HISTORY AND EVALUATION OF EMMER WHEAT

Suliman Zommita, Ashraf Soliman, Nusret Zencirci[1]
[1]Bolu Abant İzzet Baysal University, Faculty of Arts and Science, Department of Biology Bolu Turkey
Email: sulimanzometa@gmail.com, ashraf.alfaidy@gmail.com, nzencirci@yahoo.com

***Corresponding Author:**
sulimanzometa@gmail.com

INTRODUCTION

Grains are the most important source of calories and protein in the world. It is known that 52% of the daily calorie intake per capita in the world is taken from proteins and 47% from grain products. Wheat grain, which is one of the most important cereal products, has been the main food source for most countries for many years due to its suitable nutritional value, transportation, storage, easy cultivation, and wide adaptation limits.

Undoubtedly, wheat comes first among the cultivated plants that are of great importance in different aspects today. Wheat is an indispensable food item for human nutrition in Turkey as well as all over the world. Productive and high-quality wheat varieties developed with traditional plant breeding programs have met the nutritional needs of people so far, and studies continue rapidly today. However, world agriculture is facing serious problems due to changing biotic and abiotic environmental pressures. The cultivars have become more homogeneous in terms of their genetic structures and contain less genetic diversity than their village varieties, transitional forms, and wild relatives. Wild species, transitional forms, and village varieties are gene stores that have a wide genetic base and constitute an important resource for the elimination of future problems of cultivated plants or for the acquisition of new characteristics in plants.

Turkey is a center of genetic diversity for Aegilops and Triticum species. The Middle East and its adjacent Mediterranean environment and Western Asia are the areas where 22 wild wheat species are distributed (Van Slageren 1994). Wild wheat species, which we can encounter all over Turkey, are of great importance both in studies on the distribution and evolution of wheat and in genetic improvement efforts to increase the quality of today's durum and bread wheats. Turkey is also a gene center for spelt spelts. Spelled wheats, which have different genome structures and are cultured, are the transitional forms between today's wheat and wild wheat. These are diploid (2n= 14) einkorn (*T. monoccocum*), tetraploid (2n= 28) emmer (*T. dicoccum*) and hexaploid (2n= 42) spelt wheat (*T. spelta*) (Akar and Eser 2016). Spelt wheat is not cultivated in Turkey, while the cultivation of emmer and einkorn has a very old history. As a matter of fact, einkorn and emmer remains were found in the Çayönü excavation (Harlan 1995), which was about 10,000 years back from today, and in addition to this, in the excavations made in different regions of Turkey (Çatalhöyük, Hacılar and Can Hasan) belonging to the periods 7000-8000 years ago, emmer and einkorn samples were also found. found. While einkorn and emmer from spelt are grown in organic or ecological conditions in rural, mountainous and unsuitable lands of Turkey as well as Italy, France, India, Morocco, Serbia, Russia, Switzerland, and Ethiopia today, spelt wheat is added to the Southern Mediterranean countries of Europe. It is grown under similar conditions, especially in Germany and Austria (Stalknecht et al. 1996).

These wheat types are named as "Kavlıca" in Eastern Anatolia and "Gacer" in Kayseri, in addition to the naming of hot springs (Akar and Eser 2016). Unfortunately, these wheat varieties have been discredited by the spread of modern wheat varieties that are husked at harvest or do not require additional husking costs, have a high 1000-grain and hectoliter weight, and also respond better to input use (chemical fertilizers, pesticides, and intensive tillage). The production, which was 130,000 tons in the 1950s, decreased to 4.549 tons as of 2016, while the yield increased from 95 kg/da to 200 kg/da with the effect of cultivation areas (TUIK 2017).

In addition to morphological features, yield, vitamins (A and B vitamins), microelements (Zn and Fe), and physical quality elements, SDS was added in 2016 within the framework of the TUBITAK project no. 17 emmer cultivar candidates were selected in terms of sedimentation and protein. Within the scope of this thesis, it was aimed to determine the emmer variety candidates suitable for Konya conditions based on yield and advanced quality characteristics with the trial established in the Konya/Kadınhanı location. For this purpose, basic quality characteristics such as thousand grain weight, hectoliter weight, protein ratio, and sedimentation, as well as some microelement (Cu, Fe, Zn, Mn, and Se) and vitamin (B and A vitamin) contents of emmer cultivar candidates were determined.

