

Importance of Durum Wheat Breeding in Terms of Bulghur in Southeastern Anatolian Region of Turkey *

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Abstract— Durum wheat, it has only been produced in the specific zones of the world and Turkey is a major producer with 3.5 million tons/year, has basically been used for bulghur and pasta. Notwithstanding our country is self-sufficient in durum wheat production, it has quality deficit with respect to high quality varieties. In order to close that quality shortage it has been needed quality durum wheat imports.

Although the durum wheat is pronounced as macaroni wheat in our country, it is used for bulghur in large proportion (66.5 %) in Turkey. Generally, bulghur is used as pilaw and it is more healthier and cheaper in comparison with rice. The importance of bulghur in terms of human nutrition is better understood with each passing day. In recent years, it has also been seen a serious trend in favor of bulghur in Europe and America. Bulghur production in Turkey was performed around 1 million tons in about 500 plants in 2001. This amount increases if productions of family working are also added. It can be said that bulghur has an important exportation potential for our country with given the number of operating and production capacity.

Therefore, in terms of both to meet the demands of industry and manufacturers can market their products without problem as well as consumer health to ensure sufficient quantity and quality durum weath production which is the raw materials of qualified bulghur, it should be given weight to durum wheat breeding programs and it can be shown a greater sensitivity to this issue.

Keywords—Bulghur, Durum Wheat Breeding, Quality, Southeastern Anatolian Region of Turkey.

I. INTRODUCTION

DURUM wheats, which have an important place in the wheat species, have only been produced as limited and in the specific zones of the world. It is the fact that Turkey and Middle Eastern Countries are known as producer of durum wheat because it is produced there for many years. South, West and Thrace are most suitable regions in point of both agronomic and quality in our country [1]. Southeastern Anatolia Region has a huge agricultural potential with the presence of extensive land and favorable climate conditions for durum wheat. This region is considered as one of the few places of the world for growing durum wheat because of its ecological conditions along with considered as one of the gene

centers of world [2]. Therefore, this region has possibility of obtaining more efficient and high quality products than other regions. Also, Southeastern Anatolia Region is of great importance due to the fact that it is durum wheat belt of our country and high durum quality region. About 4 million tons, a substantial part of the production of durum wheat of world, have been producing in Turkey. In our country, it has produced bulghur, noodles and bread than durum wheat except pasta unlike other countries in the world [3].

Grain based industry has a vital place in Turkey's food sector. Due to its rapidly growing population and constant increase in the demand for grain products, grain products processing industry shows a quite dynamic aspect. Durum wheat is the basic raw material for macaroni and bulghur. Durum wheat is produced in a limited number of countries in the world and Turkey is one of the most important countries that produce durum wheat in the world. The quality of durum wheat is one of the most important factors that influence the quality of pasta [4].

Wheat quality is very important for both farmers and industrialists. Although it hasn't been a considerable alteration in planting area in last forty years in Turkey, it has been supplied wheat demand with increase in production via utilization of certificated seed and productive varieties and rise in irrigation possibility and appropriate cultivation techniques, however this situation caused quality problems. Also, it hasn't been seen the important wheat scarcity owing to increment in yield in Turkey, so far. But, the present quality problem has increased wheat imports to about 3.5 million tons. Incoming to our country in the last 20 years, 30 million tons of imported wheat are caused by our need to high-quality wheat. In spite of the fact that our quality wheat production is varying according to the years, unfortunately, it has not reached to desired level. This situation and developments in the world and the growing of wheat imports in recent years has revealed that serious measures should be taken in the coming periods [5].

Southeastern Anatolia Region is an important center in point of durum wheat and its products (bulghur, pasta). However, the production of durum wheat at the desired quality level, which is not achieved, is still one of the most important problems of the sector. They need high quality durum wheat and gets quality durum wheat via import way [6].

