International Journal of
Health Systems and Medical Science

ISSN: 2833-7433
Volume 1 | No 6 | Dec-2022

Distribution of Local Species Belonging to Aegilops L. Species Distributed in the South-West, Central and North-East Regions of Uzbekistan

Faridun Sobirov [1]

[1] Institute of Genetics and Plant Experimental Biology of the Academy of Sciences of the Republic of Uzbekistan

Abstract: As the number of people on the earth increases progressively year by year, it is also required to supply the population with food. The demand for soft wheat, which is the main food crop, will also increase. At the moment, the repeated self-breeding of soft wheat and the creation of a new variety lead to the narrowing of the genome of this plant, and as a result, its tolerance to the effects of various inconveniences (biotic and abiotic factors) is decreasing. Wild relatives have maintained their resistance to biotic and abiotic stressors throughout evolution. In solving this problem, it is appropriate to refer to the species of the genus Aegilops L., which belong to wild relatives. During 2021-2022, expeditionary research was carried out in the southwestern, central and northeastern regions of Uzbekistan, and local species of the genus Aegilops L. were collected and their collection catalog was compiled.

Keywords: Aegilops L., common wheat, nutrition, biotic and abiotic factors.

Introduction. In recent decades, great attention has been paid worldwide to the problems of conservation and rational use of plant genetic resources, which serve as the basis for breeding development and ensuring food security [5]. According to the Second World Report on the State of Genetic Resources for Food and Agriculture, there are 1,750 genebanks worldwide, storing 7.03 million samples (FAO, 2010). Wheat (Triticum aestivum L.) is an important food crop. Despite the great success in its cultivation, it remains an urgent problem to create varieties with genes that effectively protect them from adverse abiotic and biotic environmental factors along with high potential yield [3].

The genetic diversity of common wheat is not sufficient to solve this problem. Therefore, the most urgent task of geneticists and breeders is to create new varieties of wheat using introgression of genetic material from wild species that are resistant to various adverse environmental factors [3]. Therefore, when creating varieties and breeding lines of wheat on the basis of long hybridization, the question of the degree of influence of the replacement and transfer of foreign genes on various economically valuable characters remains natural [21].

Drought is one of the main environmental factors limiting plant growth and productivity. In order to ensure a reduction in the loss of agricultural products during dry years, it is necessary to have varieties resistant to moisture deficit. The problem of obtaining drought-resistant varieties is relevant for most cultivated plant species in many countries of the world [2, 6, 16].

Creation of disease-resistant varieties is a current direction of breeding. In order to expand the genetic diversity of modern varieties of soft wheat, the method of interspecies hybridization is used with the involvement of wild relatives [7]. The growing needs of the world's population to increase the production of cereal grains can be met by increasing the area and productivity of major cereal crops, including common wheat (Triticum aestivum L.). At the same time, the main obstacle to the

expansion of areas under soft wheat cultivation is unfavorable factors that wheat is not sufficiently resistant to [8].

Soil salinity is one of the main limiting factors that negatively affects the growth and development of wheat. Grain quality deteriorates and yield decreases in wheat under salinity conditions [19]. One of the ways to overcome the negative effects of the salinity factor is the use of wheat varieties resistant to salinity. Development and cultivation of such varieties will expand agricultural land and reduce crop losses [20]. In the research of a number of authors, it is emphasized that the wild relatives of cultivated plants, as a unique genetic resource, are able to solve the problems of resistance to diseases, pests, cold, drought, and expand the inevitably limited genetic base of modern varieties [17]. It is important to use the gene pool of wild relatives to expand breeding opportunities and create stress-resistant, productive and high-quality varieties [1, 10].

The D genome is known to have a positive effect on traits related to wheat grain yield and quality. The improvement of the D-genome of wheat by direct hybridization with the D-genome donor (Aegilops tauschii) is reviewed in [4], with the obtaining of synthetic hexaploids and an evaluation of the advantages and disadvantages of using each method. Synthetic hexaploids are used as valuable genetic resources in the breeding programs of CIMMIT, ICARDA international centers and in the national programs of Australia, France, Japan, Mexico, the Netherlands, Great Britain, the USA, as well as China [14].