1. Emmer Wheat General Information

Kasap (2013), 4 bread (*Triticum aestivum* L.), 4 durum (*Triticum turgidum* spp. *durum* (Desf.)) modern wheat genotypes and Triticum wheat genotype (emmer), which is currently cultivated on a limited basis and among them, 1 old spelt. Turgidum subspecies 4 different tetraploid genotypes (*Triticum turgidum* L. ssp. *dicoccum* (Schrank ex Schübl.) Thell.; *Triticum turgidum* L. ssp. *polonicum* (L.) Thell.; *Triticum durum* Desf.; *Triticum turgidum* L. ssp. *turgidum*) were compared in the ground conditions of Çukurova in order to investigate the yield and the factors affecting yield in different wheat species and to help reach a more effective situation in future breeding programs. In the general correlation analysis made with the data of the genotypes of all three species, the relationships between earing time and yield were examined, and a negative significant relationship between earing time and yield, and when the species were correlated within themselves, the relationship between earing time and yield was insignificant among genotypes of bread wheat species. It is seen that there are stronger negative significant relationships between the genotypes of the genotypes compared to the general correlation. The fact that the yield of the old tetraploid wheat species, which has a longer spike time than the current wheat, is lower than the modern varieties, is thought to be a factor because the time between grain filling and physiological maturity is shorter. It was seen that the strongest and most stable relationship with grain yield was between harvest index, and no consistent relationship was found between grain yield and biological yield. When the effect of grain weight and grain number on grain yield was examined, it was seen that grain weight played a more effective role in grain yield than grain number. An earlier number was found to be negatively correlated with yield in general, although it was not consistent, while ear weight was positively correlated.

Özbek (1998) Intra- and inter-population biochemical variation was determined in 19 *T. dicoccum* populations collected from different altitudes in the northern passage region of Turkey. Endopeptidase-1, Aminopeptidase-1, Aminopeptidase-2 isoenzymes and gliadin and glutenin seed storage proteins were screened for a total of 8 loci. In general, it was determined that gliadin loci were more polymorphic than other loci for all populations. In the analysis results, it was determined that two populations at 1000 m and two populations at 1100 m had a higher degree of variation in gliadin loci than other populations. In addition, it was determined that in two populations at 950 m, they carried the gamma-gliadin, omega-gliadin 35, LMWG-2 genetic commitment groups in their genotypes, which is related to high bread making quality, robust gluten structure, and high sedimentation volume. It has been stated that these populations can be used as a gene source in the development of varieties with high bread-making quality and robust gluten structures in breeding studies.

It is known that Emmer wheat has a high protein and a rich mineral composition (Zaharieva et al. 2010). Many studies have shown that the emmer genotypes have a high variation in grain protein ratio and the protein ratio can reach 18-23% (Perrino et al. 1993; Damania et al. 1992; Stehno 2007). Buvaneshwari et al. (2005) also stated that the semolina yields of emmer wheat and durum wheat were similar.

It has been found in many studies that it is similar to or higher than durum wheat in terms of gluten content (Piergiovanni et al. 2009). Cubadda and Marconi (1996) reported that emmer wheat has a similar amino acid content as bread wheat. Stehno (2007) reported a particularly high lysine content (up to 3.65%) in the Czech wheat variety Rudico.

Demirel (2013) determined that 9 of them were tetraploid (*T. dicoccum*) and 14 of them were diploid (*T. monococcum*) as a result of field observations in his study conducted with diploid and tetraploid husked wheat village varieties collected from Kastamonu. observed in terms of In addition, as a result of molecular characterization analyses using ISSR markers and examining the kinship relations with the appropriate statistical program, the mean Dice similarity coefficient was found to be 0.553 between the genotypes of 23 Kastamonu populations and 9 registered cultivars. He calculated that it was 95.42.

