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Importance of durum wheat breeding in terms of bulgur in Southeastern Anatolian Region of Turkey

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Abstract. Durum wheat is grown in specific regions of the world, with Turkey being a major producer with 3.5 million tons/year of grain. It has basically been used for the production of bulghur and pasta. Although Turkey is self-sufficient in durum wheat production, the quality falls short of the finest varieties grown in other parts of the world and Turkey has to import better quality varieties to close this quality gap.
In Turkey 66.5% of the durum wheat, termed as "macaroni wheat", is used for making bulghur and the rest for pasta products. Generally, bulghur is used to make "pillaf" as it is cheaper and healthier than rice. The importance of bulghur in human diet is being appreciated and this trend has progressed to Europe and even as far as America. During 2001 about 1 million tons of bulghur was produced by about 500 manufacturing plants throughout the country. In order to meet the demands of industry and consumer preferences, greater importance has been given to durum wheat breeding in Turkey in recent years.

Keywords. Durum wheat breeding – Quality – Bulghur – Southeastern Anatolia – Turkey.

Importance de l'amélioration du blé dur pour la production de boulgour dans le sud-est de la région anatolienne de la Turquie

Résumé. *Le blé dur est cultivé dans des régions spécifiques du monde dont la Turquie qui est un important producteur avec 3,5 millions de tonnes/an de grain. Il est essentiellement utilisé pour la production de boulgour et de pâtes. Bien que la Turquie soit autosuffisante pour la production de blé dur, la qualité est inférieure par rapport aux meilleures variétés cultivées dans d'autres parties du monde et ce pays doit donc importer des variétés de meilleures qualités pour combler cet écart.*

En Turquie, 66,5% du blé dur, qualifié de "blé macaroni", est utilisé pour la fabrication de boulgour et le reste est destiné à la production de pâtes. Généralement, le boulgour est utilisé pour faire le "pillaf", car ce produit est moins cher et plus sain que le riz. L'importance du boulgour dans l'alimentation humaine est appréciée et cette tendance s'est répandue en Europe et a gagné du terrain même en Amérique. En 2001, environ 1 million de tonnes de boulgour ont été produites par environ 500 usines de production disséminées à travers tout le pays. Afin de répondre aux demandes de l'industrie et aux préférences des consommateurs, une plus grande importance a été accordée à l'amélioration du blé dur en Turquie au cours des dernières années.

Mots-clés. *Amélioration du blé dur – Qualité – Boulgour – Sud-est de l'Anatolie –Turquie.*

I – Introduction

The Mediterranean region, including Turkey, has been known for durum wheat for centuries. The South, West and Thrace are most suitable regions both agronomically and quality-wise for the cultivation of durum wheat in Turkey (Doğan, 2004). Southeastern Anatolia Region has a huge agricultural potential with the presence of extensive land and favorable climate conditions for durum wheat (Genç *et al*., 1993). Therefore, this region has potential for producing more efficient and high quality bulghur products than other regions. In our country, more bulghur, noddles and flat-bread are produced from durum wheat than any other wheat, unlike other countries in the world (Özberk *et al*., 2003).

Grain based industry has a vital place in Turkey's food economy sector. Due to the country's rapidly growing population and constant increase in the demand for grain products, grain processing industry has a remarkable potential for growth. Durum wheat quality is one of the most important factors that determine the quality and consumer acceptance of the end-product (Millma, 2010).

Wheat quality is very important for both farmers and industrialists. Although the area planted to durum wheat in Turkey has not changed much in the last 40 years, increase in demand has been largely met with increase in production via utilization of certificated seed and high-yielding varieties, coupled with application of irrigation. However, this has resulted in some quality problems which has required import of high-quality durum wheat from other sources to about 3.5 million tons. In spite of the fact that durum wheat quality is improving, there is still much scope for improvement. This situation and unstable developments in the region and the growing of wheat imports in recent years has meant that serious measures should be taken to improve durum production and quality in Turkey (UHK, 2011).

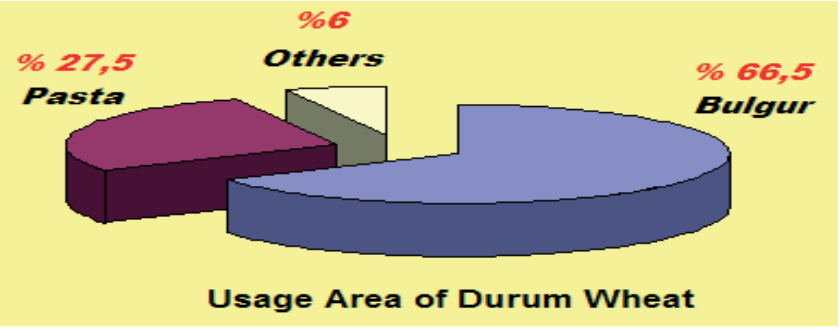

Figure 1. Durum wheat products and their relevance.

Southeastern Anatolia Region is an important center for durum wheat and its products (bulghur, pasta), however, the production of durum wheat at the desired quality level has not been reached. The farmers need high quality durum wheat to sow so that the same does not need to be imported as at present (TMSD, 2008).

II – Improvement, evaluation, interpretation

As mentioned above, durum wheat is used for making bulghur and pasta in Turkey (Kılıç et al., 2007; Anonymous, 2006). The production figures are as follows: (i) pasta 346,000 tons (27.5%); (ii) bulghur 839,000 tons (66.5%); (iii) other 75,000 tons (6.0%) (Zencirci and Aktan, 1998; TUIK, 1991).

Figure 2. Bulgur preparation at home.