Species belonging to the genus Aegilops L. were collected from various regions of Uzbekistan (Samarkand, Kashkadarya, Jizzakh, Navoi, some districts of Tashkent regions) during the 2021-2022 expedition years [9, 18]. 5 species belonging to the Aegilops L. family distributed in these regions (Aegilops tauschii, Aegilops triuncialis, Aegilops cylindrica, Aegilops crassa, Aegilops juvenalis) are distinguished by their adaptation to the growing climate, that is, their resistance to abiotic and biotic factors there and their unique adaptations to that area stands It was determined based on expeditionary observations that these species are distributed at an altitude of 500-1650 m above sea level and are almost not found in mountainous areas above this altitude [11, 12].

Table 1. A brief description of species belonging to the genus Aegilops L. distributed in different regions of Uzbekistan

Spread area	Height above sea level, h=	Altitude spread limit	Coordinate	Aegilops tauschii	Aegilops triuncialis	Aegilops cylindrica	Aegilops crassa	Aegilops juvenalis
Samarkand region								
Samarkand district								
Ohalik	870	750-870	39°55'04.76" 66°89'66.49"	+	+	+	+	-
Akbuyra	850	770-860	39°51'22.79" 66°88'62.89"	-	-	+	+	-
Mironkul	794	720-830	39°56'78.64" 66°83'50.04"	+	+	+	+	-
Nayzatepa	754	700-780	39°57'68.54" 67°01'71.19"	+	+	-	-	-
Shurboicha	757	700-780	39°58'64.14" 67°02'13.18"	+	+	-	-	-
Dargom	747	690-760	39°58'15.89" 67°00'53.08"	+	+	+	-	-

Urgut district								
Tersak	1121	1000-1160	39°36'92.53" 66°94'38.18"	+	+	+	+	-
Kizilbosh	1025	970-1080	39°23'17.03" 67°00'19.37"	+	+	-	+	-
Amankutan	1320	1200-1370	39°18'24.29" 66°55'49.11"	+	+	+	+	-
Taxtakaracha	1650	1590-1670	39°28'48.88" 65°82'25.25"	+	+	-	-	-
Nurobod district								
Nurbuloq	577	520-600	39°79'61.36" 66°44'49.91"	+	-	-	+	-
Oqsoy	755	690-780	39°54'35.01" 66°62'72.69"	+	+	-	-	-
Tovoqbuloq	768	695-780	39°54'24.86" 66°68'49.07"	+	+	+	-	-
Urtashurcha	600	580-650	39°66'52.92" 66°36'65.58"	-	+	-	-	-
Zirabuloq	508	500-550	39°58'84.76" 66°32'73.53"	-	+	+	-	-
Baybicha	705	680-750	39°51'98.34" 66°46'94.73"	-	-	+	+	-
Tepakul	800	770-840	39°55'28.45" 66°79'66.63"	+	+	+	+	-
Sarikul	771	740-810	39°51'28.52" 66°51'90.06"	-	+	-	-	-
Sazagan	775	720-790	39°53'96.48" 66°72'75.43"	-	+	-	-	-
Pastdargom district								
Zarafshon	518	500-560	39°88'42.13" 66°48'48.46"	+	+	-	-	-
Kushrabot district								
Jush	890	850-925	40°37'62.50" 66°39'29.89"	-	+	+	+	-
Kovunchi	930	890-955	40°30'89.66" 66°47'69.09"	-	+	+	+	-
Bulungur district								
Ishmantub	810	795-870	39°85'22.20" 67°42'05.26"	-	+	+	-	-
Mirzabulok	890	850-930	39°85'48.52" 67°37'79.10"	-	+	+	-	-
Kashkadarya region								
Kitab district								
Kaynar	825	790-845	39°18'56.28" 66°85'32.80"	-	-	+	-	-
Varganza	855	820-900	39°19'72.08" 66°98'36.83"	-	+	+	+	-
Bashir	874	830-920	39°23'38.40" 67°03'65.46"	-	+	+	+	+
Ruskishlak	720	700-760	39°09'13.71" 66°53'12.62"	-	-	+	-	-
Kitab	770	720-790	39°19'65.25" 66°90'68.54"	-	-	+	-	-