Kaplan et al. (2014) used a total of 17 spelled wheat populations, 10 emmer and 7 einkorn, and investigated yield and some quality characteristics of spelt in order to investigate the possibilities of using spelt in animal nutrition. Yield, harvest index, crude protein, crude oil, Neutral Detergent Fiber (NDF), Acid Detergent Fiber (ADF), raw ash, metabolic energy, organic matter digestibility in the study conducted in Kayseri conditions in 3 replications in 2012-2013. and gas production parameters were investigated. While Emmer populations stand out with their high ADF and NDF values, Einkorn populations were found to be good in terms of crude oil, crude protein, metabolic energy and organic matter digestibility. As a result, it has been emphasized that these spelled populations can be used as parents in the breeding of einkorn and emmer varieties to be developed for use as alternative feed sources in animal nutrition.

2. History of Emmer Wheat

It is known as emmer or çatalsiyez in Turkey. *T. dicoccum* Schrank, which means two-grain wheat in German, is called emmer, and its origin goes back to the near east (Nevo et al., 2002).

Emmer is called by many names: *T. turgidum (L.) Thell.* ssp. *dicoccum* (Schrank) Schübl., *T. farrum* Bayle-Barrele, *T. amyleum* Seringe, *T. zea* Wagini, *Spelta amylea* Seringe, *T. volgense* (Flaskb.) Nevski, *T. vulgare dicoccun* Alef., *T. sativum dicoccum* Hack., and *T. ispahanium* Helsot). The tetraploid and hexaploid varieties are two-grain wheat. Two prevailing ears are the ear. Each of them is fitted with sophisticated grains. The long and firm husk is the characteristic. The stem is fragile and the spikelets fall off easily when harvested fully mature (Bavec & Bavec, 2006).

Triticum dicoccum Schrank Type Emmer (*Triticum dicoccum* Schrank) wheat grown in Anatolia is an exceptional species where is grown smoothly in an area of approximately 6,50 hectares in Kastamonu district, İhsangazi, where people can benefit from bulgur, wheat and animals from its stalks (Wikitrend, 2011).

Extensive research has shown the remains of primitive *Triticum dicoccum* Schrank in early settlements from the late Stone Age (17,000 BC) to the late Mesolithic Age and the early Neolithic (Stone Age) (10000 BC) to the Bronze Age (10,000 BC). It existed between 1,000 and 10,000 BC in the Near East, and Far East, North Africa, and Europe (Zohary & Hopf, 1988). Emmer production has been taken under protection in the south of Russia, in India, and in the isolated regions of Abyssinia (Pickersgill, 2000).

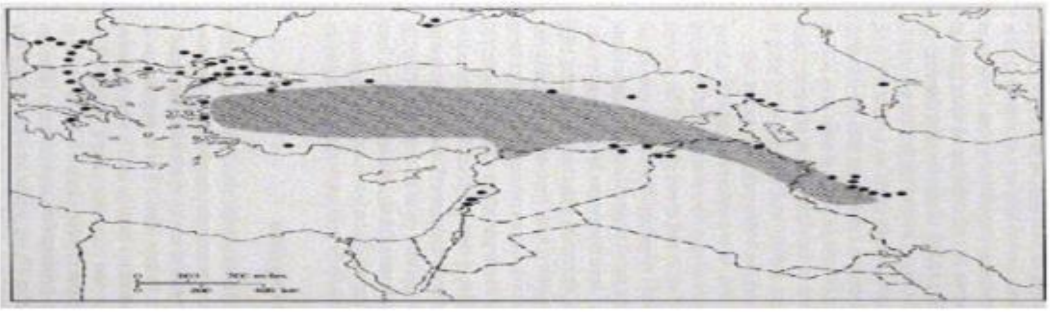

Figure 1. Distribution of *Triticum dicoccum* Schrank (emmer) wheat

Troccoli and Codianni (2005) determined the wheat type which can grow the best in insufficient or inefficient soils and found that the most economically can be cultivated one is *Triticum dicoccum Schrank*. It has a lower grain yield than durum wheat in continuous field cultivation trials, but *Phalaris arundinacea* and *Avenafatua* have higher yields than einkorn and spelt (Troccoli & Codianni, 2005).

Troccoli and Codianni (2005) stated in his study that increasing the rate of nitrogenous fertilizers decreases the yield. In a similar study, Castagna et al. (1995) found that increasing nitrogenous fertilizer does not affect the yield. These studies are important for reducing inputs in production systems such as organic agriculture.

The grain yield in emmer varies from 200 kg/hectare to 4,000 kg/hectare and there is a strong correlation between climatic conditions (location) and grain yield. The estimated grain yield is between 45% and 75% in spring wheat (Cubadda & Marconi, 2002).