Bulghur possesses high 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 very rich and therefore it is proposed as a substitute for rice in some countries, where there is high consumption of rice. Also it is a food item with durable and easy preparation, as far as the production technology (Özkaya, 1997; Bayram, 2000).

A study conducted in the USA in 1992, bulghur scored 69 points in the food table 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 (Dönmez *et al*., 2004; Bayram, 2005).

Turkey is a country which imports rice and exports bulghur. Bulghur takes part among semi-finished food products which is rare in the food industry (Bayram *et al*., 1996). Today, the number of bulghur processing 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 urban homes and villagers are added (Bayram, 2005). Average consumption of bulghur is 12 kg per person on a country average. This value is around 23 kg in the East region and 7 kg in the the western regions. Amount of production and the economic value of bulghur have been increasing year after year. This increase in production, together with the recognition of bulghur as a superior food source, vitamins-wise, has been leading to an increase in bulghur exports (Bayram *et al*., 2002).

Figure 3. Amount (Q = Kg) and value (V = US $) of bulgur exports from Turkey with respect to year (IGEME, 2009).

In recent years, bulghur has been produced outside Turkey as well. For example, the total number of bulghur plants have jumped from almost nil to around twenty in USA and Canada alone. The annual bulghur production is 250,000 tons/year in United States. Bulghur is usually known and

consumed by Arabic, Greek, Armenian, and Turkish speaking peoples in the EU countries. Turkey is the largest provider of bulghur according to official records to these countries. Along with Turkey, there are bulghur manufacturers in France, Greece, and Sweden. Annual production of the manufacturers in Europe are around 2.000-3.000 tons/year, but sale value is low due to the problems of quality and acceptability. Factories have been also established in Arab and European countries in the last five years (Bayram and Öner, 2004). While bulghur was produced in limited quantities for those who migrated from Middle East to the United States in the past, The U.S. has begun to produce a wide range of products for export including the Middle East to other countries (Baysal, 1996).

Wheat type in bulghur production is one of the important factors affecting the quality. The bright yellow color and high protein is preferred (Tekeli, 1964; Elgün and Ertugay, 1992). 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 cannot be always be selected (Megep, 2008). To obtain a product of high quality at every stage of production it becomes necessary to select the most appropriate genotypes. Bulghur quality is under the influence of the variety and environment, too as with other types of wheat (Aydın *et al*., 1993).

Table 1. Export destination of bulgur from Turkey (Q = 000 Kg; V = 000US $).

	2006		2007		2008	
Country	**Q**	**V**	**Q**	**V**	**Q**	**V**
Iraq	16,152	5,582	21,587	8679	21,443	15,045
Liberia	7,988	2276	17,119	7394	18,493	10,268
Germany	5,871	3110	9,711	6090	8,379	10,091
Sierra Leone	5,283	1528	7,480	3112	6,408	3,583
Saudi Arabia	4,583	1627	913	452	1,992	1,574
France	585	274	1,224	920	1,393	1,621
The Netherlands	1,084	559	1,891	1297	1,262	1,557
Israel	3,042	1062	2,367	1063	1,776	1,403
UK	1,032	529	1,230	840	1,035	1,168
Mauritania	1,491	445	1,067	428	1,692	1,058
Sweden	849	485	1,012	1161	806	860
Australia	902	429	730	466	789	802
USA	646	310	740	470	688	770
Rep. N Cyprus	891	376	1,186	722	778	745
Belgium	607	304	834	558	550	641
Jordan	547	206	276	108	649	576
Russian Fed.	364	205	421	344	501	573
UAE	605	231	827	488	683	562
Austria	245	127	301	237	375	464
Denmark	303	147	321	218	311	380
Kuwait	679	207	539	292	416	378
Canada	214	104	515	185	374	378
Switzerland	218	112	243	176	308	352
Greece	283	110	270	182	274	268
Azerbaijan	105	50	221	271	271	250
Norway	129	74	90	70	138	173
Syria	0	0	6	3	193	134
Egypt	46	17	36	18	111	108
Kazakstan	89	48	115	86	99	104
Total (others included)	54,779	21,465	72,624	37,609	70,070	56,977

The wheat improvement concept of the future will be in the direction of satisfying consumer demands on the final product. In recent years, advances have been observed in technology and

the consumers research for new/better products. In addition, changes in the European Union processing laws brings about some regulations in Turkey too. Therefore, there is a need for development of platforms for relevant scientists and other persons from each sector to discuss these progress and regulations together. It is imperative that wheat producers, wheat sellers, such as mercantile exchanges and the Turkish Grain Board, research institutes, seed growing sector, universities, industrialists, and exporters should engage in more in dialogue together. Moreover, functional foods, nutrition, and food security are the topics that should also be discussed. Southeastern Anatolia Region falls within 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 (Millma, 2010).

III – Conclusions

Nowadays, in order to increase the production of durum wheat and to have the desired high quality, it becomes necessary to concentrate on breeding for the quality of durum wheat varieties in addition to high-yield. In this way, it is hoped that the currently decreasing durum wheat production will rise again in Turkey, and the foreign-dependence of agricultural industry who are manufacturing this product will be reduce (Sözen and Yağdı, 2005).

Quality of raw materials should be improved in order to produce products that the consumers desire in the coming years (Millma, 2010). Contributions could be made to human health by: 1) increasing the bulghur consumption of Turkey on par with rice, 2) subject to genetic screening durum wheat cultivars and lines in order to identify genotypes with high values in terms of bulghur quality needed by the industrial sector, and 3) to focus on breeding programs to be executed for the high-quality bulghur varieties in Southeastern Anatolia Region.

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