



Variety Development of Wheat in Turkey and the Impact of Regulations

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ABSTRACT

The main aims of this study were to compile the historical wheat variety list released in wheat breeding in Turkey, to compare the wheat variety release with some selected countries and evaluate the impact of regulations on wheat research and variety development. Wheat breeding started in 1925 soon after the foundation of Republic of Turkey. First variety was released in 1928, and 617 wheat varieties were released since then. National Variety List (NVL) was published every year, however only 484 of total released varieties are currently in the NVL. 485 varieties are of bread wheat and 128 of them are durum wheat, 2 two are of *Tr. monococcum*, 1 is of *Tr. turgidum* and 1 is of *Tr. spelta*. As Turkey has diverse growing conditions, spring, winter and facultative bread and durum wheat varieties are grown, and varieties are released for these conditions. 316, 191 and 110 varieties of winter, spring and facultative wheat have been released, respectively. The comparisons were made for variety release among Turkey, Iran, Hungary and the UK. The highest number of varieties released per ha was in UK followed by Hungary, Turkey, Iran in 5-year-period. New regulations stimulated releasing greater number of varieties and involvement of private sector in breeding. Surveys are made to find out the varieties planted in the farmers' field and their adoption rates. New molecular technologies, such as fingerprinting can be used to increase accuracy of the variety identification and adoption rate of any variety in such surveys.

Keywords: wheat, breeding, variety, National Variety List

Introduction

Considering the importance of wheat products in people's diet and wheat trade internally and internationally, wheat is a staple food and strategic crop in Turkey. Though, wheat has been grown in Turkey for about 10 000 years, modern wheat development activities started much later. During the Ottoman era, wheat was grown in high rainfall areas, mainly outside Modern Turkey's territory (Braun et al. 2001). Wheat breeding started in the country with the establishment of a research station in Eskisehir in 1925, soon after the foundation of the Republic of Turkey (Ozbek et al. 2016). The name of the station was "Islahı Buzur" meaning seed development. This was followed by the establishment of research stations in Adapazarı, Yeşilköy (Istanbul) and Ankara before 1930. By 1989, there were 14 public research institutes working on wheat, though some of them were closed later (such

as the Yeşilköy Research Institute). Wheat variety development studies aimed to develop Winter Wheat (WW) and Spring Wheat (SW), and Bread Wheat (BW) and Durum Wheat (DW) varieties, since Turkey has different regions with different climatical conditions. The most important outcome of the investment in agricultural research is the development of varieties for cultivation by farmers. It is noted that release of wheat varieties started soon after the establishment of first research stations (Keser et al. 2017). The first wheat variety released in Turkey was Karakılıçık1133 by Yeşilköy Agricultural Research Station, Istanbul (now closed) in 1928 (Altay, 2018).

The main aims of this study were to compile the wheat varieties developed and registered in the history of wheat breeding in Turkey and to give insight on the impact of regulations on wheat R&D development and variety registration. Though, the National Variety

List (NVL) is compiled, published and renewed yearly by Variety Registration and Seed Certification Center (VRSCC), not all released varieties in wheat breeding history are listed in NVL. In accordance with regulations, wheat varieties are registered for a period of 10 years and variety owners can apply for renewal after every 10 years. If the variety owner does not apply for renewal of it, the variety is automatically dropped from the NVL. This provides the basis and reason for this study. Previous studies have attempted to compile all the varieties released in Turkey; however, the numbers were increasing year by year and some of the old varieties and the ones dropped from the NVL were missing in those lists (Braun et al. 2001; Ozberk et al. 2016; Keser and Cakmak, 2021).

In this study, in order to look at the impact of regulations on wheat variety development, the variety development activities are divided into 3 periods: I. 1925-1963, II. 1964-2006 and III. 2007-2021. The main characteristics of the periods are as follows;

First period: 1925-1963

The first thing done in wheat breeding is the collection of Land Races (LR), mainly from the region where the Research Station is located. Pure lines were then developed by making the selections from the collected populations and good performers were registered, their seeds were multiplied and provided to the neighboring farmers first. Some LRs were also collected from different parts of Turkey and the same procedure was applied to them as well. The seeds of identified genotypes were produced in the fields of the Research Station and distributed to neighboring regions around the station, until State Farms (SF) were established in mid-1940s. There was no close coordination or concerted effort among the research stations; they were mainly serving the region where they were located. Crossing started in the late 1920s, and few varieties were developed from crosses in this period. The crosses were mainly made between LRs or between LRs and introduced germplasm, e.g. Mentana. Seed Law no 308, which set the rules for releasing a variety and seed production, was published in 1963 and is considered as the end of the first period (OG, 1963).

Second period: 1964-2006

After 1963, already established State Farms (SF) reframed their working according to Seed Law no 308 and these farms were becoming more formal and coordinating for seed production and distribution. While most new varieties were coming from crosses during this period, there were few LR-selected-varieties and introduced varieties. Seed was being produced by SFs, according to the rules of Seed Law no 308,

and distributed to the farmers during this period. There were also introduced/imported SW and WW varieties from Mexico and USA, respectively in mid- to late-1960's as part of a project. The Green Revolution was in progress in the 1960s in India and Pakistan. SW varieties developed by CIMMYT in Mexico were introduced and planted, and wheat production increased dramatically in those countries. As Turkey already had areas growing SW, Turkey also wanted to introduce new SW varieties to increase the wheat production. Turkey made an agreement with Oregon State University in the USA called the "Wheat Enhancement Program". This agreement aimed to increase wheat production in Turkey not only in SW areas, but also in areas growing WW. The project was implemented in two phases, starting in 1967 (Kronstad, 2000). The first phase was the introduction of SW varieties, developed in CIMMYT, Mexico and introduced into the coastal areas of Turkey. The second phase focused on enhancing wheat production on the Anatolian Plateau in collaboration with Oregon State University. Seventeen varieties (10 from USA and 7 from Mexico) were directly introduced from USA and they were registered in Turkey.

Third period: 2007-2021 (inclusive)

A new Seed Law no 5553 was published in the Official Gazette in 2006, replacing the 1963 Seed Law (OG, 2006). This is considered the end of the second period. Since 2007, all varieties were coming from crosses except a few primitive wheat varieties (*Tr. monococcum* and *Tr. turgidum* and *Tr. spelta*) selected from landraces. Before the new Seed Law was published, the Plant Breeders Right (PBR) Law no 5042 on new plant varieties was also published in 2004 (OG, 2004). These new regulations stimulated the variety development and registration not only in the public sector, but also in private sector.

The number of varieties registered has increased over time and these have been recorded in the NVL. This list is compiled and published by the VRSCC, in accordance with the rules in force. In 1963, seed was being produced for 31 wheat varieties (22 BW, 9 DW) (OG, 1969). By 2015, 135 wheat varieties were recorded in farmers' fields, according to a survey conducted across 27 provinces in Turkey (Bishaw et al. 2021). The number would have most probably been increased if the survey had covered all wheat growing areas of Turkey.

Materials and Methods

The sources used to compile the variety release/registration in Turkey from the beginning of wheat breeding to 2021 (inclusive) were the NVL and

the Registration Reports of the VRSCC, websites of variety owners, reports of the Research Institutes (especially for the varieties dropped from the NVL, which were also confirmed by breeders, when needed). Growth Habit (GH) and origin was assigned to each variety based on the registration report of the VRSCC, the website of the variety owner or the GH given in some publications and theses. In addition to Turkey, the number of varieties released in 5 years period were compiled from Hungary, the UK and Iran, and the comparisons have been made based on the number of released varieties in this period and area per variety in each country. In order to evaluate the impact of the regulations on variety release in Turkey, it has been studied in 3 periods (1925-1963; 1964-2006 and 2007-2021). The impact was evaluated based on the total number of varieties released and the number of variety release per year in each period.

Results and Discussions

The most important outcome of the investment in agricultural research is the development of varieties for cultivation by farmers. As the stages and timeline given in Table 1, it takes about 15 years from crossing to commercialize a variety in a conventional breeding scheme in Turkey (Keser et al. 2021). However, if any organization (public or private) introduces a genotype from outside the timeline becomes shorter; it may be reduced to 3-4 years depending on what stage the genotype is introduced at.