Panji	719	700-790	39°14'80.68" 66°96'07.64"	+	-	+	+	-
Korabulok	733	710-800	39°16'22.07" 66°98'77.85"	+	+	+	-	-
Kuktash	914	880-950	39°17'71.26" 67°07'55.20"	-	-	+	-	-
Obikanda	850	820-900	39°16'82.24" 67°12'5478"	-	-	+	-	-
Javz	1225	1100-1280	39°11'46.08" 67°16'83.92"	+	+	+	-	-
Reserve	1374	1190-1400	39°11'23.74" 67°17'35.27"	+	+	+	+	-
Shakhrisabz district								
Xisor	1540	1430-1590	38°53'51.11" 67°15'42.82"	-	+	-	-	-
Xitoy	1380	1320-1430	38°52'29.21" 67°18'24.21"	-	+	-	-	-
Olmali	1225	1200-1280	38°87'35.35" 67°30'89.28"	-	+	-	-	-
Navoi region								
Xatirchi district								
Yangirabod	640	620-680	40°03'86.02" 65°97'72.02"	+	+	-	-	-
Kuktepa	700	670-750	40°46'09.61" 66°07'07.02"	+	+	+	+	-
Oqtepa	775	725-810	40°11'41.56" 66°01'95.01"	+	+	-	+	-
Chimmos	765	730-800	40°42'02.79" 66°18'79.25"	-	+	-	-	-
Langar	1345	1300-1450	40°39'81.07" 65°99'59.46"	+	+	-	-	-
Chuya	900	870-950	40°42'44.18" 66°00'53.19"	-	+	+	-	-
Jizzakh region								
Zomin district								
Terakzor	1220	1180-1270	39°75'84.20" 68°41'15.79"	-	-	+	-	-
Qo'riq	720	690-750	39°93'18.65" 68°39'22.66"	-	+	-	-	-
Duoba	1010	980-1050	39°81'09.07" 68°38'66.74"	-	+	+	-	-
Milliy bog	1440	1390-1480	39°72'10.74" 68°43'83.05"	+	+	+	-	-
Pass	1030	1010-1080	39°83'37.93" 68°37'03.23"	-	+	+	-	-
Achchi	520	510-550	39°95'81.30" 68°21'16.42"	-	+	+	-	-
Boytepa	1000	980-1045	39°84'77.02" 68°37'34.21"	-	+	-	-	-
Qorong'isoy	1110	1090-1150	39°76'70.00" 68°40'59.20"	-	-	+	-	-
Qizilsoy	620	600-680	39°96'24.90" 68°34'46.06"	+	+	+	-	-