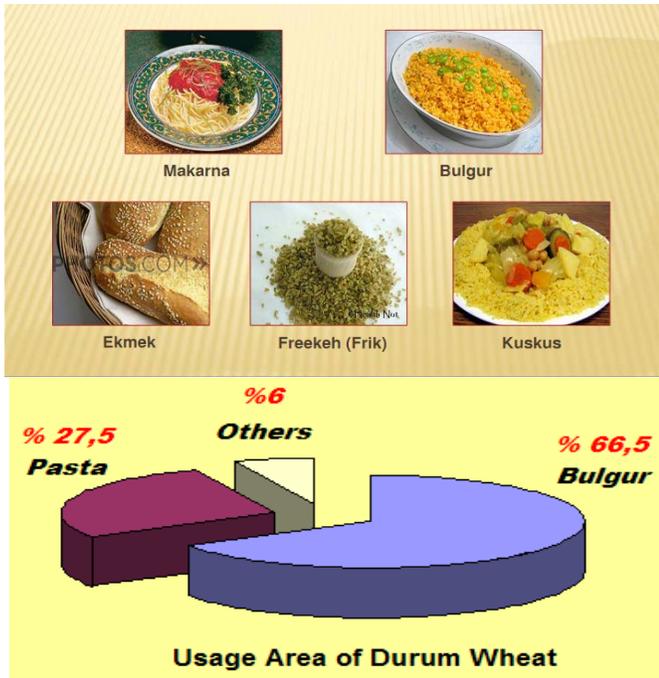
II. IMPROVEMENT- EVALUATION- INTERPRETATIONS

Usage areas of durum wheat especially focus on pasta and bulghur. Although durum wheat is pronounced as macaroni

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* Only abstract of this study was offered to International Symposium Genetics and Breeding of Durum Wheat. Also this study was performed with support of the Scientific and Technological Research Council of Turkey.

wheat in Turkey, actually it is highly used as bulghur. Durum wheat is utilized as bulghur in the region, too [7, 8]. Durum wheat grain is mainly utilized in the following ways in Turkey: (i) pasta 346,000 tons (27.5% of durum wheat production); (ii) bulghur 839,000 tons (66.5% of durum wheat production); (iii) other 75,000 tons (6.0% of durum wheat production) [9, 10].



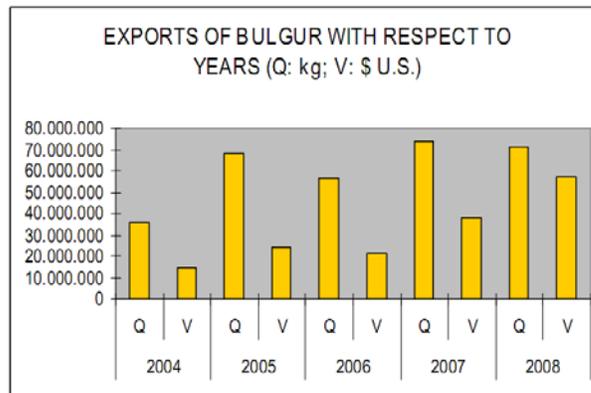
Bulghur is too rich in terms of nutritional value. Compared to pasta and rice, in the same consumption-class, bulghur is cheaper and more nutritious. Especially, compared to rice with regards to B vitamin group, bulghur is too rich and therefore it is food proposed instead of rice in some country where rice is very consumed by human. So, it is a good nourishment for consumer. Also it is a food item with durable and easy preparation in addition to the simplicity of the production technology [11, 12].

A study conducted by the Center of Science in the USA in 1992. In this study, being a number with 69 points in the food table, bulghur were followed by wheat, rice, pasta and oats. In the same study bulghur took third place after barley and oats in terms of fiber and left behind pasta and wheat [13, 14].

