir, Konya, Polatlı): The Case of Central Anatolia Region

Ticaret Borsalarında (Eskişehir, Konya, Polatlı) Alımı Yapılan Buğdayların Kalite Kriterlerinin Belirlenmesi: Orta Anadolu Bölgesi Örneği

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ABSTRACT

Objective: The aim of this study is to compare the quality values of wheat obtained from different Commodity Exchanges and the quality values of wheat in the purchasing criteria of the Turkish Grain Board. Our secondary aim is to determine the effect of farmer cultivation techniques on quality of wheat production.

Material and Methods: The quality values of wheat purchased by Wheat Commodity Exchanges in 2018 were analyzed. In addition, 425 farmers were interviewed face-to-face and data were collected through a questionnaire. Chi-square test was used for data analysis. The upper limit was 0.05 for significance.

Results: According to the wheat purchasing table of the Turkish Grain Board, the protein values of wheat coming to Konya and Polatlı Commodity Exchanges (90-95% good and very good) were higher than those coming to Eskişehir Commodity Exchange (86-88% good and very good). Quality values such as hectolitre, gluten index and sedimentation were found to be at the average values in all three exchanges. In the study area, 24.9% of the producers were found to have fully applied the cultivation technique.

Conclusion: The most important problem in quality wheat production, inadequate cultivation techniques and negative effects of genotype-environment interaction were determined. This resulted in a difference between the quality characteristics of the cultivated wheat varieties and the quality characteristics of the wheat produced by the farmers.

Anahtar Sözcükler:

Buğdayda kalite, kalite kriterleri, ticaret borsaları, yetiştirme tekniği

ÖZ

Amaç: Bu çalışmanın amacı, farklı Ticaret Borsalarında alınan buğdayların kalite değerleri ile Toprak Mahsulleri Ofisinin alım kriterindeki buğdayların kalite değerleri karşılaştırılmıştır. Çiftçinin yetiştirme tekniği uygulamalarının buğday üretimindeki kaliteye etkisinin belirlenmesi ikincil amacımızdır.

Materyal ve Metot: 2018 yılında Buğday Ticaret Borsalarınca alımı yapılan buğdayların kalite değerleri incelenmiştir. Ayrıca, 425 çiftçi ile yüz yüze görüşülerek anket ile veri toplanmıştır. Verilerinin analizinde Ki-kare testi kullanılmıştır. Anlamılık düzeyi üst sınırı 0.05 alınmıştır.

Bulgular: Toprak Mahsulleri Ofisinin buğday alım baremine göre, Konya ve Polatlı borsalarına gelen buğdayların protein değerleri (90-95% iyi ve çok iyi), Eskişehir Borsasına gelenlerden daha yüksek olduğu (86-88% iyi ve çok iyi) saptanmıştır. Hektolitre, glüten indeksi ve sedimantasyon gibi kalite değerlerinin her üç borsada da ortalama değerler düzeyinde olduğu belirlenmiştir. Çalışma alanında, yetiştirme tekniğini tam olarak uygulayan üreticilerin oranı % 24.9 olarak bulunmuştur.

Sonuç: Kaliteli buğday üretimindeki en önemli sorun, yetiştirme tekniği uygulamalarındaki yetersizlik ve genotip-çevre etkileşiminin negatif etkileri olduğu saptanmıştır. Bu da, ıslah edilen buğday çeşitlerinin kalite özellikleri ile çiftçiler tarafından üretimi yapılan buğdayın kalite özellikleri arasında farkın oluşmasına neden olmuştur.

INTRODUCTION

In Turkey, most wheat production are produced in Central Anatolia (Central, North-Central South). 42.1% of wheat cultivation areas and 36.6% of production belong to this region. wheat production in Turkey is to provide a source of income to 3.5 million farmers. The fact that the fields used in wheat production have different climatic and soil characteristics, and the effects of biotic and abiotic stress factors cause a significant change in yield and quality. The quality of wheat varies according to its place of use, its processing technique, the products to be obtained from it and the consumer. In wheat, quality is a relative concept. This concept varies from person to person and the intended use. Wheat quality is important for both producers and industrialists. Changes in consumer demand over time and new developments in food technology highlight the yield of wheat production as well as product quality. In order to obtain high-quality bakery products, food industrialists demand the development of wheat varieties with high quality characteristics (Doğan and Kendal, 2012). Therefore, support for production should encourage quality production. Within this scope, the Turkish Grain Board (TGB) purchases wheat based on protein, wheat based industry is thought to help overcome the difficulties in supplying quality wheat (Serpi et al. 2011). Wheat cultivation has traditionally focused on grain yields and features aimed at improving industrial quality. However, it has been concluded that in addition to producing more in recent years, improvements in product quality are essential (Welch and Graham, 1999).