Since the first wheat variety was released in 1928, 617 wheat varieties have been released in Turkey (Annex 1). Only 484 of these are currently in the NVL (VRSCC, 2021); 133 wheat varieties are not currently listed. As both BW and DW are grown in Turkey, BW and DW varieties along with some primitive wheats have been registered; 485 varieties are BW and 128 of them are DW varieties, 2 are *Tr. monococcum*, 1 is *Tr. turgidum* and 1 is *Tr. spelta* (Table 2). As Turkey has diverse growing conditions, spring, winter and facultative bread and durum wheat varieties are grown, and varieties are released to be grown in those diverse conditions. 316 WW varieties have been released, and 191 and 110 for SW and FW, respectively.

While 15 public research institutes released 313 varieties, 7 universities released 23 varieties (Table 3), and 67 private companies were involved in releasing 281 varieties (Table 4) in total. Universities are considered as public sector in later analysis, as they were public universities. In public research institutes, the highest number of varieties were released by the Central Research Institute for Field Crops followed by the Transitional Zone Agricultural Research Institute,

with 49 and 46 varieties released respectively (Table 3). Though the list indicates 41 varieties were released by the Maize Research Institute, 17 of them were directly introduced from the USA (10) and Mexico (7) and registered with the Maize Research Institute within the wheat enhancement program.

Wheat breeding in Turkey has a long history with international relationships and intensive international cooperation on wheat development with countries and international organizations that made substantial impact on wheat breeding and production in Turkey (Lantican et al. 2005; Lantican 2016). Turkey has introduced wheat varieties from 23 different countries and two CGIAR Centers, CIMMYT and ICARDA. In total, 221 varieties originating from 23 countries have been released in Turkey; the highest number of varieties were from Italy with 60 varieties followed by France and Bulgaria with 28 and 20 varieties, respectively. 107 varieties originated from the CGIAR Centers, CIMMYT and ICARDA, with germplasm being mostly SW. Turkey, CIMMYT and ICARDA have been carrying out the International Winter Wheat Improvement Program (IWWIP) since 1986 (IWWIP, 2021). The IWWIP provides germplasm, advanced lines and potential variety candidates to breeding programs both in Turkey and around 50 other countries. 110 varieties originating from IWWIP germplasm have been released by both public institutions and private companies in Turkey.

Comparisons of wheat variety releases in selected countries

Wheat varieties are released by public institutions and private sector organizations in many countries. Their contribution to variety development and release is used to compare the public vs private sector and to understand the development stage of the private sector in a given country. In this study, several countries were selected to make comparisons among themselves but mainly with Turkey. When selecting countries, wheat area, similarity/diversity of wheat growing conditions and public/private/university roles and involvement in wheat variety development were considered. Hungary and the United Kingdom (UK) from Europe, and Iran (a neighboring country to Turkey where both, WW and SW are grown under irrigated and rainfed conditions) were selected. Wheat is grown in high rainfall and high yield potential conditions in Hungary and UK on around 1.0 million ha and 1.8 million ha respectively (based on a 5-year average of 2016-2020) (FAO, 2021). BW is the dominating species in both Hungary and UK, with few DW varieties and small acreage in Hungary. There is very little, if any, DW area in UK. Turkey, with 7.3 million ha on average of same period has the largest wheat area among the 4 countries, and

Iran follows Turkey with 6.8 million ha on average (FAO, 2021). DW covers about 25% of the wheat area in Turkey, and around 5-10% in Iran. While public institutions and universities and the private sector work on wheat variety development and release in Iran and Turkey, only public institutions and the private sector release wheat varieties in Hungary, and only the private sector releases wheat in UK. It is also necessary to note that any variety released in an EU country can be registered in Hungary or the UK and directly enter production.

Along with having the largest area of wheat planted, Turkey also released the highest number of varieties over the 2016-2020 period, followed by the UK, Hungary, and Iran (Table 5). There are frequent discussions among breeders, seed producers, millers, industry and decision-makers asking why so many varieties are released in each year and why there are so many varieties in the market, especially in Turkey. Without getting into the discussion deeper about whether the number of varieties are high or low, as this is not the scope of this study, we may evaluate the current situation in selected countries. The number of varieties released per year in each country may be misleading for making comparisons, without taking into consideration the wheat area, diversity of the wheat growing conditions and farm households, wheat species, wheat products, industry, and end-user demand, etc. However, the number of varieties released in 2016-2020 period and wheat area will be used to make some comparisons among the countries to provide initial insights to the readers of this study.

The average number of varieties released per year in the 2016-2020 period in Hungary (Personal com with Dr. Gyula, Budapest, Hungary 2021), Iran (Personal communication with Dr. Roustaii, Maragheh, Iran, 2021), Turkey and the UK (PVSG, 2021) were 13.2, 10.2, 43.8 and 34.2, respectively. The highest average number of varieties released per year was in Turkey followed by the UK, Hungary and Iran in the same period. One of the comparisons that can be made is how many varieties are released per area in the countries in the same period. Looking at the area per variety, the average area per variety released in 2016-2020 period is 76752 ha, 666075 ha, 167766 ha and 52478 ha in Hungary, Iran, Turkey and UK respectively (calculated as average total area divided by average number of varieties released in the period). While the highest number of varieties released per ha was in UK, lowest was in Iran in the same period, Hungary was the second and Turkey is in the third rank when area/variety is considered. The calculation and comparison based on

the area per variety released may not be completely reflecting varieties grown in the farmers' fields since every new variety may not go to production soon after release or in a given period that may stay in the list for years without contributing to the production. However, it may be an indication to show how productive the breeding programs in releasing variety in different countries are.

The impact of regulations on wheat variety release

Wheat releases were studied across the 3 periods in order to evaluate the impact of regulations on variety development in Turkey. During the first period, public institutes were developing varieties, producing the seed and distributing it to farmers within the framework of Ministry of Agriculture directives. There were not closely coordinated and concerted efforts among the institutes; mainly, each institute was acting separately. Nineteen varieties were released from the beginning of wheat research until the first regulation enacted in 1963, while 90 varieties were released in the second period, and 408 in the third (Table 6). While one variety was released in every 2 years in the first period, it was 4.4 varieties/year and 25.5 varieties/year in the second and third periods, respectively. The new 2004 PBR Law and the 2006 Seed Law stimulated variety release not only in the private sector but also in the public sector. Turkey, by changing the regulation, aimed to increase private sector involvement in variety registration, seed production and seed distribution in order to benefit from the yield advantages of newly developed wheat varieties in a short time as the newer varieties had higher yields both in irrigated and rainfed conditions mainly through genetic gain in yield (Gummadov et al. 2015; Keser et al. 2017). It was hoped that the newly developed varieties with high yield, good industrial quality, disease resistance, biotic and abiotic stress tolerance would go faster to farmers' fields and that production would be boosted and would be more stable without being influenced by weather fluctuations, both across different growing environments and years, as most of the wheat has been grown under rainfed conditions. Subsequently, the total number of released varieties increased drastically. In addition, due to the government's certified seed subsidies and the yield advantages of new varieties, it can be concluded that the increasing demand of farmers for certified seeds contributes to the introduction of a growing number of new varieties.

The private sector aggressively increased wheat variety registration in the 3rd period and released a greater number of varieties per year than public sector,

starting from 2011 onwards except in 2015 and 2019, when the numbers were very close (Figure 1). The private sector released 9 times more varieties than the public sector in 2017, releasing 45 varieties compared to the public sector's 5. In other years in this period, the private sector was releasing about two times as many varieties than the public sector, except 2015, 2019 and 2020.

Though the wheat seed production more than doubled from 210044 t in 2007 to 483951t in 2019 and distribution in the same years were 173045 t and 448882 t, respectively, it is not known what percent of the seed distributed was coming from new varieties. In addition, there has been no nation-wide study giving what is planted in farmers' fields in a given year though some studies provide areas covered by old and new varieties (Bishaw et al. 2021).