Cubadda and Marconi (2002) stated that good loaves can be produced from emmer flour and that its breads made from whole grain flour have an intense texture and mild taste compared to breads made from triticale or rye. It is also stated that the texture of the loaves and emmer bread is different from the common wheat. Emmer is an ancient wheat variety that has been grown in Anatolia for centuries. It is mostly grown around Kars province and is known as farro and wild wheat. Farro wheat started to disappear in the early 2000s due to its difficult harvest because of a lack of government support; it was difficult to separate from the shell of the grain; and poor flour for good bread alone in the early 2000s. Today, it has gained importance with the efforts of some non-governmental organizations and farmers.

It was supported by the Environment Fund/Small Grants Program and it, thus, found the opportunity for national recognition. The increasing interest in healthy and safe products for a long and energetic life has played a significant role in the production of such products. Today, emmer wheat is cultivated by 400 farmers in approximately 12 provinces and around 600 tons are produced. Traditionally, bulgur, cabbage wrap, and milk soup are consumed in noodles, pastries, and bread flour (Zengin, 2015).

3. Emmer Wheat Evolution Process

Molecular genetics and archaeological data show that emmer wheat evolved from wild emmer wheat in the fertile crescent region 8,000 years ago. According to the archaeological data, it is thought that the hullless tetraploid wheats (durum and emmer) originated in the Near East and evolved from emmer wheat. The data of Zohary et al. (2000)'s RFLP studies support the hypothesis that durum wheat is derived from emmer wheat.

It has been reported by previous researchers that Emmer wheat evolved in Karacadağ in the South East (Ozkan et al., 2002). Emmer wheat culture began in Mesopotamia and western Anatolia around 6000 BC. Wheat is the most cultivated grain in the Near East. Today, it is made only in Ethiopia, Iran, Italy, Transcaucasia, Turkey and the Balkans.

A wheat collection consisting of tetraploid wheats was analyzed by Ozkan et al. (2002) with the AFLP marker system. Again, Ozkan et al. (2002) scanned the domestication geographies of tetraploid wheat with the AFLP marker system. Ozkan et al. (2002) reported that the results of these two studies support the hypothesis that Triticum dicoccoides has two very different genetic taxa. It is stated that one of these taxa emerges in the region, including Israel, Syria, Lebanon, and Jordan, while the other occurs in the central and eastern regions of Turkey and in the region, including Iran and Iraq. It is stated that this second taxa most likely constitutes the genetic source of domesticated wheat. In addition, it is explained that the Karacadağ population showing common genomic structures with Iran-Iraq lines supports the thesis that Karacadağ population may be the possible ancestor of domestic genotypes.

Enjalbert et al. (1999) used RFLP markers to compare allele frequencies in wheat populations. Two populations and six subpopulations have been studied for ten years in four different regions. They explained that, as a result of the study, the difference between the subpopulations was significantly large. The variation in allele frequencies of the populations was higher than expected. As a result of the study, they revealed that this result also affects the development process of populations.

Gupta et al. (1999) made a significant contribution to the scientific world with their study on the application areas of molecular markers in wheat cultivation. Emphasizing the importance of the development of molecular markers used for diversity studies in recent years, they stated that these molecular markers are RFLP, RAPD, DAF, AFLP and SSR, and they carried out important studies thanks to these markers. Researchers who thought that these markers were suitable for giving different characteristics to wheat germ and for mapping the genome supported their work with some other markers such as MP PCR, ESTs and SNPs. The latest information on topics such as synthetic cereal genomes marker assisted selection, proof of markers, linkage of markers with cereal cultivation, and seed breeding were examined in this study.