Gallaorol district								
Mullabuloq	670	620-700	39°93'44.74" 67°52'44.70"	+	+	+	-	-
Sangzor	570	520-590	40°02'73.56" 67°61'97.43"	+	+	+	+	-
Saroy	740	700-770	39°88'83.85" 67°49'17.71"	+	+	-	+	-
Saribozor	630	610-670	40°03'88.69" 67°64'60.14"	-	+	+	+	-
Bakhmal district								
Odamali	880	825-900	39°85'27.10" 67°70'57.20"	-	+	+	-	-
Buloqboshi	710	675-740	40°01'15.89" 67°60'12.00"	-	+	+	-	-
Xoltoy	1000	970-1060	39°81'84.77" 67°77'91.31"	+	+	+	-	-
Baxmal	1315	1280-1350	39°76'67.78" 67°92'53.56"	-	+	+	-	-
Tangatopdi	1540	1500-1620	39°68'65.18" 67°92'74.29"	+	+	+	-	-
Jadik	1230	1190-1260	39°68'55.50" 67°90'62.28"	-	+	+	-	-
Dag'oba	1615	1560-1670	39°68'55.08" 67°90'62.42"	-	+	+	-	-
Sutli buloq	1180	1140-1200	39°79'98.58" 67°91'57.71"	+	+	-	-	-
Jizzax district								
Buxoriy	580	550-610	40°09'55.62" 67°96'39.89"	-	-	+	-	-
Hasangaba	650	620-700	40°05'14.01" 67°73'25.81"	-	+	+	-	-
Sayxan	615	600-650	40°05'40.86" 67°70'66.50"	-	-	+	+	-
Tashkent region								
Bostanliq district								
Yangikurgan	1160	1120-1210	41°58'28.93" 70°08'27.28"	-	+	-	-	-
Sijjak	1050	1010-1090	41°69'09.73" 70°06'11.29"	-	+	+	-	-
Navruz	1070	1010-1095	41°59'07.50" 70°06'11.20"	-	+	+	-	-
Gagarin	1190	1160-1240	41°58'28.93" 70°06'27.28"	-	+	+	-	-
Pansionat	1080	1050-1120	41°59'09.03" 70°06'10.66"	-	-	+	-	-
Avenyu	1077	1025-1110	41°59'07.50" 70°06'11.20"	-	+	-	-	-
Gagarin 2	1080	1040-1120	41°59'05.68" 70°06'01.40"	-	+	-	-	-
Kanyon	1160	1110-1190	41°58'42.82" 70°07'41.97"	-	+	+	-	-
Burchimullo	1012	990-1060	41°60'08.48" 70°10'29.73"	-	+	+	-	-

Piramida	1010	970-1050	41°61'09.63" 70°02'69.02"	-	+	+	-	-
Chorvok	1000	950-1040	41°61'12.41" 70°02'69.92"	-	+	+	-	-
Boladala	1030	960-1070	41°64'14.69" 70°06'56.37"	-	+	+	-	-
Yakkatut	990	950-1040	41°62'41.40" 70°07'40.34"	-	+	-	-	-
Jarboshi	1110	1080-1140	41°65'28.98" 70°01'08.62"	-	-	+	-	-
Terrazza	950	900-990	41°61'90.01" 69°95'71.18"	-	+	+	-	-
Nanay	970	920-1010	41°72'17.06" 70°11'67.15"	-	+	+	-	-
Koksu	930	910-960	41°64'46.84" 70°21'98.45"	-	+	+	-	-
Xojikent	835	820-870	41°60'85.56" 69°89'60.98"	-	+	+	-	-
Aktash	1130	1110-1160	41°64'24.67" 69°76'49.48"	-	+	+	-	-
Soylik	820	800-850	41°59'90.06" 69°76'65.52"	+	+	+	-	-
Kuyoshtepa	1169	1120-1220	41°64'34.02" 69°76'42.59"	-	+	+	-	-
Kibray district								
Yukori yuz	508	500-530	41°36'48.20" 69°39'81.40"	-	-	+	-	-

From the data in Table 1, it can be seen that the highest point in terms of the height limit above sea level in the distribution frequency of the samples is Takhtakoracha Pass (1650) and the lowest point is Upper Face and Zirabulok (508). In terms of regions, the highest point in Samarkand region is Takhtakoracha pass (1650) and the lowest point is Zirabulok (518), in Kashkadarya region the highest point is Hisar (1540) and the lowest point is Panji (719), in Navoi region the highest point is Langar (1345) and the lowest point is the lowest point is Yangirabad (640), the highest point is Dagoba (1615) and the lowest point is Achchi (520) in Jizzakh region, the highest point is Gagarin (1190) and the lowest point is Uro Yuz (508) in Tashkent region. If we consider species, Ae. cylindrica, the highest point is Dag'oba (1615) and the lowest point is Upper Face and Zirabulok (508), Ae. tauschii type, the highest point is Takhtaqoracha pass (1650) and the lowest point is Zirabulok (508), Ae. in the triuncialis type, the highest point is Takhtakoracha Pass (1650) and the lowest point is Zarafshan (518), Ae. in the crassa type, the highest point Qovunchi (930) and the lowest point Sangzor (570) were recorded. Taking into account the distribution of species, it was found that these species do not occur below 500 m above sea level and above 1650 m above sea level, and Ae. tauschii, Ae. triuncialis and Ae. cylindrica species were found to be distributed in the highest and lowest points.

