



Mini Review

CONSERVATION AND UTILIZATION OF WILD SPECIES OF GENUS *TRITICUM* FROM THE NATIONAL GENE BANK OF BULGARIA

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ABSTRACT

In recent years, increasingly appreciates the importance of The Plant Genetic Resources for development and success of the plant breeding, agriculture and ecology. Collection of wild wheat species of genus *Triticum*, which supports, study and stored in the IPGR-Sadovo is represented by 45 plant species. It contains 783 accessions of which 160 samples are *Tr. sphaerococcum*, 124 *Tr. turgidum*, 84 *Tr. monococcum*, 73 *Tr. spelta*, 60 *Tr. boeoticum*, 59 *Tr. dicoccon*, 30 *Tr. polonicum*, 22 *Tr. dicoccoides*, 21 *Tr. timopheevi*, 13 *Tr. carthilicum*, 12 *Tr. macha*, 11 *Tr. compactum* and 81 from other species.

The maintained germplasm diversity from wild wheat species is determined by their regions of origin. The largest part of accessions are from Russia (97 pieces), Bulgaria (45 pieces), Germany (38 pieces), Spain (16 pieces), USA (13 pieces), India (12 pieces), etc. Particular attentions should be paid to wheat originating from Bulgaria. These are the accessions that form the category of “original” germplasm, whose identity must be controlled in the process of storage and reproduction. Available gene pool is the basis for successful plant breeding improvement working and maintains original germplasm for research.

Key words: collection, wild wheat species, genus *Triticum*, plant genetic resources.

In recent years, increasingly appreciates the importance of The Plant Genetic Resources for development and success of the plant breeding, agriculture and ecology. Narrowing of the border of genetic variation observed in common winter and durum wheat, as a result of the use of conventional breeding practices, reduces the opportunities for improving the productivity and adaptability of crops. Due to approaching the limits of the biological productivity as result of global climate change the need of the new genetic pools is essential (1-5). In this context, the study and evaluation of the genetic resources of wild species of wheat is the major priority of the research work in the Institute of Plant Genetic Resources - Sadovo. Scientists' efforts are aimed to efficient use of the available

germplasm, as a source for better ecological plasticity and resistance to stress factors.

In the National Genebank of the IPGR-Sadovo are preserved 57 684 seed samples from 62 131 totally registered as plant germplasm in the country (<http://eurisco.ecpgr.org>). They are stored in three collections: working collection, basic collection and exchange collection. In the basic collection seeds are stored under long-term storage: hermetical containers at – 18 °C, after sorption seeds drying to a suitable limit (6).

Collection of wild wheat species of genus *Triticum*, which supports, study and stored in the IPGR-Sadovo is represented by 45 plant species. It contains 783 accessions of which 160 samples are *Tr. sphaerococcum*, 124 *Tr. turgidum*, 84 *Tr. monococcum*, 73 *Tr. spelta*, 60 *Tr. boeoticum*, 59 *Tr. dicoccon*, 30 *Tr. polonicum*, 22 *Tr. dicoccoides*, 21 *Tr.*

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timopheevi, 13 *Tr. carthilicum*, 12 *Tr. macha*, 11 *Tr. compactum* and 81 from other species (Table 1). All accessions were obtained from

expeditions at home and abroad, or are the result of seeds germplasm exchange with other gene banks and research institutes.

Table 1. Characteristic of the collection of wild wheat species maintained in the National Genebank in IPGR-Sadovo

GENUS	SPECIES	NUMBER OF ACCESSIONS	NUMBER OF VARIETES
<i>Triticum</i>	<i>sphaerococcum</i>	160	17
<i>Triticum</i>	<i>turgidum</i>	124	30
<i>Triticum</i>	<i>monococcum</i>	84	11
<i>Triticum</i>	<i>spelta</i>	73	12
<i>Triticum</i>	<i>boeoticum</i>	60	17
<i>Triticum</i>	<i>dicoccon</i>	59	23
<i>Triticum</i>		33	
<i>Triticum</i>	<i>polonicum</i>	30	13
<i>Triticum</i>	<i>dicoccoides</i>	22	10
<i>Triticum</i>	<i>timopheevi</i>	21	3
<i>Triticum</i>	<i>carthilicum</i>	13	4
<i>Triticum</i>	<i>macha</i>	12	4
<i>Triticum</i>	<i>compactum</i>	11	5
<i>Triticum</i>	<i>urartu</i>	7	
<i>Triticum</i>	<i>turanicum</i>	6	1
<i>Triticum</i>	<i>araraticum</i>	5	2
<i>Triticum</i>	<i>aethiopicum</i>	4	3
<i>Triticum</i>	<i>ispaghanicum</i>	4	1
<i>Triticum</i>	<i>thaoudar</i>	4	
<i>Triticum</i>	<i>vavilovii</i>	4	2
<i>Triticum</i>	<i>zhukovskiyi</i>	4	
<i>Triticum</i>	<i>aegilopoides</i>	3	1
<i>Triticum</i>	<i>fungicidum</i>	3	1
<i>Triticum</i>	<i>militinae</i>	3	
<i>Triticum</i>	<i>palaeocolchicum</i>	3	2
<i>Triticum</i>	<i>persicum</i>	3	2
<i>Triticum</i>	<i>tritordeum</i>	3	
<i>Triticum</i>	<i>triunciale</i>	3	
<i>Triticum</i>	<i>crassum</i>	2	
<i>Triticum</i>	<i>georgicum</i>	2	1
<i>Triticum</i>	<i>karamyshevii</i>	2	1
<i>Triticum</i>	<i>tauschii</i>	2	1
<i>Triticum</i>	<i>ventricosum</i>	2	
<i>Triticum</i>	<i>aucheri</i>	1	
<i>Triticum</i>	<i>jakubzineri</i>	1	1
<i>Triticum</i>	<i>kiharae</i>	1	
<i>Triticum</i>	<i>ligustica</i>	1	
<i>Triticum</i>	<i>ovatum</i>	1	
<i>Triticum</i>	<i>petropavlovskii</i>	1	
<i>Triticum</i>	<i>subcompactum</i>	1	
<i>Triticum</i>	<i>timococcum</i>	1	
<i>Triticum</i>	<i>timonovum</i>	1	
<i>Triticum</i>	<i>triaristatum</i>	1	
<i>Triticum</i>	<i>umbellatum</i>	1	
<i>Triticum</i>	<i>variabile</i>	1	
Total numbers		783	168