Our country has difficulties in providing competitive and high quality raw material flow with wheat prices in the world. There may be differences in the quality of the same wheat varieties brought to wheat commodity exchanges, flour mills and wheat traders. The factors that cause this are climate, small scale of farms and farmer practices. These factors can affect the prevention of the use of technology and input, increase production costs, and decrease the efficiency and quality. In addition, it is important to apply the cultivation technique in the right time and quantity (which fertilizer and which medicine) in the production of quality wheat. For this reason, wheat producers should be educated by extension studies on growing technique (Cevher and Altunkaynak, 2019). This situation prevents the economic use of technology and agricultural inputs and also increases production costs and negatively affects the yield and quality. It is of great importance that the producers apply the cultivation technique at the right time and quantity (which fertilizer and which medicine). Wheat producers do not have sufficient knowledge about cultivation technique and quality product. Therefore, more agricultural extension works should be carried out to producers on this subject (Cevher and Altunkaynak, 2019). In a study, it was stated that producers should be educated about input use, application time and methods in order to increase yield and quality in wheat production at the regional level (Tiryakioğlu et al. 2017). They stated that the quality of wheat varies greatly depending on the genetic characteristics of the seed variety, agricultural processes applied during cultivation, environmental conditions and storage. (Posner and Hibbs, 1997). In our country, wheat is grown in different regions in different quality, and there is a quality difference between wheat grown in the same province. Therefore, the most suitable districts and regions for wheat production should be identified and the producer should be supported (Paran and Topal, 2017). Among the varieties developed in recent years, both in terms of yield and quality, It was found that there are more superior varieties than the old varieties. This shows that yield and quality can be increased together in wheat production. Quality ratio in wheat, cultivation techniques also have a significant effect (Cook and Veseth, 1991). It has been reported that the protein content of wheat is more affected by soil, climate and fertilizer applications than the variety and the protein ratio varies between 6% and 25% (Anonymous, 1990). In another study, they found that environmental impact variance for quality criteria was greater than genetic factor variance (Peterson et al. 1992). However, it has been reported that the most decisive factor on the quality criteria of bread in both irrigated and dry areas is variety (Souza et al. 2004). It was determined that the factors affecting quality wheat production were variety, climatic conditions and soil properties (Kahraman, 2008). In order to obtain a high-quality, high-protein grain, nitrogen should be given as top fertilizer during spike (Kün, 1983). Fertilization is the most effective input on yield and quality obtained per unit area. It is accepted that 50% of the increase in wheat yield is caused by fertilization (Sağlam, 2012; Eryılmaz et al. 2017). Nitrogenous fertilizers used to increase yield in agricultural production are the most important factors affecting the amount of protein in wheat. Nitrogen fertilization in nitrogen fertilization up to a certain point, increased the amount of protein in wheat was observed (Guler, 1996).

Due to the climatic conditions, Central Anatolia and the Passage Regions are suitable for high quality wheat production. However, the wheat varieties obtained are

not in the desired yield and quality. Most of the wheat produced in the region is brought to Konya (KCE), Polatlı (PCE) and Eskişehir Commodity Exchange (ECE). In this study, quality values of wheat varieties traded in stock exchanges were investigated. In addition, it has been investigated whether cultivation techniques which affect quality values are realized at producer level or not.

MATERIALS and METHODS

In this section, characteristics of the research area, wheat Commodity Exchange data, Farmer surveys, Data and variables and Data analysis are given.

Characteristics of the research area

Ankara, has 1.233.042 ha of agricultural area, it is one of Turkey's leading province in terms of crop production. The most produced field products in the province are wheat and barley. Wheat is the most important plant produced in field agriculture. Wheat cultivated area in Ankara is 477.205 ha, production is 1.554.837 tons and yield is 326 kg / ha (TÜİK, 2016). 8.6% of the agricultural land in the province can be irrigated. The share of Ankara's agricultural sector in gross value added is 8.5%. In the last ten years, the average rainfall is 388 mm. Konya has an agricultural area of 1.960.028 ha. 4.8% of the value of agricultural production in Turkey is made in Konya. About 70% of the agricultural areas are dry farming and 30% are irrigated. The average annual rainfall of Konya is 323 mm. The amount of wheat cultivated area is 7.462.413 and production is 2.045.298 tons (TÜİK, 2016). This amount is approximately 10% of Turkey's wheat production. The average yield is 310 kg / da. In recent years there has been an increase of approximately 100% in wheat production and 80% in yield. The wheat cultivation area in Eskişehir is 1.949.987 da. The amount of agricultural land is 573,639 ha. The amount of 546 182 tonnes of wheat production and this amount is about 2.5% of wheat production in Turkey (TÜİK, 2016). About 71.7% of the agricultural areas are dry farming and 28.3% are irrigated. The average annual precipitation in Eskişehir is 346 mm.