Li et al. (2000) aimed to reveal DNA differentiation, adaptation, and the effects of microclimatic stress factors in the wild wheat species *T. dicoccoides*. A genetic diversity study was analyzed by the RAPD-PCR method in 118 registered samples of *T. dicoccoides*. The samples used in the study are those collected from Israel. As the study area, two climatically suitable regions in the Quercus forest were preferred. The first zone is the sunlit areas between the trees, and the second zone is the shaded areas under the trees. In the study, amplification was performed using 20 oligonucleotide primers. As a result of the study, genetically single, double, and multiple loci were found among the samples grown in the shade and sun areas. The study proved that this DNA polymorphism is linked to microclimatic stress factors.
Szűcs et al. (2003) detected genetic diversity in *T. durum* seeds by means of molecular markers. RFLP and RAPD markers were used to reveal genetic variation among *T. durum* genotypes. RAPD analysis was analyzed with twenty-three winter *T. durum* genotypes of different origins. Five of them were also analyzed using the RFLP method. Eight of the sixteen RAPD primers and thirteen of the forty-seven RFLP endonuclease combinations showed polymorphism among the five T. state genotypes. Similarity values ranging from 0.04 to 0.14 were obtained by RAPD and RFLP methods. As a result of genetic diversity analysis of 23 *T. durum* genotypes using the RAPD method, polymorphism was observed in 87.5% of 16 primers. The study is important in terms of showing that there is less genetic relatedness between *T. durum* genotypes using RFLP probes and RAPD primers compared to previous studies. These results can be used to provide various agricultural characteristics to *T. durum* hybrids, in mapping studies, and in the development of breeding programs. In addition, the results presented can make the genetic characteristics of the processed *T. durum* genotypes remarkable.
Röder et al. (2000) enabled important developments in the field of biology with the study of natural selection originating from microsatellite (SSR) in wild wheat species in various ecological regions in Israel and Amniad. As the study area, Israel, the natural habitat of *T. dicooccoides*, the north of Galilee and the Amniad regions were used. These ecological areas are divided into four habitats, namely: North, Valley, Ridge, and Karst. It is divided into nine subregions in these habitats. These regions show significant differences in terms of their ecological characteristics. These differences are; the presence of stones, the height or lowness of the ecoregion, the soil surface, the moisture of the soil before or after the rain. The results of the study showed that there is significant genetic diversity and variation in four major habitats and nine sub-habitats. Habitat-specific ales and linkage imbalances were observed in karst habitat, and sub-habitats. This subpopulation showed very high genetic diversity. These results; showed that barrenness stress plays an important role in natural selection, causing deviations in non-coding sequences.
Medini et al. (2005) studied the genetic diversity of wild wheat species in the Near East using the AFLP method. Five species were used in the study. In order to explain the genetic diversity of wild wheat species, Aegilops and Triticum species originating from the Near East were propagated by AFLP method. Intra-population diversity was studied with at least seven individuals. Four primers were used for amplification. As a result of the study, polymorphic ones were determined in the observed bands. Among the five species used in the study, Aegilops speltoides is the species with the highest in-population diversity level. At the same time, these species are the species with the highest genetic diversity among populations. In Triticum species, on the other hand, in-population diversity level was observed at the lowest level in diploid species (*T. urartu* and T. *boeoticum*), while in-population diversity level was high in two tetraploid species (*T. dicoccoides* and *T. araticum*). These results revealed that the genetic diversity observed in diploid Triticum species forms the basis of interspecies diversity, while the genetic diversity observed in tetraploid Triticum species forms the basis of in-population diversity. The result of this study is important in terms of revealing the genetic diversity of wild wheat species grown in natural populations and allowing the genetic diversity in gene banks to be maintained by the AFLP method.
Karl et al. (2005) aimed to determine the genetic diversity of local hexaploid wheat species in Oman by the microsatellite (SSR) marker method. The species were grown with the help of the traditional irrigation system from the mountains in northern Oman. In this study, using the microsatellite method, it was desired to find out what kind of a relationship there was between the geographical origin of local wheat species and their genetic diversity. The wheat collection used in the study covers the Northern Oman region, where local wheat is grown. In the study, total DNA isolation was made from 6 lake plants. A population of 161 wheats was studied using 35 microsatellites. A total of 305 polymorphic bands were obtained for 35 microsatellites. 35 microsatellite values ranging from 0.02 to 0.89 and determined as 0.50 on average were obtained by the PIC method. With the highest value observed in the Batinah region, the mean heterozygosity value for 35 microsatellites was determined as 9.09. The average number of specific alleles was determined as 1.85 and the highest value was observed in the Dakhilia region. The average number of alleles differed for each region. These results showed a correlation between the number of alleles and genetic diversity in all regions. The correlation between the two values observed for 35 microsatellites was found to be 0.657. In addition, correlation values for Batinah, Dahinah, Dakhilia, and Sharguia materials were determined as 0.718, 0.706, 0.657, and 0.651. These values show that all local wheat species are related to each other. Most of the local wheat species were distinguished by this cluster analysis. However, this study was not sufficient to distinguish some wheat species. This study showed that local wheat species in Omani have very high genetic diversity values, and at the same time, microsatellites are very important in the identification of these wheat species.
Joshi et al. (2000) stated in their study in the last 20 years that DNA markers have shown great improvement in the last 20 years, and with this development, they can be used in many subjects such as molecular biology studies, plant genome analysis studies, taxonomy, physiology, ecology, genetics and plant breeding. He showed that he made great contributions to the science of biology.
Teklu et al. (2006) analyzed genetic diversity with microsatellites in tetraploid native wheat grown in Ethiopia. The researchers studied Triticum durum Dasf, which was grown in Ethiopia; *T. dicoccon* Schrank and *T. turgidum* L. analyzed 141 tetraploid wheats using 29 microsatellites. They obtained a large number of alleles and high levels of polymorphism