Conventionally, the calculation of which varieties are planted in farmers' fields and the rates of adoption of wheat varieties is determined through surveys, and the names of the varieties are determined based on the opinion of an expert or the farmer's declaration during the survey. However, some studies indicate that the accuracy of information collected during surveys and the identification of the variety when done by an expert or farmer's declaration may be as low as 30% (Jaleta et al. 2020), especially in countries where informal seed systems and seed exchanges among farmers are in high rates. Phenotypic identification and knowledge of the farmer about a particular variety can also vary due to environmental effects and the limited knowledge of the farmer. The application of molecular marker technologies to identify varieties grown in farmers' fields can overcome these challenges and increase the accuracy of varietal identification (Dreisigacker et al. 2019) and the adoption rate of any given variety. Molecular technologies including finger printing are becoming widely available and cheaper. These technologies may increase accuracy compared to phenotypic identification and farmers' declarations (Yirga et al. 2016). The fingerprinting technology has been used successfully in different countries and in different crops both for identification of the varieties and their adoption rates (in wheat Yirga et al. 2016; Dreisigacker et al. 2019; Hodson et al. 2020; Jaleta et al. 2020, Garapaty et al. 2021, in maize Yirga et al. 2016, in rice Kretzschmar et al. 2018). This technology can also be used to accurately identify varieties planted in farmers' fields and evaluate the adoption rates of the varieties in Turkey. This will help all stakeholders, breeders, seed producers, wheat industry, farmers and more importantly for decision makers to plan better for the future.

Conclusions

617 wheat varieties were developed in Turkey since the beginning of the wheat breeding in 1925. Many primary, secondary and tertiary regulations were developed to regulate the variety registration, seed production and distribution. New regulations stimulated to develop greater number of varieties and private sector involvement in variety registration seed production and distribution. New technologies, such as fingerprinting, can be used to evaluate what is planted in farmers' fields that would help all stakeholders in this business, especially for decision makers.

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Table 1. Conventional wheat variety development, evaluation, and release scheme in Turkey.

Steps	Variety Trial Stages	Timeline (year)	No of Locations
1	Crossing	0	1
2	Selecting segregating populations	1-5	1
3	Observation nursery	6	1
4	Preliminary yield trial	7	1-2
5	Yield trial	8	2-3
6	Advanced yield trial	9	2-3
7	Regional yield trial	10	4-6
8	Registration trials	11-12	6-10
9	Seed multiplication and demonstration	12-13	
10	Commercialization	~15	

Table 2. The number of wheat varieties released in different species and their growth habit.

Species ¹	No of Varieties	Growth Habit ²	No of Varieties
BW	485	WW	316
DW	128	SW	191
<i>Tr. monococcum</i>	2	FW	110
<i>Tr. turgidum</i>	1		
<i>Tr. spelta</i>	1		
Total	617		617

¹ Species; BW Bread Wheat; DW Durum Wheat² Growth Habit; WW: Winter Wheat, SW: Spring Wheat
FW: Facultative Wheat

Table 3. The number of wheat varieties released by public institutes and universities in Turkey.

No	Institutions and Universities	Number of Varieties
1	Central Research Institute for Field Crops, Ankara	49
2	Transitional Zone Agricultural Research Institute (ARI), Eskişehir	46
3	Maize Research Institute, Sakarya	41
4	East Mediterranean ARI, Adana	30
5	Bahri Dagdas International ARI, Konya	27
6	Aegean ARI, Izmir	25
7	GAP International ARI, Diyarbakır	23
8	Thrace ARI, Edirne	23
9	State Farms, Ankara	15
10	Eastern Anatolian ARI, Erzurum	11
11	GAP ARI, Şanlıurfa	7
12	Black Sea ARI, Samsun	6
13	Yeşilköy ARI, İstanbul	6
14	West Mediterranean ARI, Antalya	3
15	East Mediterranean Transitional Zone ARI, Kahramanmaraş	1
Total		313
1	Faculty of Agriculture, Ankara Uni., Ankara	6
2	Faculty of Agriculture, Çukurova Uni., Adana	6
3	Faculty of Agriculture, Namık Kemal Uni., Tekirdağ	5
4	Faculty of Agriculture, Harran Uni., Şanlıurfa	2
5	Faculty of Agriculture, Uludağ Uni., Bursa	2
6	Faculty of Agriculture, Dicle Uni., Diyarbakır	1
7	Faculty of Agriculture, Selçuk Uni., Konya	1
Total		23

Table 4. The number of wheat varieties registered by private companies in Turkey.

No	Company Names	Number of Variety	No	Company Names	Number of Variety
1	ProGen Tohum A.Ş.	19	35	Altınbaşak Tohumculuk Ltd.Şti.	2
2	Ekiz Toh.Dan.Ür.Tic.Arş.Proj.Tar. ve Gıd.Ltd.Şti.	15	36	Büke Tarım ve Hay.İth.İhr. ve Tic.Ltd.Şti.	2
3	Tareks Tar.Ür.A.G.İth.İhr.Tic.A.Ş.	15	37	C.T.O Ekin Tarım Ürn.Tic.Ltd.Şti.	2
4	Trakya Tarım ve Vet.Tic.Ltd.Şti.	15	38	CYD Ağaoğlu San.Tic Paz.Ltd.Şti.	2
5	Tasaco Tarım San. ve Tic.Ltd.Şti.	13	39	Dobruca Tohumculuk San.Tic.Ltd.Şti.	2
6	Alfa Toh.Tar.Gıd.İnş.Hay.Paz.San.Tic.Ltd.Şti.	11	40	Kartaş Tohumculuk San. ve Tic.Ltd.Şti.	2
7	Tekfen Tarımsal Araş.Üre. ve Paz.A.Ş.	11	41	May-Agro Toh.San. ve Tic.A.Ş.	2
8	Maro Tarım İnş.Tic. ve San.A.Ş.	10	42	Orhas İç ve Dış Tic.Ltd.Şti.	2
9	Tekcan Toh.Gıda Tarım Ürün.San.Tic.Ltd.Şti.	9	43	OSM Tohumculuk San.Tic.Ltd.Şti.	2
10	Ata Tohumculuk İşl.San. ve Tic.A.Ş.	8	44	Prof. Dr. Turan TATLIOĞLU	2
11	Limagrain Tohum Islah ve Üret.San.Tic.A.Ş	8	45	RTS Tarım Ltd.Şti.	2
12	Tarar Un ve Gıda San.Tic.Ltd.Şti.	8	46	S.S. Akşehir İlgin Pancar Ekicileri Koop.	2
13	Yıldız Bitkisel Ürün.Tohum. ve Tar.San.A.Ş.	8	47	SAPEKSA	2
14	Akçakaya Tarım Tic. Ve San.Ltd. Şti.	7	48	Semillas Fito Tarım San.Tic.A.Ş.	2
15	Caso Tohum San. ve Tic.Ltd.Şti.	6	49	Taşpınar Tarım Tic. ve San.Ltd.Şti.	2
16	13 Yıldız Tohumculuk	5	50	Turtat Tohum Islah Ltd.Şti.	2
17	Agrova Tar. Üretim Paz.Ltd.Şti	5	51	Ankomer Tohum. ve Ziraat San.Tic.Ltd.Şti.	2
18	BC İnstitüte Tar.Ür.Oto.San. ve Tic.Ltd.Şti.	5	52	Ayazlar Toh.Tar.Ürün.İç Dış Tic.San.Ltd.Şti.	1
19	Semila Tohumculuk San. ve Tic.Ltd.Şti.	5	53	Bağlariçi Tohumculuk	1
20	Syngenta Tarım San. ve Tic.A.Ş.	5	54	Ekip Tarım Ltd.Şti.	1
21	Caussade Tohumculuk Tarım Ltd.Şti.	4	55	İsmailoğulları Tar.Ürün.İlaç.Nak.Tah.Ltd. Şti.	1
22	Kuran Tarım Dış.Tic.Ltd.Şti.	4	56	Kalender Gıda Tarım Ltd.Şti.	1
23	LT Tarım Üretim Paz.Tic.Ltd.Şti.	4	57	Kappadokia Tarım Ltd.Şti.	1
24	Ziya Organik Tarım A.Ş.	4	58	Marmara Tohum Geliştirme A.Ş.	1
25	Avesa Tarım Gıda ve Hay.Ltd.Şti.	3	59	Özbuğday Tar.İşl. ve Toh.A.Ş.	1
26	Çamlıca Tohumculuk Tic.Ltd.Şti.	3	60	Pankobirlik Kooperatifleri Birliği	1
27	İ.T.U. ve Tar.İlaç Toh.Paz.San. ve Tic.Ltd.Şti.	3	61	Rıfatoğlu Tar.Ür.Petr.Nak.İnş.Mad.San.Tic.Ltd.Şti.	1
28	Meya Tohum Dan.San.Tic.Ltd.Şti.	3	62	Safgen Tohumculuk San. Tic.Ltd. Şti.	1
29	NBC Tarım Ltd.Şti.	3	63	Sarı Tohumculuk San. ve Tic.Ltd.Şti.	1
30	Olgunlar Tur.Tar.Enerji Üret.Tic.Paz.Ltd.Şti.	3	64	SASEED Tar. Tic.Ltd.Şti.	1
31	Utek Tarım İnş. Gıda San. Tic.Ltd.Şti.	3	65	Silvan Nergiz San. Tic.Ltd.Şti.	1
32	Agro Teknik Zir.Ür.San.Tic.A.Ş.	2	66	Söke Tohum Ltd. Şti.	1
33	Aksoy Turizm ve Gıda San.Tic.Ltd.Şti.	2	67	Trakya Genetik Arge Dan.Ür.İth.İhr.Paz.Ltd.Şti.	1
34	Alkan İnş.Müh.Tur.Taş.San. ve Tic.Ltd. Şti.	2			