It was found out from the expedition research that from the regions of the Republic with high humidity to the regions with a high level of steppe and desertification, the amount of green mass in the plant decreases, the height of the plant decreases, the number of stalks in the total stem decreases, the number of spikes in the ear decreases, and the grain weight in the plant decreases. But even in such a situation, it was observed that the plant adapted to dry conditions and managed to complete the vegetation period. It can be seen that the local representatives of this species have adapted to the environment in which they have been growing for millions of years in the evolutionary process. However, due to the increasing population and the occupation of territories, annual grasses are massively harvested by humans for fodder, and as a result, the areas occupied by local species of this

species are decreasing year by year. We will see that the area where we went on an expedition last year to pick plants, will be occupied and surrounded by people the next year. This requires the preservation and reproduction of the species and its transmission to the next generation.

Table 2. In 2021-2022, the number of local specimens of the genus Aegilops L. collected from some district areas of Samarkand, Kashkadarya, Navoi, Jizzakh and Tashkent regions

Species	Provinces					Total
	Samarkand	Kashkadarya	Navoi	Jizzakh	Tashkent	
Ae. cylindrica	33	27	2	19	29	110
Ae. tauschii Coss	22	17	6	9	1	55
Ae. triuncialis L.	51	34	10	22	25	142
Ae. crassa Bois	13	4	1	4	0	22
Ae. juvenalis L.	0	1	0	0	0	1
Total	119	83	19	54	55	330

The data of Table 2 were determined in descending order of the samples taken in the region in Samarkand (119), Kashkadarya (83), Tashkent (55), Jizzakh (54), Navoi (19) regions. In the cross section of the species, local samples Ae. triuncialis (142), Ae. cylindrica (110), Ae. tauschii (55), Ae. crassa (12), Ae. juvenalis (1) species. Ae. triuncialis species is considered the most common species, and this species was found in almost all studied regions, it was recorded in Samarkand (51), Kashkadarya (34), Tashkent (25), Jizzakh (22), Navoi (10) regions. Ae. cylindrica species is the second most widespread in the studied regions and was found in Samarkand (33), Tashkent (29), Kashkadarya (27), Jizzakh (19), Navoi (2) regions. Ae. The tauschii species is the third most widespread in the studied regions and was found in Samarkand (22), Kashkadarya (17), Jizzakh (9), Navoi (6), and Tashkent (1) regions. Ae. crassa type is the fourth most common in the studied regions and was found in Samarkand (13), Jizzakh (4), Kashkadarya (4), Navoi (1) regions. Ae. juvenalis species was found in Kashkadarya (1) region, taking the fifth place in terms of distribution in the studied areas, and this species was recorded as a rare species.

Table 3. A brief description of species belonging to the genus Aegilops L. distributed on Earth

Section	Diploid (2n=14)		Tetraploid (2n=28)		Hexaploid (2n=42)	
	Species	Genome	Species	Genome	Species	Genome
Aegilops L.	Ae. umbellulata	U	Ae. biuncialis	UM		
Aegilops L.			Ae. columnaris	UM		
Aegilops L.			Ae. geniculata	MU		
Aegilops L.			Ae. kotschyi	SU		
Aegilops L.			Ae. neglecta	UM	Ae. neglecta	UMN
Aegilops L.			Ae. peregrina	SU		
Aegilops L.			Ae. triuncialis	UC		
Comopyrum	Ae. comosa	M		SU		
Comopyrum	Ae. uniaristata	N				
Cylindropyron	Ae. markgrafii	C	Ae. cylindrica	DC		
Sitopsis	Ae. bicornis	S^b				
Sitopsis	Ae. longissima	S^l				
Sitopsis	Ae. sharonensis	S^{sh}				
Sitopsis	Ae. searsii	S^s				