Commodity exchanges data

In this study, records of important Commodity Exchanges (Polatlı, Konya and Eskişehir) which purchase wheat in Central Anatolia Region were used. The main material of the study is the quality values of wheat produced under farmer conditions and coming to Commodity Exchanges (Eskişehir, Konya and Polatlı). The quality values of wheat coming to the Commodity Exchanges were examined and evaluated according to TGB quality criteria. The quality values applied in the TGB purchase are shown in table 2.

Table 1. Some characteristics of the research area

Çizelge 1. *Araştırma alanın bazı özellikleri*

Wheat Commodity Exchanges	Agricultural Area (ha)	Wheat's Share in Turkey (%)	Average Yield (kg/da)	Average Annual Rainfall (mm)*
Ankara/Polatlı	842.659	5.5	326	388
Eskişehir	559.513	2.5	360	346
Konya	1.406.485	10.0	310	323

Source: Provincial Directorate of Agriculture and Forestry (Ankara, Eskişehir, Konya), (2018)

*General Directorate of Meteorology (2019)

Provincial Directorate of Agriculture and Forestry yerine Directorate of Provincial Agriculture and Forestry

Table 2. TGB Bread wheat quality criteria

Çizelge 2. *TMO ekmeklik buğday kalite kriterleri*

Quality	Hectoliter (kg/L)	Flour yield (%)	Protein (%)	Age gluten (%)	Gluten index (%)	Dry gluten (%)	Sedimentation (ml)
Very good	> 80	> 72	> 13.0	> 36	> 96	> 12	> 37
Good	78.0–79.9	68-71.9	12.0–12.9	28-35.9	80-95	9-11.9	31-36
Middle	76.0–77.9	62-67.9	10.5-11.9	20-27.9	63-79	7-8.9	22-30
Low	< 76	< 62	< 10.5	< 20	< 63	< 7	< 22

Source: TGB (2018)

Farmer surveys

The main population of the study consisted of wheat producers (Ankara Province) registered in Farmer Registration System (FRS). In this population, land widths were taken into consideration while calculating the number of sample farms. Since land size is not homogeneous according to districts and each district has to be represented in the study, Stratified Random Sampling method was used in the study. The sample size was determined as 425. The data consists of primary data obtained through surveys, secondary data obtained from the reports of institutions and organizations. The questionnaires were conducted between May and October 2018 through face-to-face interviews.

Data and variables

In the evaluation of the general structure of wheat producer; indicators such as producer's education, place of residence, non-agricultural income, income level of the enterprise, land width and cultivation techniques were examined. The variables considered in the study are given in table 3 together with their definitions.

Table 3. Variables and descriptions
Çizelge 3. *Değişkenler ve açıklamaları*

Variable	Defination
Education	1=Primary, 2=Middleschool, 3=High school, 4=University
Place of residence	1=Rural, 2=City
Off-farmincome	1=No, 0=Yes
Annual Income Status	1=Low, 2=Intermediate, 3=High
Land size	1=[≤ 150]; 2=[151, 250]; 3=[251-350]; 4=[≥351]
Cultivation Technique Application	1= No implementation, 2= Partly implementation, 3= Completely implementation

Data analysis

The relationships between the socio-economic variables of the producer and the opinions of wheat production were examined by chi-square test. The upper limit was 0.05 for significance.

RESULTS and DISCUSSION

In this part of the study, wheat varieties and quality values treated in PCE, ECE and KCE are discussed.

Polatlı commodity exchange data

The PCE exchange addresses an important area in the Central Anatolia Region. In our study, 44.48% of the wheat traded in Polatlı Commodity Exchange was produced in Polatlı region, while 55.52% was determined to come from neighboring provinces and districts (PCE, 2017). Most of the wheat processed is produced from the conditions of the Central Anatolia Region. Although these data change proportionally over the years, it can be said that they remain at the same level. Since protein and hectolitre are the most important criteria for the purchase of product quantities coming to the stock exchanges, the evaluations were made on these quality criteria in our study. Wheat quantities and quality ratios coming to PCE are given in table 4.