Species in the collection are represented with the considerable diversity. *Tr. turgidum* include 30 varieties, *Tr. sphaerococcum* -17, *Tr. boeoticum* - 17, *Tr. polonicum* - 13, *Tr. dicoccoides* - 10. *Tr. spelta* is represented by 12 varieties, of which large numbers of samples are from *var. duhamelianum*. Recorded accessions of einkorn (*Tr. monococcum*) are 11 varieties, of which the most are from: *var. hohensteinii*, *var. and flavescens var. vulgare*. Emmer (*Tr. dicoccon*) is represented by 23 varieties. Of these, a large number of accessions are from: *var. farrum*, *var. pycnurum*, *var. rufum* and *var. compactomiei*.

The maintained germplasm diversity from wild wheat species is determined by their regions of

origin (**Table 2**). The largest part of accessions are from Russia (97 pieces), Bulgaria (45 pieces), Germany (38 pieces), Spain (16 pieces), USA (13 pieces), India (12 pieces), etc. Samples of unknown origin are 495. Particular attentions should be paid to wheat originating from Bulgaria. These are the accessions that form the category of “original” germplasm, whose identity must be controlled in the process of storage and reproduction. From supported 45 species originating from Bulgaria, 18 are from *Tr. boeoticum*, 18 - *Tr. sphaerococcum*, 5 - *Tr. monococcum*, 3 - *Tr. dicoccon* and 1- *Tr. militinae* (**Table 3**). Available gene pool is the basis for successful plant breeding improvement working and maintains original germplasm for research.

Table 2. Origin of accessions of ancient wheat maintained in IPGR-Sadovo.

COUNTRY OF ORIGIN	NUMBER OF ACCESSIONS
Unknowns	495
Russia	97
Bulgaria	45
Germany	38
Spain	16
USA	13
India	12
Armenia	8
Iran	7
Turkey	6
Israel	5
France	5
China	4
Other country	33
	784

Table 3. Wild wheat species originating from Bulgaria

GENUS	SPECIES	SPAUTHOR	NUMBER OF ACCESSIONS
<i>Triticum</i>	<i>baeoticum</i>	Boiss	18
<i>Triticum</i>	<i>dicoccon</i>	Schrank	3
<i>Triticum</i>	<i>militinae</i>	Zhuk.et Migusch	1
<i>Triticum</i>	<i>monococcum</i>	L.	5
<i>Triticum</i>	<i>sphaerococcum</i>	Perciv.	18
Total number			45

A team of scientists at the Institute of IPGR-Sadovo deals with the study of wild species and their use as donors. Evaluations are performed in indicators related to morphological and agronomic characteristics of the samples (7). Modern methods of statistical processing are applied, and thus characterization of each accession,

representation of the variation in collection and emanate of genotypes, carriers of valuable characteristic for the purpose of plant breeding programs is achieved. The wild species: *Tr. dicoccon*, *Tr. turgidum*, *Tr. monococcum*, *Tr. boeoticum*, *Tr. polonicum*, *Tr. sphaerococcum*, *Tr. aegilopoides*, *Tr. dicoccoides*, *Tr. cartlicum*, *Tr. spelta*, *Tr. timopheevi* were

tested to abiotic stress. The best frost resistance shown species: *Tr. sphaerococcum* (containing chromosomes from D genome) and *Tr. boeoticum*- A genome (8). Information about high levels of frost tolerance of different accessions of these species has been published by other authors (9, 10). The tetraploid *Tr. dicoccon* is the best suited as a source of genes for tolerance to osmotic stress (11, 12). This species is characterized by high resistance to stem rust (*Puccinia graminis*) in humid conditions and immunity to some races of fungal diseases as well as they are not attacked by Swedish fly (13, 14).

Plant breeding selection of cereals in IPGR-Sadovo is aimed at creating varieties with high drought tolerance, ecological plasticity and adaptability to adverse factors. The most valuable accessions are included in the hybridization schemes for the creation of genetic diversity on the signs: frost and drought tolerance in common wheat. Optimizing *in vitro* methods to overcome not cross embryonic and postembryonic incompatibility arising from hybridization between distant species. The received lines carry genes for resistance to biotic and abiotic stress effects and a better quality of the grain.

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