Sitopsis	Ae. speltoides	S^b				
Vertebrata	Ae. tauschii	D	Ae. crassa	DM	Ae. crassa	DDM
Vertebrata			Ae. ventricosa	DN	Ae. vavilovii	DMS
Vertebrata					Ae. juvenalis	DMU
Amblyopyrum	Ae. mutica	T				

As can be seen from the data in Table 3, a total of 23 named species of the Aegilops L. family are distributed, and Ae. neglecta and Ae. crassa species appear to have both tetraploid and hexaploid genomes [13]. 11 species are diploid, 10 are tetraploid, and 4 are hexaploid. All six of these species contain the "D" genome, which is very important for soft wheat, and the distribution of four of these six species in the territory of our Republic is of particular importance. The species containing the "D" genome belong mainly to the Vertebrata (5 species) and Cylindropyron (1 species) sections of the Aegilops L. family. Foreign scientists have been effectively using these species in their scientific research to enrich the narrowing genome of soft wheat in order to increase its resistance to biotic (yellow rust disease, etc.) and abiotic (drought, high salinity, high temperature, etc.) factors. In the enrichment of the soft wheat genome, the species considered to be the closest relative to it is Ae. tauschii (D genome donor) species has been found to be the best compared to other species in many studies.

Table 4. Starch and protein content in native species of Aegilops L. genus

Species	Amount of starch, %	Protein content, %	The ratio of starch to protein	The ratio of protein to starch
Ae. triuncialis	25,7	34,5	0,74	1,34
Ae. cylindrica	23,8	32,3	0,74	1.36
Ae. tauschii	24,6	29,2	0,84	1,19
Ae. crassa	24,4	31,0	0,79	1,27

From the data in Table 4, it can be seen that in the local species of the genus Aegilops L., the starch content varies from 23.8 to 25.7 percent, and the protein content varies from 29.2 to 34.5 percent, while in wheat, this indicator is 14 percent for protein and 68 percent for starch. is, that is, the indicators are opposite ratios [15]. This makes it possible to use the representatives of this group to create varieties with a high protein content.

Local collection samples of Aegilops L. species collected from different regions of the republic serve as a genetic source for further research in the practical selection of soft wheat.

Literature

1. Abugalieva A.I., Esimbekova M.A., Kozhakhmetov K., Savin T.V. Phenotypic and genetic diversity of collections of wild relatives of wheat (genus Aegilops L.): identification of sources of traits for their balanced use and ex situ conservation. Collection of materials (in two parts) of the All-Russian scientific conference with international participation and the school of young scientists (Irkutsk, July 10-15, 2018). Part I. Irkutsk-2018. - S. 36-40.
2. Ashraf M. Inducing drought tolerance in plants: Recent advances // Biotechnol. Adv. 2010. V. 28. P. 169-183.
3. Bohnert H.J., Nelson D.E., Jensen R.G. Adaptations to environmental stresses // Plant Cell. 1995. V. 7. P. 1099-1111.
4. Cox T.S., Wu J., Wang S., Cai J., Zhong Q., Fu B. Comparing two approaches for introgression of germplasm from Aegilops tauschi into common wheat. Crop J. 2017;5:355-362. DOI 10.1016/j.cj.2017. 05.006.