Table 4 shows the data on protein and hectoliter values of wheat that the producers brought to Polatlı Commodity Exchange. These quality values were evaluated and interpreted according to TGB purchasing table. When Table 4 is analyzed, it is seen that 80.6% of the wheat coming to PCE in the 2018 purchase season is 13.0% and above (very good) and 13.3% is 12.0-12.9% (good). According to these data, it was determined that 93.9% of the wheat processed in PCE is within the limits of very good and good quality criteria in terms of protein content. Due to the importance of protein content, especially high lysine content varieties have been breeding (Gerek, 1970). Wheat protein ratio is reported to vary between 6-22% depending on the variety and more environmental conditions (Ünal, 1979). They stated that the genetic progress provided by varieties developed for dry agricultural areas of our country is quite high (Zencirci and Baran, 1992). When the wheats were examined in hectoliter quality limits in Table 4, 23.6% of the treated wheat was found to be very good and 25.2% was within the limits of good quality criteria. When these ratios were examined, it was concluded that the hectolitre values were not very high. According to these results, it can be said that protein ratios of wheat produced in research area are high and hectoliter values are low. Therefore, it should

be aimed to increase the hectoliter value in wheat breeding studies as protein ratio. It was determined that the use of certified wheat seed developed by producers in recent years had an important effect on the increase in protein ratio. In a study conducted in the region, it was determined that the use of certified wheat seeds developed by the private and public sector is very common. It has been concluded that the use of certified wheat seeds has a significant effect on the increase in yield and quality values (Cevher and Altunkaynak, 2019). In another study, it was concluded that the producers use certified seeds and learn new wheat varieties from informal information sources almost every year (Köksal and Cevher, 2015). In 2018, the most processed wheat varieties were listed as Esperia, Cömert 1, Rumeli Quality and Odeska in PCE. The proportions of these varieties are shown in Figure 1.

Table 4. Polatlı Commodity Exchange wheat quality values
Çizelge 4. *Polatlı Ticaret Borsası buğday kalite değerleri*

Quality Values		Wheat Quantity (Ton)	Percent
Protein (%)	Above > 13.0	200.802	80.6
	12.0 - 12.9	33.040	13.3
	10.5 - 11.9	13.638	5.5
	Under < 10.5	1.517	0.6
	Total	248.997	100.0
Hectoliter (kg/L)	Above > 78	58.777	23.6
	77.9 - 76.0	62.668	25.2
	75.9 - 73.0	98.153	39.4
	Under > 73	29.399	11.8
	Total	248.997	100.0

Source: PCE Date (2018 Year)

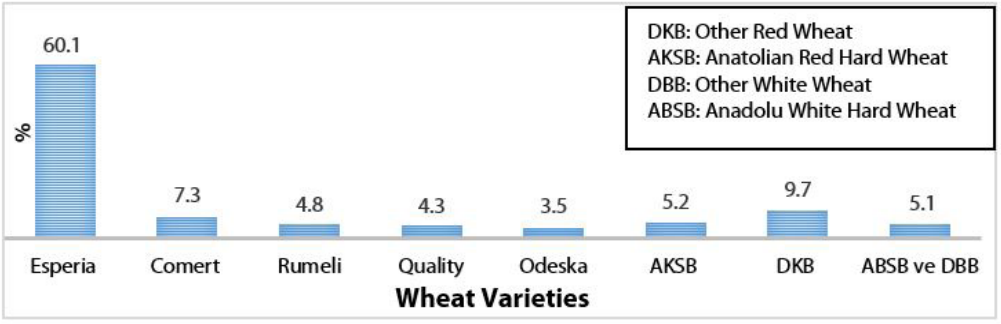

Figure 1. Wheat varieties purchased in Polatlı commodity exchange
Şekil 1. *Polatlı ticaret borsasında satın alınan buğday çeşitleri*

The names and percentage distributions of the wheat varieties brought to PTB are shown in Figure 1. In the PCE, 69 different wheat varieties were traded for sale during the 2018 harvest period. It was determined that the most traded (60.1%) wheat variety in 2018 was Esperia variety. This variety was followed by 9.7% of the varieties in the other red wheat (DKB) group. Distribution of other varieties; Cömert-1 7.3%, Rumeli 4.8%, Quality 4.3% and Odeska 3.5%. The ratio of other red wheat (Adelaide, Aldane, Alparslan, Bezostaja-1, Destan, Delebrad-2, Dropia, Flamura-85, Karasu-90, Pamukova-97, Sagittartio, Segor, Selimiye, Sertori, Stendal) was determined as 5.2%. The ratio of Anatolian white hard wheat (ABSB) and other white wheat (DBB) was determined as 5.1%. According to these data, it is seen that approximately 75% of wheats brought to PCE are in wheat varieties developed by private sector. It can be said that the spread of private sector varieties in the region is influenced by the characteristics of the variety and the extension studies. Similar results were obtained from previous studies (Köksal and Cevher, 2015; Cevher and Altunkaynak, 2019).