Although Turkey is a country which imports of rice, exports bulghur. Bulghur takes part among semi-finished which rarely seen products in food industry [15]. Today, the number of bulghur plants are nearly 500 and about 1 million ton of bulghur are produced annually in Turkey. This production was greater 2.5 times than macaroni (pasta) production. This amount of production increases when productions of home and villages are added [14]. Average consumption of bulghur is 12 kg per person. This value is around 23 kg in the east region while 7 kg in the the western regions. Amount of production and the economic value of bulghur have been continuing to increase year by year. This increase in production, together with the recognition of bulghur at the abroad, has been leading to an increase in exports [16].



Exports of bulghur with respect to year and destination countries have been seen [17].



Source: Turkish Institute of Statistics

In recent years, bulghur have been produced in abroad, too. For example, the total number of bulghur plants are around twenty in USA and Canada. The annual bulghur production is 250,000 tons/years in United States. Bulghur is usually known and consumed by society of Arabic, Greek, Armenian and Turkish in EU countries. Turkey is the largest provider of bulghur according to official records. Along with Turkey, there are bulghur manufacturer in France, Greece and Sweden. Annual production of the manufacturers in Europe are around 2,000-3,000 tons, but sale value is low due to the problems of quality and acceptability. Factories have been also established in Arab and European countries for last five years [18]. While bulghur was produced in small quantities for those who originated from Middle East in the United States in the past, it was began to be produced in a wide range of to export including the Middle East to other countries, to help the communities where it is seen the malnutrition and school nutrition programs after World War II [19].

Exports of Bulghur with Respect to Destination Countries (Q=kg, V=\$)

Country	2006		2007		2008	
	Q	V	Q	V	Q	V
IRAQ	16.152.114	5.582.136	21.587.171	8.679.140	21.443.876	15.045.876
LIBERIA	7.988.000	2.276.596	17.119.000	7.394.343	16.483.500	10.268.891
GERMANY	5.871.528	3.116.336	8.711.345	6.696.990	8.379.396	10.091.818
SIERRA LEONE	5.263.500	1.528.214	7.480.000	3.112.335	6.408.800	3.583.055
SAUDI ARABIA	4.583.277	1.627.928	913.527	452.339	1.882.190	1.674.987
FRANCE	565.367	274.754	1.224.639	920.082	1.383.874	1.621.245
THE NETHERLANDS	1.084.055	559.775	1.891.060	1.297.938	1.282.556	1.557.236
ISRAEL	3.042.794	1.062.247	2.367.443	1.063.016	1.776.309	1.403.635
U.K.	1.032.230	529.783	1.236.056	840.454	1.035.399	1.168.933
MAURITANIA	1.491.500	445.596	1.067.650	426.505	1.692.000	1.058.254
SWEDEN	849.416	495.128	1.612.139	1.161.483	806.293	860.705
AUSTRALIA	902.300	420.736	730.386	466.521	789.177	802.246
U.S.A.	646.107	310.345	740.741	470.830	688.895	779.594
TURKISH REP. NORTH. CYPRUS	891.811	376.263	1.186.740	722.481	778.578	745.319
BELGIUM	607.501	304.703	834.773	558.428	550.156	641.173
JORDAN	547.808	206.009	216.120	108.478	649.459	576.780
RUSSIAN FED.	364.244	205.012	421.900	344.879	501.990	573.936
U.A.E.	605.021	231.499	827.034	468.336	683.828	562.061
AUSTRIA	245.242	127.214	301.737	237.479	375.328	464.292
DENMARK	303.707	147.657	321.198	218.217	311.084	380.006
KUWAIT	679.308	287.235	539.689	282.138	416.405	378.760
CANADA	214.501	104.420	310.872	185.251	374.285	378.349
SWITZERLAND	216.490	112.656	243.245	176.492	308.573	362.212
GREECE	263.595	110.797	270.787	182.924	274.323	268.828
AZERBAIJAN	105.842	50.369	221.104	145.400	271.415	260.679
NORWAY	126.882	74.769	90.240	70.100	138.866	173.650
SYRIA	0	0	6.000	3.780	193.020	134.419
EGYPT	46.000	17.340	38.154	18.070	111.449	108.841
KAZAKHSTAN	89.128	48.931	115.588	86.592	99.520	104.910
TOTAL (OTHERS INCLUDED)	54.779.068	21.468.345	72.624.338	37.608.805	70.070.544	56.977.972