5. Esimbekova M. A., Bulatova K. M., Kushanova R. Zh., Mukin K. B. Biodiversity of wild species from the genus Aegilops L. in Kazakhstan for wheat breeding. Izvestiya TSHA. - 2015. - No. 6. - S. 5-16.
6. Fleury D., Jefferies S., Kuchel H., Langridge P. Genetic and genomic tools to improve drought tolerance in wheat // J. Exp. Bot. 2010. V. 61. P. 3211-3222.
7. Gultyaeva E.I., Shaydayuk E.L., Kazartsev I.A. Intraspecific variability of Puccinia triticina on hexaploid species of Triticum and Aegilops trivialis. Vavilov Journal of Genetics and Breeding 2017;21(6):671-676. DOI 10.18699/VJ17.28-o
8. Houshmand S., Arzani A., Mirmohammadi-Maibody S.A.M. Effects of salinity and drought stress on grain quality of durum wheat. Commun. Soil Sci. Plant Analysis. 2014;45:297-308. DOI: 10.1080/ 00103624.2013.861911
9. Jabbarov I.Sh., Sobirov F.Sh. Distribution and biodiversity of local species of the genus Aegilops L. within the southeastern region of Uzbekistan. Khorazm Mamun academy and ahborotnomasi: Ilmiy journal. - No. 11 (82), Khorazm Mamun Academy, Khiva-2021. - pp. 39-46
10. Jabbarov I.Sh., Sobirov F.Sh. Genetic diversity of species of the genus Aegilops L. from the southeastern region of Uzbekistan using SSR markers. Materials of the international scientific conference "Formation and development of experimental biology in Tajikistan" Dushanbe: Donish, 2022. - P. 261-262.
11. Jabbarov I.Sh., Sobirov F.Sh. Study of collections of the genus Aegilops L., Uzbekistan to identify potential sources of useful traits. IX-th international scientific conference "Ecological features of biological diversity". October 7-8, 2021 In the city of Kulyab, Khatlon region of the Republic of Tajikistan. - S. 138-139.
12. Jabbarov I.Sh., Sobirov F.Sh. Use of native species of the genus Aegilops L. in introgressive breeding of wheat. Ilmiy tadqiqotlar summit 2022. Republic kup tarmoqli ilmiy summit materiallari heat. Tashkent-2022. - S. 687-688.
13. Kilian B, Mammen K, Millet E, Sharma R, Graner A, Salamini F, Hammer K, Ozkan H (2011) Aegilops. In: Kole C (ed) Wild crop relatives: genomic and breeding resources. Cereals. Springer, Berlin, pp 1-76
14. Li J., Wan U.S., Yang W.Y. Synthetic hexaploid wheat enhances variation and adaptive evolution of bread wheat in breeding processes. J. Syst. Evol. 2014;52:735-742.
15. Mamadyusufova M.G., Saboiev I.A., Rakhimov M.M., Nasyrova F.Yu., Aliev K.A. The content of starch and protein in wheat and its wild relatives growing under different conditions. Reports of the Academy of Sciences of the Republic of Tajikistan. 2013, Volume 56, No. 10. - C. 832-837.
16. Mir R.R., Zaman-Allah M., Sreenivasulu N., Trethowan R., Varshney R.K. Integrated genomics, physiology and breeding approaches for improving drought tolerance in crops // Theor. Appl. Genet. 2012. V. 125. P. 625-645.
17. Sitpaeva G. T., Esimbekova M. F., Morgunov A. I., and Karabaev M. K., “On the current state of the genetic potential of wild relatives of cereals in the southeast and east of Kazakhstan,” Mezhd. conf. "Development of key areas of agricultural sciences in Kazakhstan: breeding, biotechnology, genetic resources." - Astana, 2004. - S. 246-252.
18. Sobirov F.Sh., Jabbarov I.Sh. Distribution of species of the genus Aegilops L. in the southwest of Uzbekistan. Bulletin of Science and Practice / Bulletin of Science and Practice. T. 7. No. 10. 2021. https://doi.org/10.33619/2414-2948/71/09. - S. 72-83.
19. Turki N., Harrabi M., Okuno K. Effect of salinity on grain yield and quality of wheat and genetic relationships among durum and common wheat. J. Arid Land Studies. 2012;22(1):311-314.

20. Yudina R.S., Leonova I.N., Salina E.A., Khlestkina E.K. Changes in Salt Tolerance of Common Wheat as a Result of Introgression of the Genetic Material of Aegilops speltoides and Triticum timopheevii. Genetics and plant breeding. 2015, Volume 19, No. 2. DOI 10.18699/VJ15.021.

21. Yudina R.S., Leonova I.N., Salina E.A., Khlestkina E.K. Effect of alien introgressions in the wheat genome on its resistance to osmotic stress. Vavilov Journal of Genetics and Breeding, 2014, Volume 18, No. 4/1. 643-649 p.