Table 5. The number of wheat varieties released by public institutions and private sector in selected countries in 2016-2021.

Year/ Institution	Hungary			Iran			Turkey		UK	
	Public	Private	Hungary Total	Public	Private	Iran Total	Public	Private	Turkey Total	Private Total
2016	4	11	15	4	0	4	10	26	36	10
2017	4	12	16	4	4	8	5	44	49	23
2018	6	5	11	9	3	12	12	20	32	54
2019	4	8	12	9	0	9	21	20	41	56
2020	6	6	12	8	10	18	27	34	61	28
2021	na	na	na	14	2	16	17	41	58	29
Grand Total	24	42	66	48	19	67	92	185	277	200

Table 6. The number of varieties released in different periods in Turkey.

Period	Number of Variety Released	Year	Var/Year
1928-1963	19	39	0.5
1964-2006	190	43	4.4
2007-2021	408	16	25.5
Total/Average	617	97	6.4

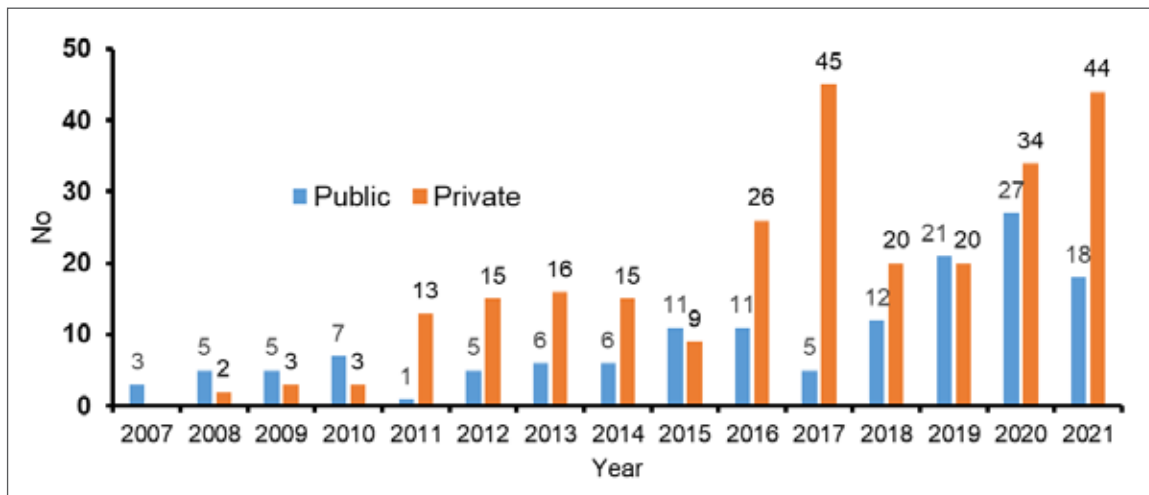


Figure 1. Wheat variety release by the public and private sectors between 2007 and 2021, after the Seed Law no 5043 was published in 2006.

Annex 1. Wheat varieties released in Turkey from the beginning of wheat breeding to 2021.

No	Variety	Spp. ¹	Rel. Year ²	Rel. By ³	GH ⁴	Origin ⁵	No	Variety	Spp. ¹	Rel. Year ²	Rel. By ³	GH ⁴	Origin ⁵
1	Karakılıçık1133	DW	1928	Public	S	TR	50	Bolal2973	BW	1970	Public	W	US
2	Sarı710	DW	1929	Public	F	TR	51	Kıraç 66	BW	1970	Public	W	TR
3	Ak702	BW	1931	Public	F	TR	52	Etoil De Choisy	BW	1975	Public	S	FR
4	Sivas111-33	BW	1933	Public	W	TR	53	Tosun144	BW	1975	Univ	W	TR
5	Cumhuriyet Buğdayı	BW	1936	Public	S	TR	54	Tosun21	BW	1975	Univ	W	TR
6	Kızılca6451	BW	1936	Public	S	TR	55	Tosun22	BW	1975	Univ	W	TR
7	Sertak52	BW	1936	Public	F	TR	56	Cumhuriyet75	BW	1976	Public	S	TR
8	Köse-220-39	BW	1939	Public	F	TR	57	Dicle74	DW	1976	Public	S	TR
9	Yayla305	BW	1939	Public	W	TR	58	Gediz75	DW	1976	Public	S	TR
10	Akbaşak7194	DW	1943	Public	W	TR	59	Porsuk2800	BW	1976	Public	W	US
11	Akbaşak073-44	DW	1944	Public	W	TR	60	Sakarya75	BW	1976	Public	S	TR
12	Ankara093/44	BW	1944	Public	W	TR	61	Lancer	BW	1977	Public	W	US
13	Kunduru414/44	DW	1944	Public	W	TR	62	Orso	BW	1977	Public	S	IT
14	Melez13	BW	1944	Public	W	TR	63	Çakmak79	DW	1979	Public	W	TR
15	Tunus Buğdayı	BW	1944	Public	W	TR	64	Gerek79	BW	1979	Public	W	TR
16	SürakM1593-51	BW	1951	Public	W	TR	65	Gököl79	DW	1979	Public	W	TR
17	Köse Melez1718	BW	1958	Public	W	TR	66	Haymana79	BW	1979	Public	W	US
18	Kırmızı5132	DW	1963	Univ	W	TR	67	Kırkpınar79	BW	1979	Public	F	TR
19	Sarıbursa7113	DW	1963	Univ	W	TR	68	Tunca79	DW	1979	Public	W	TR
20	185-1	DW	1964	Public	F	TR	69	Ata81	BW	1985	Public	S	TR
21	4-11	BW	1964	Public	W	TR	70	Atay85	BW	1985	Public	W	TR
22	Akova B-1	BW	1964	Public	S	TR	71	İzmir85	BW	1985	Public	S	TR
23	Mentana B-1	BW	1964	Public	S	IT	72	Çukurova86	BW	1986	Public	S	TR
24	4-22	BW	1966	Public	F	TR	73	Marmara86	BW	1986	Public	S	TR
25	Floransa N4-8	BW	1966	Public	S	AU	74	Diyarbakır81	DW	1987	Public	S	TR
26	P-8-6	BW	1966	Public	W	TR	75	Kop	BW	1987	Public	S	TR
27	P-8-8	BW	1966	Public	W	TR	76	Balçalı85	DW	1988	Univ	S	TR
28	Berkmen469	DW	1967	Public	W	TR	77	Ege88	DW	1988	Public	S	TR
29	Kunduru1149	DW	1967	Public	W	TR	78	Genç88	BW	1988	Univ	S	TR
30	Aköz 867	BW	1968	Public	S	TR	79	Kaklıç88	BW	1988	Public	S	TR
31	Bezostaja1	BW	1968	Public	W	RU	80	KateA-1	BW	1988	Public	W	BG
32	Burt	BW	1968	Public	W	US	81	Creso	DW	1989	Public	S	IT
33	Gaines	BW	1968	Public	W	US	82	Doğu88	BW	1990	Public	W	US
34	Inia66	BW	1968	Public	S	MX	83	Karasu90	BW	1990	Public	W	TR
35	Jaral66	BW	1968	Public	S	MX	84	Doğankent1	BW	1991	Public	S	TR
36	Lerma Rojo64	BW	1968	Public	S	MX	85	Gün91	BW	1991	Public	F	TR
37	Mayo64	BW	1968	Public	S	MX	86	Kızıltan91	DW	1991	Public	F	TR
38	Nadadores63	BW	1968	Public	S	MX	87	Murat1	BW	1991	Public	W	TR
39	Noroeste66	BW	1968	Public	S	MX	88	Seri82	BW	1991	Public	S	MX
40	Oviachic65	DW	1968	Public	S	MX	89	Sham1	DW	1991	Public	S	SYR
41	Penjamo62	BW	1968	Public	S	MX	90	Salihli92	DW	1992	Public	S	TR
42	Pitic62	BW	1968	Public	S	MX	91	Dağdaş94	BW	1994	Public	W	TR
43	Siete Cerros66	BW	1968	Public	S	MX	92	Kutluk94	BW	1994	Public	F	TR
44	Sonora63	BW	1968	Public	S	MX	93	Altıntaş95	DW	1995	Public	W	TR
45	SuperX	BW	1968	Public	S	MX	94	BasriBey95	BW	1995	Public	S	TR
46	Tevere	BW	1968	Public	W	IT	95	Başak95	BW	1995	Univ	W	TR
47	Tobari66	BW	1968	Public	S	MX	96	Ceylan95	DW	1995	Public	S	TR
48	Wanser	BW	1968	Public	W	US	97	Harran95	DW	1995	Public	S	TR
49	Yektay406	BW	1968	Public	W	IT	98	KaşifBey 95	BW	1995	Public	S	TR