Konya commodity exchange data

Wheat varieties and quality values treated in KCE (2018 year) are shown in table 5. Table 5 shows the data related to hectoliter and protein values of the wheat varieties that are the most common in KCE. Quality values were evaluated according to TGB purchase table. When the table is examined, it is seen that the minimum hectoliter values of the wheat coming to the stock market vary between 61.0 kg / L and 73.9 kg / L. The highest values in terms of hectoliters vary between 83.2 kg / L and 80.4 kg / L. The average hectoliter values of the wheat that came to the TC ranged from 75.8 kg / L to 78.5 kg / L. These values are the data of the top 10 wheat varieties from 64 wheat varieties. When the protein values of the varieties are examined, it is seen that the minimum values vary between 7.3% and 10.8% and the maximum values vary between 16.0% and 19.6% according to the varieties. The mean values ranged from 11.5% to 14.0%. According to the TGB purchase table, it can be said that approximately 94.1% of the wheat coming from KCE are in very good and good limits. The most common wheat varieties in the KCE were Bezostaja, Odeska, Konya-2002, Bayraktar, Altay 2000, Sönmez 2001, Esperia, Tosunbey, Rumeli and Altindene. In a study, it was determined that the hectoliter weight of bread and durum wheat produced in Konya Province in 2012, 2013, 2014 and 2015 and purchased in the Commodity Exchange varies between 78.95-79.92 kg / hl and protein ratio varies between 10.58-12.89% (Paran and Topal, 2017). Similarity in terms of hectolitre and differences in protein were found between the previous study and the data in our study. In our study, it can be said that the protein ratio is higher. It was concluded that the new certified seeds used by the producer and the climate data in 2018 affected this situation. It was determined that wheat coming to KCE consisted mainly of varieties developed by public sector. The factor affecting this situation can be said to be due to the fact that public varieties are more suitable for climate and soil structure in Konya region. The wheat varieties which were processed the most in KCE (2018) were identified as Bezostaja, Odeska, Konya-2002, Bayraktar and Altay 2000.

Eskişehir commodity exchange data

Wheat varieties and quality values treated in ECE (2018 year) are shown in table 6.

In Table 6, the hectoliter and protein values of the wheat with the highest amount of ECE are shown. Quality values were evaluated according to TGB purchase table. When the table is examined, it is seen that the minimum hectoliter values of the wheat coming to the commodity exchange vary between 66.2 kg / L and 73.6 kg / L. The highest values in terms of hectoliters vary between 81.2 kg / L and 82.7 kg / L. The average hectoliter values of the wheat that came to ECE ranged between 70.6 kg / L and 78.7 kg / L. These values are the data of 75 wheat varieties coming to the stock exchange and 14 wheat varieties coming to the commodity exchange the most. When the protein values of the cultivars were examined, it was determined that the minimum values ranged between

Table 5. Konya Commodity Exchange wheat quality values

Çizelge 5. *Konya Ticaret Borsası buğday kalite değerleri*

Variety Name	Minimum Value		Maximum Value		Average Value	
	Hectoliter (kg/L)	Protein (%)	Hectoliter (kg/L)	Protein (%)	Hectoliter (kg/L)	Protein (%)
Bezostaja	71.6	9.0	83.1	16.0	76.8	12.3
Odeska	68.0	8.3	83.1	17.7	76.1	12.7
Konya-2002	63.1	7.3	82.4	18.2	76.9	12.3
Bayraktar	70.3	7.5	82.9	17.0	77.2	12.2
Altay 2000	73.9	8.3	80.4	17.7	76.7	11.5
Sönmez 2001	64.7	8.1	81.6	17.4	76.3	12.5
Esperia	61.0	8.2	81.7	19.6	75.8	13.4
Tosunbey	65.1	9.0	83.2	18.4	78.1	13.1
Rumeli	67.5	9.6	82.6	17.8	78.5	13.4
Altındane	71.2	10.8	83.0	18.4	78.5	14.0

Source: KCE Data (2018 Year)

8.7% and 11.8% and the maximum values ranged between 9.9% and 19.3% according to the varieties. The mean values ranged from 10.9% to 13.9%. According to TGB purchase table, it can be said that 86.5% of wheat coming to Eskişehir Commodity Exchange is in very good and good limits. In 2018, the most commonly processed wheat varieties in the ECE were determined as Ahmetağa, Michelangelo, Midas, Müfitbey and Nacibey. The distribution of the most processed wheat varieties in the ECE is shown in Figure 2.