Source: Turkish Statistical Institute

Wheat type in bulghur production is one of the important factors affecting the quality of bulghur. In the production of wheat is usually expressed that it is used durum wheat having the bright yellow color and rich protein [20, 21]. However, the desired level of bulghur quality is always not possible. There are several reasons for this and one of the most important is that appropriate raw materials can't be selected [22]. To obtain a product of high quality and healthy at every stage of production it must be used the most appropriate genotypes. Like wheat quality is effected by the variety and environment, processing quality of wheat and produced bulghur quality is under the influence of the variety and environment, too [23]. Today, it has being developed the breeding understanding regarding this.

The wheat improvement concept of the future will be in the direction of satisfying consumer demands on the final product. In recent years, increases have been observed in technology and the consumers' search for new product. In addition, changes in the European Union process brings about some regulations in Turkey. Therefore, there is a need for developments of platforms for relevant people from each sector to discuss these progresses together. It appears that wheat producers, wheat sellers such as mercantile exchanges and Turkish Grain Board, research institutes, seed growing sector, universities, industrialists and exporters need to engage more in dialogue together. Moreover, functional foods, nutrition and food security are the topics that should be discussed on the basis of the sector. In the ancient time, the first agriculture took place in the Fertile Crescent which

includes also Southeastern Anatolia Region today. Southeastern Anatolia Region is known as the gene center of wheat. Especially Şanlıurfa and its surroundings are known as our country's durum wheat belt. In this respect, the region is of capital importance in terms of durum wheat processing industry [4].

III. RESULTS AND SUGGESTIONS

Nowadays, in order to increase the production of durum wheat and to have the desired high quality, to concentrate to the breeding working for the quality of durum wheat varieties in addition to high-yield is of great importance. In this way, decreasing durum wheat production will rise again, foreign-dependence of agricultural industry manufacturing this product will reduce [24].

Quality of raw materials should be improved and raw materials should be produced enough to meet the need of the pasta and bulghur sector and in order to produce quality products that the consumers desire in the coming years [4].

As a result, contribute to human health by increasing the bulghur consumption of Turkey in according to rice, to subject to genetic screening durum wheat cultivars and lines in order to identify genotypes with high value in terms of bulghur quality needed by industrial sector, to focus on breeding programs to be executed for the high-quality bulghur varieties in Southeastern Anatolia Region, which is one of the gene centers, thereby to increase the production of durum wheat and to be supplied needs of agricultural industry from its region for bulghur are of great importance.

ACKNOWLEDGMENT

Sponsor and financial support acknowledgments are placed in the unnumbered footnote on the first page.