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No	Variety	Spp. ¹	Rel. Year ²	Rel. By ³	GH ⁴	Origin ⁵	No	Variety	Spp. ¹	Rel. Year ²	Rel. By ³	GH ⁴	Origin ⁵
99	Kırgız95	BW	1995	Public	W	TR	148	Momtchill	BW	2000	Public	W	BG
100	Seyhan95	BW	1995	Public	S	TR	149	Tahirova2000	BW	2000	Public	S	TR
101	Sultan95	BW	1995	Public	W	TR	150	Yelken2000	DW	2000	Public	W	TR
102	İkizce96	BW	1996	Public	F	TR	151	Alparslan	BW	2001	Public	W	TR
103	Lirasa92	BW	1996	Private	S	MX	152	Alpu2001	BW	2001	Public	W	TR
104	Amanos97	DW	1997	Public	S	TR	153	Attila12	BW	2001	Public	W	HU
105	Bandırma97	BW	1997	Public	S	TR	154	Centauro	BW	2001	Private	S	IT
106	Karacabey97	BW	1997	Public	F	TR	155	İzgi2001	BW	2001	Public	F	TR
107	Kınacı97	BW	1997	Public	W	TR	156	Köksal2000	BW	2001	Univ	S	TR
108	Palandöken97	BW	1997	Public	W	TR	157	Martar	BW	2001	Private	W	DE
109	Pamukova97	BW	1997	Public	S	TR	158	Nenchatun	BW	2001	Public	W	TR
110	Selçuklu97	DW	1997	Public	F	TR	159	Nurkent	BW	2001	Public	S	TR
111	Süzen 97	BW	1997	Public	F	TR	160	Pandas	BW	2001	Public	S	IT
112	Altın40/98	DW	1998	Public	W	TR	161	Pınar2001	DW	2001	Univ	F	TR
113	Altıntoprak98	DW	1998	Public	S	TR	162	Sagittario	BW	2001	Private	S	IT
114	Ankara98	DW	1998	Public	F	TR	163	Saraybosna01	BW	2001	Public	W	SI
115	Aytın98	BW	1998	Public	W	TR	164	Sönmez2001	BW	2001	Public	W	TR
116	Gönen98	BW	1998	Public	S	TR	165	Svevo	DW	2001	Private	S	IT
117	Karacadağ98	BW	1998	Public	S	TR	166	Turan	BW	2001	Private	S	DE
118	Mızrak98	BW	1998	Public	F	TR	167	Zenit	DW	2001	Private	S	IT
119	Pehlivan	BW	1998	Public	W	TR	168	Akçakale2000	DW	2002	Public	S	TR
120	Sarıçanak98	DW	1998	Public	S	TR	169	Atlı2002	BW	2002	Public	F	TR
121	Türkmen	BW	1998	Public	F	TR	170	Aydın93	DW	2002	Public	S	TR
122	Uzunyayla	BW	1998	Public	W	TR	171	Bağcı2002	BW	2002	Public	W	TR
123	Yıldız98	BW	1998	Public	W	TR	172	Daphan	BW	2002	Public	W	TR
124	Yılmaz98	DW	1998	Public	W	TR	173	Dariel	BW	2002	Private	S	IL
125	Ziyabey98	BW	1998	Public	S	TR	174	Fırat93	DW	2002	Public	S	TR
126	Adana99	BW	1999	Public	S	TR	175	Galil	BW	2002	Private	S	IL
127	Ceyhan99	BW	1999	Public	S	TR	176	Konya2002	BW	2002	Public	W	TR
128	Çeşit1252	DW	1999	Public	W	TR	177	Meram2002	DW	2002	Public	F	TR
129	Flamura85	BW	1999	Public	W	RO	178	Meta2002	BW	2002	Public	S	TR
130	Genç99	BW	1999	Univ	S	TR	179	Negev	BW	2002	Private	S	IL
131	Golia	BW	1999	Public	F	IT	180	Sakin	BW	2002	Public	S	TR
132	Göksu99	BW	1999	Public	W	TR	181	Soyer02	BW	2002	Public	F	TR
133	Harmankaya99	BW	1999	Public	W	RO	182	Şölen2002	DW	2002	Public	S	TR
134	Karahan99	BW	1999	Public	W	TR	183	Tüten2002	DW	2002	Public	S	TR
135	Prostor	BW	1999	Public	W	BG	184	Yıldırım	BW	2002	Public	W	TR
136	Saroz95	BW	1999	Public	W	TR	185	Yüreğir89	BW	2002	Public	S	TR
137	Yakar99	BW	1999	Public	F	TR	186	Zencirci2002	BW	2002	Public	F	TR
138	Aksel2000	BW	2000	Public	F	TR	187	Canik2003	BW	2003	Public	F	TR
139	Altay 2000	BW	2000	Public	W	TR	188	Dropia	BW	2003	Private	W	RO
140	Balatilla	BW	2000	Univ	S	TR	189	Eser	BW	2003	Public	F	TR
141	Balçalı2000	DW	2000	Univ	S	TR	190	Özdemirbey97	BW	2003	Private	S	TR
142	Bayraktar2000	BW	2000	Public	W	TR	191	Ahmetağa	BW	2004	Public	F	TR
143	Çetinel2000	BW	2000	Public	W	TR	192	Alibey	BW	2004	Public	S	TR
144	Demir2000	BW	2000	Public	F	TR	193	Ekiz	BW	2004	Public	F	TR
145	Fuatbey2000	DW	2000	Public	S	TR	194	Gap	DW	2004	Public	S	TR
146	Kümbet2000	DW	2000	Public	W	TR	195	Menemen	BW	2004	Public	S	TR
147	Mirzabey2000	DW	2000	Public	F	TR	196	Özcan	BW	2004	Public	S	TR