Table 6. Eskişehir Commodity Exchange wheat quality values
Çizelge 6. *Eskişehir Ticaret Borsası buğday kalite değerleri*

	Minimum Value		Maximum Value		Average Value	
Variety Name	Hectoliter (kg/L)	Protein (%)	Hectoliter (kg/L)	Protein (%)	Hectoliter (kg/L)	Protein (%)
Ahmetağa	66.2	8.7	81.2	15.7	76.61	11.69
Mıchelangelo	70.0	10.3	81.3	16.0	77.29	12.70
Midas	68.5	10.0	80.9	9.9	76.85	11.74
Müfitbey	67.0	8.8	79.6	15.3	73.90	10.94
Nacibey	70.7	10.9	80.4	15.7	74.99	11.75
Nota	73.6	10.3	80.6	13.8	76.86	12.17
Renan	66.5	11.8	78.0	17.0	74.84	13.80
Rumeli	69.6	10.6	82.6	17.0	78.71	13.99
Sönmez 2001	67.5	8.9	82.7	15.4	77.39	12.19
Sultan-95	65.6	10.1	74.9	17.0	70.59	11.88
Syrena Odeska	70.4	9.1	80.6	18.0	76.69	12.54
Tosunbey	70.4	9.1	79.2	16.2	76.08	12.88
Ukrayna	69.4	9.7	80.3	19.3	76.56	11.96
Yunus	71.5	9.7	80.4	14.2	77.51	12.07

Source: ECE Data (2018 Year)

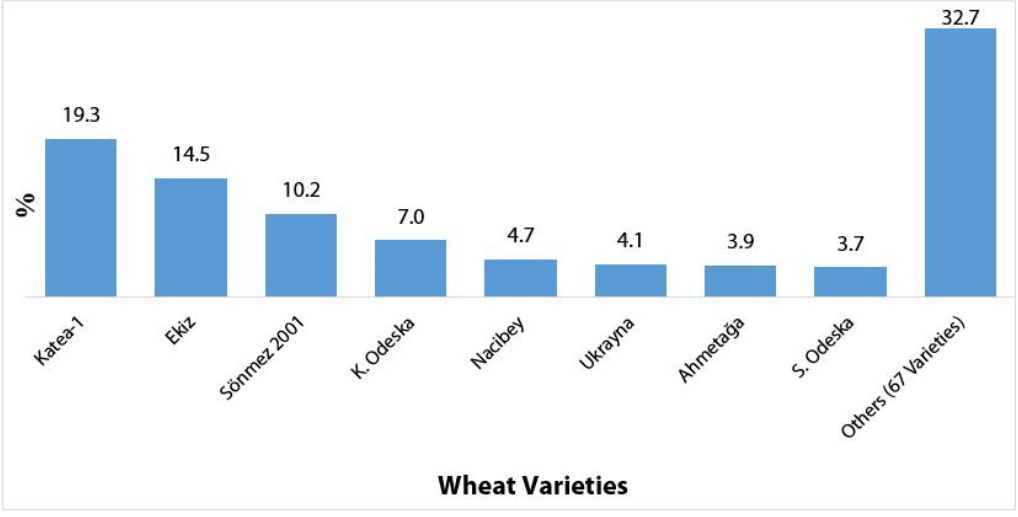

Figure 2. Wheat varieties purchased in Eskişehir Commodity Exchange
Şekil 2. *Eskişehir Ticaret Borsasında satın alınan buğday çeşitleri*

Figure 2 shows the names and percentage distributions of wheat varieties that come to ECE during the 2018 harvest period. In this period, 75 wheat varieties were brought to the commodity exchange by the producers. Among the varieties of wheat brought for sale, Katea-1 was the most traded (19.3%). This was followed by 14.5% Ekiz, 10.2% Sönmez 2001, 7% by Krasunia Odeska, 4.7% by Nacibey, 4.1% by Ukrayna, 3.9% by Ahmetağa and 3.9% by S. Odeska. 67 of the 75 wheat varieties brought to the commodity exchange were named as other varieties and their ratio was determined as 32.7%. According to the data obtained, most of the wheat varieties brought to the ECE are composed of varieties developed by public institutions (Katea-1, Ekiz, Sönmez 2001, Nacibey, Ahmetağa). his result shows that wheat grown in Ankara and Konya regions are superior in terms of quality and yield is higher in Eskişehir region. Because, it has been concluded that quality varieties that have adapted to Ankara and Konya regions are widespread and that varieties which are superior in terms of yield are widespread in Eskişehir region.