REFERENCES

- [1] Doğan, R., 2004. Determination of Some Agricultural Properties of Improved Durum Wheat Lines in Bursa Conditions. Uludağ Univ. Agric. Fac. Journal. 18(1), 193-206 (in Turkish).
- [2] Genç, İ., Yağbasanlar, T., Özkan, H., Kılınc, M., 1993. Some Researchs on Adaptation of Some Selected Durum Wheat Lines in SAR irrigation conditions. Durum Wheat and Its Products Symp., Ankara, 261-274 (in Turkish).
- [3] Özberk, I, Ozberk, F, Braun, H.J., 2003. Performance and stability of CIMMYT-derived durum wheat cultivars in the Souteastern Anatolia Region. Arnel R.Halleuer International Symposium on Plant Breeding, 17-22 August, Mexico city, pp:58-60.
- [4] Millma, 2010. Miller Magazine, İstanbul, (21):30-31. <http://www.millermagazine.com/arsiv/sayi21.pdf>
- [5] UHK, 2011. Ulusal Hububat Konseyi Buğday Raporu, Mayıs-2011 (National Cereal Council Wheat Report, May-2011), pp:2, <http://uhk.org.tr/dosyalar/bugdayraporumayis2011.pdf>
- [6] TMSD, 2008. Türkiye Makarna Sanayicileri Derneği (Turkey Macaroni Industrialists Society), pp:32, http://www.makarna.org.tr/dosyalar/21_8_28.doc.
- [7] Kılıç, H., Dönmez, E., Yazar, S., Şanal, T., Altıkat, A., 2007. Determination of Durum Wheat Varieties that Suitatble to Elazığ and Malatya Conditions. Vegetal Research Journal, (2): 6–13 (in Turkish).
- [8] Anonymous, 2006. Publication of Southeast Anatolian Agricultural Research Institute. No: 2006/1 s,18 (in turkish).
- [9] Zencirci, N., Aktan, B., 1998. A report on durum wheat quality in Turkey. <http://resources.ciheam.org/om/pdf/a22/95605361.pdf>.
- [10] TUIK, 1991. State Institute of Statistics, Agricultural Statistics, State Institute Publications, Ankara.

- [11] Özkaya, B., 1997. Important of Bulghur Processing Technique in terms of Nutrition Quality, 2.Flour-Bulghur and Biscuit Symp. Karaman,153-164 (in Turkish).
- [12] Bayram, M., 2000. Bulghur Around The World. Cereal Foods World. Vol.45 No.2. 80-82.
- [13] Dönmez, E., Salantur, A. Yazar, S., Akar, T., Yıldırım, Y., 2004. Place of Bulghur and to Improve Bulghur Varieties in Country. TARM Journal, Ankara (in Turkish).
- [14] Bayram, M., Öner, M. D., 1996. Today's Situation and Problems of Bulghur Production. Food Technology Journal, 1(8),39-45 (in Turkish).
- [15] Bayram, M., 2005. Bulghur The Product Of Ancient World And Mystery. Bulghur: The Product of Ancient World and Mystery", (Eds. Bayram, M. Avcı, A., Arslan, O.), Gaziantep Univ. and Bulghur Industrialists Club, pp:22-23, 30-33.
- [16] Bayram, M., Öner, M.D., Kaya, A., 2002. Cereal Products Technology Congress and Exhibition. Gaziantep (in Turkish).
- [17] IGEME, 2009. Bulghur, Prime Ministry Undersecretariat for Foreign Trade Export Promotion Centre, <http://www.economy.gov.tr/upload/sectoralreports/Bulghur.pdf>.
- [18] Bayram, M., Öner M.D., 2004. Bulghur Sector in 2003. 1-2. Floury Products Technology, 61:23-29, 62:20-30 (in Turkish).
- [19] Baysal, A., 1996. Important of Bulghur in point of Nutrition and Health. 2. Flour, Bulghur and Biscuit Symp. Karaman, 23-30 (in Turkish).
- [20] Tekeli, T., 1964. Bulghur, Cereal Technology. Ankara Univ. Agri. Fac. 228, 103-109, (in Turkish).
- [21] Elgün, A., ve Ertugay, Z., 1992. Cereal Processing Technology, Atatürk Univ. Agri. Fac. No: 297, Lesson Books Series. 52, 346-348 (in Turkish).
- [22] MEGEP, (Professional Training and Teaching System Strengthening Project), 2009. Food Technology, Bulghur Production-1, National Training Ministry, Ankara, s: 6 (in Turkish)
- [23] Aydın F., Koçak, A.N. and Dağ, A., 1993. A Research on Determination of Bulghur Quality of Some Wheat Varieties. Durum Wheat and Its Products Symposium. Ankara, 310-315 (in Turkish).
- [24] Sözen, E. ve Yağdı, K., 2005. Determination of Quality Properties of Some Advanced Durum Wheat Lines. Uludağ University Agricultural Faculty Journal, 19 (2), 69-81, (in Turkish).