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197	Seval	BW	2004	Public	W	TR	246	Geyal	BW	2011	Private	W	BG
198	Tosunbey	BW	2004	Public	F	TR	247	Levante	DW	2011	Private	S	IT
199	Turabi	DW	2004	Public	S	TR	248	Mane Nick	BW	2011	Private	S	ES
200	Gelibolu	BW	2005	Public	W	TR	249	OS Alka	BW	2011	Private	W	HR
201	Nina	BW	2005	Private	W	HR	250	Pinzon	BW	2011	Private	S	ES
202	Özberk	DW	2005	Univ	S	TR	251	Saragolla	DW	2011	Private	S	IT
203	Tekirdağ	BW	2005	Public	W	TR	252	Aglıka	BW	2012	Private	W	BG
204	Tina	BW	2005	Private	W	HR	253	Altındane	BW	2012	Public	S	TR
205	Urfa2005	DW	2005	Univ	S	TR	254	Andino	BW	2012	Private	W	FR
206	Dumlupınar	DW	2006	Public	W	TR	255	B 52	BW	2012	Private	na	na
207	Karatopak	BW	2006	Public	S	TR	256	Bisante	DW	2012	Private	F	TR
208	Müfitbey	BW	2006	Public	W	TR	257	Charly Nick	BW	2012	Private	na	na
209	Osmaniyem	BW	2006	Public	S	TR	258	Eraybey	BW	2012	Public	W	TR
210	Beşköprü	BW	2007	Public	F	TR	259	Forblanc	BW	2012	Private	W	IT
211	Guadalupe	BW	2007	Public	F	FR	260	Gündaş	DW	2012	Public	S	TR
212	Hanlı	BW	2007	Public	S	TR	261	Iridium	BW	2012	Private	W	FR
213	Artuklu	DW	2008	Public	S	TR	262	LG59	BW	2012	Private	W	ES
214	Cemre	BW	2008	Public	S	TR	263	May8059	BW	2012	Private	W	BG
215	Eyyubi	DW	2008	Public	S	TR	264	Quality	BW	2012	Private	W	IT
216	Krasunia odes'ka	BW	2008	Private	W	UA	265	Rumeli	BW	2012	Private	W	TR
217	Nacibey	BW	2008	Public	W	TR	266	Soylu	DW	2012	Univ	W	TR
218	Syrena odes'ka	BW	2008	Private	W	UA	267	Turkuaz	BW	2012	Private	W	TR
219	Şahinbey	DW	2008	Public	S	TR	268	Vasilina	BW	2012	Private	W	UA
220	Aldane	BW	2009	Public	F	TR	269	Vittorio	BW	2012	Private	F	IT
221	Eminbey	DW	2009	Public	W	TR	270	Yunus	BW	2012	Public	W	TR
222	Hakan	BW	2009	Private	W	TR	271	Zıtka	DW	2012	Private	F	RS
223	İmren	DW	2009	Public	F	TR	272	Adagio	BW	2013	Private	W	FR
224	Kaan	BW	2009	Private	W	TR	273	Adelaide	BW	2013	Private	F	IT
225	Kenanbey	BW	2009	Public	F	TR	274	Altın Başak	BW	2013	Public	S	TR
226	Selimiye	BW	2009	Public	W	TR	275	Antille	BW	2013	Private	W	IT
227	Yunak	BW	2009	Private	W	BG	276	Artico	BW	2013	Private	W	IT
228	Bereket	BW	2010	Public	W	TR	277	Avorio	BW	2013	Private	W	IT
229	Colfiorito	BW	2010	Private	W	IT	278	Bona dea	BW	2013	Private	W	SK
230	ES26	BW	2010	Public	W	TR	279	Casanova	DW	2013	Private	W	IT
231	Güney Yıldızı	DW	2010	Public	S	TR	280	Cesare	DW	2013	Private	F	IT
232	Kırık	BW	2010	Public	F	TR	281	Diñç	BW	2013	Public	S	TR
233	Lütfibey	BW	2010	Public	W	TR	282	Geronimo	BW	2013	Private	W	IT
234	May8462	BW	2010	Private	W	na	283	Gökkan	BW	2013	Public	S	TR
235	Özkan	BW	2010	Univ	S	TR	284	Kırkayak	BW	2013	Private	W	TR
236	TT601	BW	2010	Private	W	TR	285	Mesut	BW	2013	Public	F	TR
237	Zühre	DW	2010	Public	S	TR	286	Nota	BW	2013	Private	W	RU
238	Anapo	BW	2011	Private	F	IT	287	Pitagora	DW	2013	Private	S	IT
239	Ayyıldız	BW	2011	Public	W	TR	288	Renan	BW	2013	Private	W	FR
240	Botticelli	BW	2011	Private	W	IT	289	Sarı Başak	DW	2013	Public	S	TR
241	Burgos	DW	2011	Private	S	ES	290	Segor	BW	2013	Private	W	CH
242	Carisma	BW	2011	Private	W	IT	291	Seri2013	BW	2013	Public	S	TR
243	Claudio	DW	2011	Private	S	IT	292	Stendal	BW	2013	Private	W	IT
244	Cömert2	BW	2011	Private	W	TR	293	Yubileynaya100	BW	2013	Private	W	RU
245	Esperia	BW	2011	Private	W	IT	294	Anforeta	BW	2014	Private	W	IT