The effect of cultivation techniques on wheat quality

One of the most important factors in sustainable agricultural activity is to obtain high yields per unit area. However, quality production is an important factor in agricultural activity in recent years. Therefore, it is increasingly important to obtain high quality crops with high yields in agricultural production. Quality is affected by many factors in wheat production. These factors are; varieties, certified seed use, ecological factors and cultivation techniques.

Quality production varies depending on these factors. These factors are a process that starts from breeding and continuing until the end of the production activity. In this process, the seed type used and producer activities are the most important elements in obtaining high quality products. In this part of the study, the cultivation techniques of wheat producers will be examined. In the study area, 57.6% of the producers received training for quality wheat production. Training activities were conducted by seed dealers, seed breeding institutions and agricultural organizations. It was determined that, extension staff in farmer' organizations and selfemployed have better levels of skills than the extension workers in public and private sectors (Boyacı and Yıldız, 2015). The status of obtaining information about the cultivation technique and the operating infrastructure and socio-economic status of the producers are shown in Table 7 and Table 8 below. Land width is an important factor in the efficient use of resources in agricultural production. Land width has an impact on wheat yield, quality and production cost. In this study, the relationship between wheat cultivation technique and land width was determined and shown in table 7.

Table 7 shows the level of knowledge of the producers of dry and irrigated land on cultivation technique separately. When the answers were examined in terms of dry land width, the relationship between cultivation technique and land width was found to be statistically significant ($p < 0.05$). When the table is examined, while the rate of application of cultivation technique up to 250 decares of land is 15.1% (9.4 + 5.7), this rate has increased to 56.2% for producers with more than 351 decares of land. It was found that 44.2% of the producers with dry land did not apply cultivation technique, 30.8% were insufficient application and 24.9% did complete application. It was determined that 40.9% of the producers with irrigated land could not be applied the cultivation technique, 27% were insufficient application and 32.1% had complete application. According to the results, it was found that cultivation technique applications in production under irrigated conditions were higher. It

Çizelge 7. Arazi genişliği ile yetiştirme tekniğini uygulama arasındaki ilişki düzeyi

Table 7. *The relationship between land width and cultivation techniques*

Cultivation Technique in Dry Conditions (da)					Cultivation Techniques of Irrigated Conditions (da)				
Land Width	Not Apply	Partly Apply	Completely Apply	p	Land Width	Not Apply	Partly Apply	Completely Apply	p
≤ 150	72.9	17.6	9.4		≤ 50	71.0	25.8	3.2	
151-250	78.2	16.1	5.7		51-100	37.0	37.0	25.9	
251-350	45.9	43.1	11.0	0.000*	101-150	42.9	23.8	33.3	0.000*
≥ 351	5.6	38.2	56.2		≥ 151	25.4	25.4	49.2	
Total	44.2	30.8	24.9		Total	40.9	27.0	32.1	

*: Statistically significant at 5% level / *:% 5 seviyesinde istatistiksel olarak önemli

can be said that the producers who do not apply the cultivation technique in dry and irrigated conditions do not discriminate seed varieties and therefore continue production with traditional production methods. In a previous study, it was determined that ecological factors and cultivation techniques directly or indirectly affect the quality criteria of wheat (Güleç et al. 2010). In another study, improvements in the nutritional quality of wheat, to some extent agronomical applications, while the greatest effect is stated by genetic improvement (Trethowan et al. 2015).

Producer cultivation techniques are one of the most important factors in obtaining high quality wheat. Therefore, in this study, the relationship between the socio-economic structure of producers and wheat production techniques was tried to be determined. The data obtained are shown in table 8.