from each species. Compared with *T. dicoccon* (*T. turgidum*) wheat, they observed that *T. durum* had a higher level of genetic diversity. They found that microsatellites with (GA) n motifs had more alleles than (GT) n motifs. Teklu et al. (2006) analyzed genetic diversity with microsatellites in tetraploid native wheats grown in Ethiopia. The researchers studied *Triticum durum* Dasf, which was grown in Ethiopia; *T. dicoccon* Schrank and *T. turgidum* L. analyzed 141 tetraploid wheats using 29 microsatellites. They obtained a large number of alleles and high levels of polymorphism from each species. Compared with *T. dicoccon* (*T. turgidum*) wheat, they observed that *T. durum* had a higher level of genetic diversity. They found that microsatellites with (GA) n motifs had more alleles than (GT) n motifs.

Teklu et al. (2007) analyzed variation in genetic diversity with SSR markers in emmer wheat (*T. dicoccon* Schrank). They investigated genetic diversity in 73 emmer wheat accessions collected from 11 different geographic locations using 29 SSR markers. They used at least two markers that recognized each chromosome from the markers they used. SSR primers produced a total of 357 different alleles with an average of 12.31 per locus. The number of fragments produced by each primer ranged from 6 (Xgwm 1066) to 21 (Xgwm 268). They found genetic diversity with twenty-nine primers, with an average of 0.82, ranging from 0.60 (Xgwm 46) to 0.9 (Xgwm 655). They stated that a significant correlation ($r = 0.882$; $p<0.01$) between the number of loci and the genetic diversity index was a high indicator of diversity. They explained that analysis of genetic diversity within and between eleven geographic locations showed that most of the genetic diversity arose within regions. Genetic differentiation (GST = 0.27) showed genetic variation among eleven regions. Accordingly, while the genetic variation within the regions was 75%, the genetic variation between the regions was determined as 27%. They found the highest number of alleles per locus (4.80) in the Iranian region. It was followed by Morocco (4.10) and Armenia (4.03). Conversely, a lower average number of alleles (2.83) was detected in the Yemen region. The mean genetic diversity index in all regions ranged from a mean of 0.60 to 0.52 (Slovakia) and 0.67 (Morocco). The multivariate techniques principal component analysis and cluster analysis (73) were applied to examine genetic relatedness between collections of emmer wheat accessions and geographic regions. The genetic distance coefficient for comparison of 55 possible pairs of regions ranged from a mean of 0.82 to 0.63 (Iran and Armenia, Georgia and Azerbaijan, Georgia and Slovakia) and 0.97 (Morocco and Yemen, Spain and Georgia, Turkey and Iran). According to the PCA results, the first two principal components explained the variation with 27%, and cluster analysis also showed the geographic differentiation pattern except for a few accessions in the Caucasus region. It provided information about emmer wheat according to the relationships of origins of geographic regions. This information can be used in plant development, germplasm protection programs, and further research.

4. Economic Importance of Wheat in The World and Turkey

Wheat, which is important because it adapts to many climatic and geographical conditions in the world, is easy to produce, is energizing and satisfying, is the most important food source in many countries. Depending on the type and variety, it is used as a raw material in the production of many consumer goods such as pasta, bulgur, noodles, biscuits, crackers, wafers, cakes, bagels, pastries, breakfast cereals, snack foods, starch, vital gluten, and starch-based sugars. is used.