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295	Astet	BW	2014	Private	W	UA	344	GK Szala	BW	2016	Private	W	HU
296	Azul	BW	2014	Private	W	IT	345	Kaynarca	BW	2016	Public	S	TR
297	Biensur	DW	2014	Private	S	FR	346	Kayra	BW	2016	Public	F	TR
298	Bora	BW	2014	Private	W	IT	347	Leuta	BW	2016	Private	W	HR
299	Bozkır	BW	2014	Public	W	TR	348	Maden	BW	2016	Private	W	TR
300	Delabrad2	BW	2014	Private	W	RO	349	MassimoMeridio	DW	2016	Private	S	IT
301	Faur F	BW	2014	Private	W	RO	350	Miriana	BW	2016	Private	W	BG
302	Galateya	BW	2014	Private	W	BG	351	Natula	BW	2016	Private	W	PL
303	Genesi	BW	2014	Private	W	IT	352	NKU Ergene	BW	2016	Univ	W	TR
304	Glosa	BW	2014	Private	W	RO	353	NKU Lider	BW	2016	Univ	W	TR
305	Kharus	BW	2014	Private	W	UA	354	Nova	DW	2016	Private	F	TR
306	Masaccio	BW	2014	Private	F	IT	355	NS 40S	BW	2016	Private	W	RS
307	Metin	BW	2014	Public	F	TR	356	Oscar	BW	2016	Private	F	TR
308	Midas	BW	2014	Private	W	AT	357	Reis	BW	2016	Public	W	TR
309	Mihelca	BW	2014	Private	W	HR	358	Renata	BW	2016	Private	W	HR
310	Nevzatbey	BW	2014	Public	W	TR	359	Sobald	BW	2016	Private	W	FR
311	Prima	BW	2014	Private	W	HR	360	Sollario	BW	2016	Private	W	FR
312	Saban	BW	2014	Public	W	TR	361	Şanlı	BW	2016	Public	F	TR
313	Tekin	BW	2014	Public	S	TR	362	Tekir	BW	2016	Private	F	TR
314	Yakamoz	BW	2014	Public	S	TR	363	Toros1003	BW	2016	Private	S	TR
315	Alada	BW	2015	Public	F	TR	364	Trionfo	DW	2016	Private	S	IT
316	Alatay	DW	2015	Public	S	TR	365	Tripudio	DW	2016	Private	S	IT
317	Altınöz	BW	2015	Public	S	TR	366	Venka1	BW	2016	Private	W	BG
318	Ayzer	DW	2015	Public	S	TR	367	Yaren	DW	2016	Public	S	TR
319	Cendere	BW	2015	Private	S	TR	368	Yörük	BW	2016	Private	F	TR
320	Efe	BW	2015	Public	S	TR	369	Yüksel	BW	2016	Public	W	TR
321	Eker	DW	2015	Public	S	TR	370	Zümürüt	BW	2016	Private	F	TR
322	Hamza	BW	2015	Private	W	TR	371	Sena	DW	2016	Univ	S	TR
323	Hasanbey	DW	2015	Public	S	TR	372	Aliğa	BW	2017	Public	W	TR
324	Kale	BW	2015	Public	S	TR	373	Alp1	BW	2017	Private	F	TR
325	Köprü	BW	2015	Public	W	TR	374	Andalusia	BW	2017	Private	W	IT
326	Maestrale	DW	2015	Private	S	IT	375	Aslı	BW	2017	Private	W	AT
327	NKÜZiraat	DW	2015	Univ	F	TR	376	Candaş	BW	2017	Public	S	TR
328	Nusrat	BW	2015	Public	F	TR	377	Çeşmeli	BW	2017	Private	W	TR
329	Perre	DW	2015	Private	S	TR	378	Çıfçıklı	BW	2017	Private	S	TR
330	Sarımustafa	BW	2015	Private	W	TR	379	Dunaviya	BW	2017	Private	W	BG
331	Sertori	BW	2015	Private	W	CH	380	Duru17	BW	2017	Private	W	HR
332	Solveig	BW	2015	Private	F	FR	381	Ecem	DW	2017	Private	S	TR
333	Tigre	BW	2015	Private	S	FR	382	Edessa	DW	2017	Public	S	TR
334	Uniya	DW	2015	Private	W	RU	383	Ekinoks	BW	2017	Public	S	TR
335	Acar	BW	2016	Public	F	TR	384	Energo	BW	2017	Private	W	DE
336	Altuğ	BW	2016	Public	F	TR	385	Flamenko	BW	2017	Private	W	FR
337	Ant	BW	2016	Private	F	TR	386	Ghayta	BW	2017	Private	W	FR
338	Asuncion	BW	2016	Private	W	IT	387	Guappo vst	BW	2017	Private	W	IT
339	Beğendik	BW	2016	Private	W	TR	388	Güdük	BW	2017	Private	W	TR
340	Boema1	BW	2016	Private	W	RO	389	Günberi	DW	2017	Public	S	TR
341	Destan	BW	2016	Private	W	TR	390	Haciveli	BW	2017	Private	F	TR
342	Enola	BW	2016	Private	W	BG	391	Havabacı	BW	2017	Private	W	TR
343	Ganos	DW	2016	Private	W	TR	392	Hendrix	BW	2017	Private	W	FR

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393	Hisar	BW	2017	Private	W	TR	442	Setan	BW	2018	Private	S	TR
394	Hüseyinbey	BW	2017	Private	W	TR	443	Severina	DW	2018	Private	W	BG
395	İkbal	BW	2017	Private	S	TR	444	Sultançayır	BW	2018	Private	F	TR
396	Lazarka	BW	2017	Private	W	BG	445	Sümerli	DW	2018	Public	S	TR
397	Lucilla	BW	2017	Private	F	IT	446	Şehzade1	BW	2018	Public	F	TR
398	Maria	BW	2017	Private	W	UA	447	Taner	BW	2018	Public	F	TR
399	Maya	BW	2017	Private	W	TR	448	Tekfen 1013	BW	2018	Private	S	TR
400	Merilin	BW	2017	Private	W	BG	449	Topkapı	BW	2018	Private	W	AT
401	Michelangelo	BW	2017	Private	W	IT	450	Türköz1	DW	2018	Public	W	TR
402	Mimmo	DW	2017	Private	F	IT	451	Viktoria	BW	2018	Private	W	HR
403	Misiia Odes'ka	BW	2017	Private	W	UA	452	Wafia	BW	2018	Private	S	FR
404	Musik	BW	2017	Private	W	FR	453	ZT Ziyade	BW	2018	Private	W	TR
405	Mv Taller	BW	2017	Private	W	HU	454	Abide	BW	2019	Public	W	TR
406	Nomade	BW	2017	Private	W	IT	455	Adonis	BW	2019	Private	S	TR
407	OS Jelena	BW	2017	Private	W	HR	456	Ahtska	BW	2019	Public	W	TR
408	Pannonia	BW	2017	Private	W	RS	457	Aleppo	BW	2019	Private	W	IT
409	Paşa	BW	2017	Private	W	TR	458	Almeria	BW	2019	Private	S	IT
410	Pelit	BW	2017	Private	F	TR	459	Anafarta	BW	2019	Public	W	TR
411	Rebelde	BW	2017	Private	W	IT	460	Annie	BW	2019	Private	W	CZ
412	Ronsard	BW	2017	Private	W	FR	461	Anzele	DW	2019	Private	S	TR
413	Sankerim	BW	2017	Private	F	TR	462	Arin	BW	2019	Private	S	TR
414	Skerzzo	BW	2017	Private	W	FR	463	Ayten Abla	BW	2019	Public	F	TR
415	Soledad	BW	2017	Private	W	FR	464	Başkurt	BW	2019	Public	W	TR
416	Tiziana	DW	2017	Private	F	IT	465	Beyazhan	BW	2019	Private	S	TR
417	Troubadur	DW	2017	Private	W	AT	466	Bilden	BW	2019	Public	W	TR
418	Yiğit	BW	2017	Private	W	TR	467	Bohemia	BW	2019	Private	W	CZ
419	Zlatoglava	BW	2017	Private	W	UA	468	Calumet	BW	2019	Public	W	FR
420	Zolotko	DW	2017	Private	W	RU	469	Çavuş	BW	2019	Public	W	TR
421	Perfekta	BW	2017	Private	W	RS	470	Demirhan	BW	2019	Public	F	TR
422	Adalı	BW	2018	Public	W	TR	471	Ginseng	DW	2019	Private	S	FR
423	Albachiara	BW	2018	Private	W	IT	472	Izvor	BW	2019	Private	W	RO
424	Argeles	DW	2018	Private	S	FR	473	İlkhan	DW	2019	Public	S	TR
425	Bc Anica	BW	2018	Private	W	HR	474	Karakalpak	BW	2019	Public	W	TR
426	Bojana	BW	2018	Private	W	BG	475	Kıpçak	BW	2019	Public	W	TR
427	Damla	BW	2018	Public	W	TR	476	Lavoisier	BW	2019	Public	W	FR
428	Dragana	BW	2018	Private	W	BG	477	Mario	DW	2019	Private	S	FR
429	FDL Miranda	BW	2018	Private	W	RO	478	Mirsa	BW	2019	Public	F	TR
430	Halis	BW	2018	Public	F	TR	479	Ovidio	DW	2019	Private	S	IT
431	Hamitbey	BW	2018	Public	W	TR	480	Pandiya	BW	2019	Private	W	UA
432	Iveta	BW	2018	Private	W	BG	481	Peçenek	BW	2019	Public	F	TR
433	Kışla	BW	2018	Public	F	TR	482	Polathan	BW	2019	Public	S	TR
434	Koç2015	BW	2018	Public	S	TR	483	Poyraz	DW	2019	Public	S	TR
435	Maja	BW	2018	Private	W	HR	484	Salgado	DW	2019	Private	F	IT
436	Meltem	BW	2018	Public	S	TR	485	Somuncuoğlu	BW	2019	Public	W	TR
437	Milandur	DW	2018	Private	W	AT	486	Stoyana	BW	2019	Private	W	BG
438	Muna	BW	2018	Private	S	TR	487	Tekfen1016	BW	2019	Private	S	TR
439	NKU Asiya	BW	2018	Univ	W	TR	488	Tekfen2038	BW	2019	Private	F	TR
440	Oktan	BW	2018	Private	S	TR	489	Teodorico	DW	2019	Private	S	IT
441	Otilia	BW	2018	Private	W	RO	490	Tigris	DW	2019	Private	S	TR