Çizelge 8. Sosyo-ekonomik değişkenler ile yetiştirme tekniğini uygulama arasındaki ilişki

Table 8. *The relationship between socio-economic variables and cultivation techniques*

Variables	Levels	Not Apply	Partly Apply	Completely Apply	Total	p
Education Levels	Primary	77 (74.8)	20 (19.4)	6 (5.8)	103	0.000*
	Middle	70 (62.5)	32 (28.6)	10 (8.9)	112	
	High	40 (25.2)	69 (43.4)	50 (31.4)	159	
	University	4 (7.8)	7 (13.7)	40 (78.4)	51	
Place of Residence	Rural	105 (42.5)	75 (30.4)	67 (27.1)	247	0.384
	City	86 (48.3)	53 (29.8)	39 (21.9)	178	
Non-Farm Income	No	148 (59.7)	66 (26.6)	34 (13.7)	248	0.000*
	Yes	43 (24.3)	62 (35.0)	72 (40.7)	177	
Income Level	Low	21 (55.3)	11 (28.9)	6 (15.8)	38	0.000*
	Middle	139 (51.9)	84 (31.3)	45 (16.8)	268	
	High	31 (26.1)	33 (27.7)	55 (46.2)	119	

*: Statistically significant at 5% level / *:% 5 seviyesinde istatistiksel olarak önemli

Values in parentheses indicate percentages/ Parantez içindeki değerler yüzdeleri göstermektedir.

When the answers were examined in terms of socio-economic variables, the relationship between cultivation technique and education, non-agricultural income and income level was found to be statistically significant ($p < 0.05$). When the table is examined, the ratio of those who do not apply the cultivation technique among primary and secondary school producers is higher than that of high school and university graduates. While 74.8% of primary school graduates and 62.5% of secondary school graduates do not apply cultivation techniques, this rate is 7.8% for university graduates.

It was found that 24.3% of the producers with non-agricultural income and 59.7% of those who did not have non-agricultural income did not apply cultivation techniques. 26.1% of high-income producers and 55.3% of low-income producers did not apply cultivation technique. While 78.4% of the university graduates applied the cultivation technique, this rate was 5.8% for primary school graduates and 8.9% for secondary school graduates. It was determined that 40.7% of the producers with non-agricultural income and 13.7% of the non-agricultural producers applied the cultivation technique completely. 46.2% of those with high income in terms of income level, 15.8% of low-income producers were found to apply cultivation technique. According to the results of the analysis, it was concluded that the producers with high education level, non-agricultural income and high income had more cultivation techniques. It can be said that the results of previous studies on breeding technique are similar to our results. In a study, it was determined that it would be possible to increase yield and quality with suitable cultivation techniques to be applied until harvest and threshing in high yielding varieties that adapt to ecological regions (Helvacı et al. 2005). Wheat production has started to be produced in irrigated areas and there has been an increase in yield. This shows that the cultivation techniques applied by the producer are effective on the yield and quality (Zengin et al. 2008). In wheat production, it is important to educate the producers about input usage, application time and methods. In addition, it is beneficial to determine the most appropriate input amount and application methods at the regional level and disseminate them at the producer level (Tiryakioğlu et al. 2017).

CONCLUSION

To ensure sustainability in wheat production and to provide healthy food quality wheat production is indispensable. Therefore, TGB promotes quality production by purchasing and pricing according to protein criteria. With this purchase method, it is aimed to increase the quality values of wheat and prevent wheat import. According to the findings of the research, it was concluded that the quality values of wheat brought to Ankara and Konya Commodity Exchanges were almost similar. It is determined that 90% of the wheat varieties coming to the stock exchanges are good and very good quality, while the ratio of hectoliters is good and very good quality is 49.5%. In the study area, the ratio of producers applying the cultivation technique package in wheat production was 24.9% in dry conditions and 32.1% in irrigated conditions. Despite the use of seeds superior to yield and quality, it was found that the desired quality criteria could not be achieved. It was concluded that this technique was caused by insufficiencies in cultivation techniques. In addition, it is known that besides the cultivation techniques such as irrigation and fertilization, which cause poor quality in wheat, climate factors such as rainfall, humidity and temperature cause product quality change in the same region according to years. Therefore, there are differences between the quality characteristics of the varieties and the quality characteristics of the wheat produced by the producers. As a result, it was determined that there were good and very good quality seed varieties according to TGB intake criteria. However, sufficient quality wheat cannot be produced in the research area. This situation arises from the inadequacy of cultivation techniques and negative effects of genotype-environment interaction. It was concluded that the quality of wheat production increased due to the purchasing criteria of TGB.

DISCUSSION

In order to obtain high quality wheat production, it is necessary to increase the area-based support rate in the wheat plant. Producers should be provided with training and extension services to raise awareness about the use of fertilizer in accordance with their techniques. In order to obtain high quality wheat production, it is beneficial to revise the quality ratios of TGB in the purchasing base.

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