Pasta is the most important food item after bread among the basic food sources of the people, especially in developing countries. Wheat of the Triticum durum type is used as a raw material in pasta making.

Due to the rapid increase in Turkey's population, it is of great importance to increase the efficiency of plant production in our limited agricultural areas in solving nutritional problems. Undoubtedly, one of the most important plants in the nutrition of Turkey's people is wheat. Many nutrients obtained from wheat products in human nutrition; The stems of the wheat plant are used in various industries such as paper-cardboard and animal nutrition. For this reason, when there is a decrease in wheat production for any reason, both in the world and in Turkey, it directly affects everyone as both the prices of bread and the prices of foodstuffs made from wheat increase. For this reason, it is of strategic importance for each country to be sufficient in terms of wheat production and to have enough wheat products in their stocks. According to the 2019 data of the Turkish Statistical Institute (TUIK), wheat, which is used extensively in nutrition in Turkey, has a cultivation area of 79 192 084 decares (d) in Turkey, a production of 19 million tons and a yield of around 240 kg/d. Yield per unit area is below the world average.

Again, according to 2019 TUIK data, wheat remains the primary product among cereals with its cultivation area of 79 192 084 decares and production of 19 million tons. Wheat is followed by products such as barley, corn, sunflower, cotton and sugar beet.

Turkey is located in the fertile crescent with durum wheat gene centers and is among the important wheat producer countries in the world. 54.6% of the cultivation areas are located in South East Anatolia, 25.4% in Central Anatolia and 16.4% in the North-West Passage Region. On the basis of provinces, Şanlıurfa is in the first place with 25.9%, Konya is in the second place with 15.9% and Mardin is in the third place with 11.7%. Especially our South East Anatolia Region is thought to have the potential to meet the demand for durum wheat, which is expected to increase in the world.

5. Conclusion

A member of the wheat family, emmer (*Triticum dicoccum*) is an annual grass. When initially domesticated in the Near East, emmer was one of the most frequently grown wheats in the ancient world because of its low yield and bristle like appendage. This kind of wheat is known as hulled wheat because it contains hulls or husks that protect the grain. Grains may be freed from their outer husks after the grain has been threshed, although this process is time-consuming and labor-intensive.

Starch wheat, rice wheat, or two-grain spelt are all other names for emmer, a kind of wheat that is high in starch. It was once one of the most precious crops in the world, but until recently, emmer has fallen out of favor. As recently as a few years ago, it was mostly used for cattle in the highlands of Italy, Spain, Germany, Switzerland, Russia, and the United States.

For thousands of years, the Egyptians relied on emmer as a healthy food source. In Italy, where it was first grown thousands of years ago, it is still being grown today. Vitamins, minerals, and fiber are all found in emmer. Vegetarians and those wishing to increase their intake of plant-based protein may benefit greatly from the combination of it with beans, which provides a complete protein supply. It may be used to create bread or pasta, as well as an excellent salad grain. It may also be used in soups and as a replacement for rice in recipes like a vegetable curry. Instead of rice, consider using farro. Additionally, there are heritage types such as Turkey Red Wheat, in addition to the three grains known as farro (einkorn, spelt, and emmer). Each type has a similar nutritional profile and a few distinct taste characteristics. Micronutrients such as minerals and antioxidants are more abundant in ancient grains such as emmer than in current wheat varieties. All ancient and heritage wheats include gluten, though. Proteins present in grains are combined to form gluten. However, emmer is not a smart option for anybody with gluten sensitivities, regardless of whether or not they also react to the gluten in ancient grains. Celiac disease sufferers should steer clear of them at all costs.

Especially in recent years, the tendency towards spelt (einkorn, emmer, and spelt) and diet products and organic foods produced from these wheats has increased rapidly throughout the world. Among the reasons for this increased interest are the high protein content of these species, their richness in microelements, amino acids, and vitamins. Although einkorn and emmer cultivation, which has a deep historical background, is still carried out in very few areas, emmer wheat has a high genetic diversity in terms of these species. With the excavations carried out to date, it has been revealed that the region where these species originate is the "Fertile Crescent" region, which is also within the borders of Turkey.

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