Continuing Annex 1

No Variety	Spp. ¹	Rel. Year ²	Rel. By ³	GH ⁴	Origin ⁵	No Variety	Spp. ¹	Rel. Year ²	Rel. By ³	GH ⁴	Origin ⁵
491 Tuğra	BW	2019	Public	W	TR	540 NKÜ Zirve	BW	2020	Univ	W	TR
492 Vehbibey	DW	2019	Public	W	TR	541 Payitaht	BW	2020	Private	W	TR
493 Waximum	BW	2019	Private	W	FR	542 Perge 07	BW	2020	Public	S	TR
494 Yavuz	BW	2019	Public	F	TR	543 Seki 07	BW	2020	Public	S	TR
495 Activus	BW	2020	Private	W	AT	544 Selamibey	BW	2020	Public	F	TR
496 Afra	BW	2020	Private	W	TR	545 Selçuklu	BW	2020	Public	W	TR
497 Akça	BW	2020	Private	F	TR	546 Sırçalı	DW	2020	Public	F	TR
498 Akmira	BW	2020	Private	W	TR	547 Simge	BW	2020	Public	S	TR
499 Aksungur	BW	2020	Public	W	TR	548 Şahika	BW	2020	Public	F	TR
500 Alturna	BW	2020	Public	W	TR	549 Teb0693	BW	2020	Private	W	TR
501 Arifbey	BW	2020	Public	W	TR	550 Tekfen1039	BW	2020	Private	F	TR
502 Aurelia	BW	2020	Private	W	HU	551 Tekfen2001	BW	2020	Private	W	TR
503 Ayaz	BW	2020	Public	F	TR	552 Tekfen2077	BW	2020	Private	W	TR
504 Babil	BW	2020	Private	S	TR	553 Tekfen2095	BW	2020	Private	F	TR
505 Bagira	BW	2020	Public	W	RU	554 Yusuf Bey	BW	2020	Private	W	TR
506 Bayındır	BW	2020	Public	W	TR	555 Zoria Ukrayna	<i>Tr. spelta</i>	2020	Private	W	UA
507 Bayram	BW	2020	Public	F	TR	556 Ağabey	DW	2021	Private	S	TR
508 Beyhan	BW	2020	Public	W	TR	557 Akçabey	BW	2021	Private	W	TR
509 Buhara	BW	2020	Public	W	TR	558 Albaşak	BW	2021	Public	W	TR
510 Cemile	BW	2020	Private	F	TR	559 Albayrak	BW	2021	Private	W	TR
511 Çağdaş	BW	2020	Private	W	TR	560 Armağan	BW	2021	Public	F	TR
512 Dekatlon	BW	2020	Private	F	TR	561 Atasiyez	<i>Tr. monoc.</i>	2021	Public	F	TR
513 Duronesse	DW	2020	Private	S	DE	562 Avşar	BW	2021	Public	F	TR
514 Durusa	DW	2020	Public	S	TR	563 Badin	DW	2021	Private	S	TR
515 Ettore	DW	2020	Private	F	IT	564 Balkoni	DW	2021	Private	F	TR
516 Eylül	BW	2020	Public	W	TR	565 Bengisu	BW	2021	Public	W	TR
517 Ezgi	BW	2020	Private	W	TR	566 Beyaz1	BW	2021	Private	F	TR
518 Fazılbe	BW	2020	Public	W	TR	567 Bisanzio	BW	2021	Private	F	IT
519 Forcali	BW	2020	Private	W	FR	568 Boldane	BW	2021	Private	F	TR
520 Germenicia	BW	2020	Public	S	TR	569 Bolkar	BW	2021	Private	W	TR
521 GK Futar	BW	2020	Private	W	HU	570 Bozok	BW	2021	Public	W	TR
522 Güçlü	BW	2020	Private	W	TR	571 Cudi63	DW	2021	Public	S	TR
523 Hünkar	BW	2020	Private	W	TR	572 Cumakale	DW	2021	Private	S	TR
524 İkonya	BW	2020	Public	W	TR	573 Dar	BW	2021	Private	F	IL
525 Karmen	BW	2020	Public	F	TR	574 Enduro	DW	2021	Private	F	TR
526 Khersons'ka99	BW	2020	Private	W	UA	575 Enerji	BW	2021	Private	W	TR
527 Kirve	BW	2020	Public	S	TR	576 Erbaş	BW	2021	Public	F	TR
528 Kobra59	BW	2020	Private	W	TR	577 Esmeray	BW	2021	Private	W	TR
529 Kürşad	BW	2020	Public	F	TR	578 Eymenbey	BW	2021	Private	S	TR
530 Levent	DW	2020	Public	W	TR	579 Fadime Ana	BW	2021	Private	W	TR
531 Meke	BW	2020	Public	W	TR	580 Falado	BW	2021	Private	W	FR
532 Metropolis	BW	2020	Private	W	IT	581 Grador	DW	2021	Private	S	ES
533 Mv Kepe	BW	2020	Private	W	HU	582 Helina	BW	2021	Private	W	BG
534 Mv Kolo	BW	2020	Private	W	HU	583 Hilar	BW	2021	Public	S	TR
535 Mv Lucilla	BW	2020	Private	W	HU	584 İsmetbey	BW	2021	Private	W	TR
536 Mv Nemere	BW	2020	Private	W	HU	585 Kafkas	<i>Tr. turgidum</i>	2021	Public	F	TR
537 Mv Pantlika	BW	2020	Private	W	HU	586 Karaduman	BW	2021	Public	W	TR
538 Mv Toldi	BW	2020	Private	W	HU	587 Karolina5	BW	2021	Private	W	RU
539 Freeman	BW	2020	Private	W	US	588 Kılınç	BW	2021	Public	W	TR

Continuing Annex 1

No	Variety	Spp. ¹	Rel. Year ²	Rel. By ³	GH ⁴	Origin ⁵
589	Koç1453	BW	2021	Public	W	TR
590	Lancillotto	BW	2021	Private	W	FR
591	Mergüze	<i>Tr. monoc.</i>	2021	Public	F	TR
592	MesutÖzen	BW	2021	Private	W	TR
593	Meya1	DW	2021	Private	S	TR
594	Meya2	DW	2021	Private	S	TR
595	Meya3	BW	2021	Private	S	TR
596	Nizar	BW	2021	Private	S	TR
597	NS Mila	BW	2021	Private	W	RS
598	NS Obala	BW	2021	Private	W	RS
599	Pamira	BW	2021	Private	S	TR
600	Ramisbey	BW	2021	Public	W	TR
601	Refikbey	BW	2021	Private	W	TR
602	Saco16	BW	2021	Private	S	TR
603	Saco2018	DW	2021	Private	S	TR
604	Selenivka	BW	2021	Private	W	UA
605	Serince	BW	2021	Public	S	TR
606	Sy Atlante	DW	2021	Private	S	IT
607	Sy Leonardo	DW	2021	Private	S	IT
608	Tekfen2064	BW	2021	Private	W	TR
609	Tekfen2239	BW	2021	Private	W	TR
610	Tılsım	BW	2021	Private	F	TR
611	Tragen103	BW	2021	Private	W	TR
612	Tufan	BW	2021	Private	S	TR
613	Zorlu	BW	2021	Public	F	TR
614	Biryıldız	BW	2021	Private	W	TR
615	İkiyıldız	BW	2021	Private	W	TR
616	Tekfen2104	BW	2021	Private	W	TR
617	Altınsa	DW	2021	Public	S	TR

¹ Species; BW Bread Wheat; DW Durum Wheat

² Year of Release

³ Released by

⁴ Growth Habit; GH is assigned to any of the variety based on the registration report of Variety Registration and Seed Certification Center, Website of the variety owner or GH given in the some scientific studies and Thesis

⁵ Origin; is assigned to any of the variety based on the registration report of Variety Registration and Seed Certification Center, Website of the variety owner or from the some scientific studies and Thesis

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