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The Species Diversity of Alfalfa In Kazakhstan And The Possibility of Its Use In Breeding

G. Meyrman [1], *S. Yerzhanova [2]

1. Professor, Academic of National Academy in Republic of Kazakhstan – Head of the Department of fodder and oil crops, "Kazakh Research Institute of Agriculture and Plant Growing".
2. PhD, Assoc. Professor – leading researcher of the Department of fodder and oil crops, "Kazakh Research Institute of Agriculture and Plant Growing

Corresponding Authors email: sakyshyer@mail.ru

ABSTRACT: Diversity of plant genetic resources is the main basis of breeding. Gene pool of crops, including fruit, in Kazakhstan consists of 79,400 samples. In this, the proportion of forage crops is 12.8 thousand samples . Experiments were carried out by the method of scientific research institute of crop production by N.I. Vavilov. The questions replenish the gene pool of forage grasses by collecting expedition in Kazakhstan and the results of the study on the productivity of forage alfalfa 1578 collection samples representing 12 of its species, including wild.
Keywords: completion of the gene pool, samples of alfalfa, collection of wild specimens, productivity of forage.

INTRODUCTION

Biological diversity in the form of genetic resources, cultivated plants, is the primary basis of breeding, to solve the problem of improving agronomic traits and properties of new varieties in the intensification of production, global climate change, as well as in solving particular problems - increasing productivity, product quality and adaptability. Delivering exceptional value to this problem, Kazakhstan joined the "Convention on Biological Diversity". Currently, the gene pool of crops , including fruit , in Kazakhstan consists of 79.4 thousand samples. In this volume, the proportion of forage crops is 16.2 % (12 834 samples). In the structure of the gene pool of forage alfalfa occupies a leading position (60%) and wheat grass (32%). Principal holders of the collection of these cultures is the Aral Experiment Station of genetic resources by N.I. Vavilov, Kazakh Scientific Research Institute of Agriculture and Plant Growing, Agricultural Experimental Station of Krasnovodopad, Research - Production Center of Grain Farming by A.I. Baraev, Ural Agricultural Experimental Station. It should be noted that the formation of the gene pool of forage crops exclusive role belongs to the Scientific Research Institute of Crop production by N.I. Vavilov (VIR), 70-80% of the samples submitted from the collection of the gene pool of VIR.

Wild gene pool of other forage crops represented 70 species belonging to 29 genera. Flora of Kazakhstan has a unique variety of species composition and ecotypes of forage crops that are of interest for use in breeding. The main ones are: Medicago L: M.coerulea, M. difalcata, M. falcata, M.sativa, M.tianchanic, M. Trautvetteri; Melilotus: M. albus Dest. , M. officinalis Dest.,sp.vilgicus, M. varia; Trifolium:M. medium, M. pretense L ; Onobrychis:O. arenaria, O. inermis,M. viciafolia scop, M. antasiatic; Astragalus: A. alopecias, A. anungdalinus, A.chionantus, A. flexus, A.globiceps, A.sieversianus, A. turszaninovii, A. unifolatus, A. vulpinu Vicia. L.: V.sativa L., V. Villosa, V. kronenburgii, V. Juncea, V. Lanuginose, Phleum L: L. Paniculatum, L. phleoides., L. Alpinum, L. Pretense, Roshevitzii; Agropyron: A.cristatum, A.cristatum subsp., A. desertorum, A. fragile sups.; Dastylis L.: L. glomerata; Bromus L.: B. inermi, B. occidentalis, B. turkestanicus, B.gracillimus, B.sterilis, B. tectorum,B.secalinum, B. Danthoniae, B. popovii Drob, B.severtzovii., B. sepparius, B.macrostachys Dest. and others [1].

Addition to the existing gene pool of wild specimens is a valuable source of further expansion of the collection of forage crops. In evolutionary terms, many forage crops have kept their wild relatives and, of course, they can become a valuable source of donor and improvement culture on individual household - important attributes and properties. That such carriers of valuable features and their inclusion in the selection process can be a starting point to achieve breakthrough success in breeding.

The territory of Kazakhstan, unlike other countries, covering different ecological zones, subzones of steppe , semi-desert landscape , as well as powerful mountain ranges - Tarbagatai, Tien Shan, Altai, Mugaljar

and various soil - climatic conditions with its environmental pressure, which contributed to the formation of highly diverse ecotypes. On the other hand, the" industrial civilization": the development of large areas under agricultural crops, production of hydrocarbons, construction of various facilities, geological exploration studies, as well as global climate change cause extinction of some species and limit their distribution in nature.
On the problem of collecting wild species of forage grasses, many researchers of the world pay attention.

The territory of Kazakhstan, at the time (1969-1978 yy.), was covered by forwarding researchers of Scientific Research Institute of Crop production by N.I. Vavilov to collect of ecotypes of wild species of fodder plants. The VIR collection was enriched in 2446 by Kazakhstan samples of forage plants, among them - 209 samples of various types of alfalfa [2]. In order to confirm the significance of the problem is relevant to note the involvement of one of the author of this article Meyirman G.T. in expedition in Almaty region with Canadian scientists Lorenz on collecting of nodule bacterias, which settle in the root system of cultivated and wild legumes. This approach is very important in breeding to enhance nitrogen-fixing ability of legumes, thereby stabilize the environmental situation in agriculture by reducing the consumption of such mobility in soil mineral nitrogen.

Many examples in the world where wild collected specimens (ecotypes) or local ecotypes in Kazakhstan became the ancestor of many commercial varieties. Thus, the known varieties of alfalfa cultivated in America, take their origin from Turkestan lucerne. Collected samples (ecotypes) of yellow alfalfa (Medicago falcata L.) from the territory of the former Semipalatinsk region, lomkokolosnik Sitnikov (Psathyrostachys Juncea) and wheatgrass (Agropyron desertorum) by Canadian scientists in the last century (1930) became the basis of genetic weed forming plasma in breeding varieties of alfalfa type Rambler, drought-resistant varieties lomkokolosnik Sitnikov - Bozoysky improved.

Of perennial forage grasses greatest fame and distribution received alfalfa. Its gene pool in Kazakhstan refers to one of the richest centers of - Central, which is considered the primary focus of origin alfalfa. Most wild populations of alfalfa representation characteristic of the Alatau mountains, eastern Tien Shan and Jungar Alatau [3].

Variety of original forms of alfalfa, especially local varieties generated by factors morphogenesis and differentiation, increased dramatically thanks to the many separate geographical areas, each of which has its own set of sorts. In modern agriculture alfalfa grown on all continents and in view of soil and climatic factors, as well as natural and artificial selection of its gene pool is constantly updated local and breeding varieties.
Genetic composition of species and varietal potential alfalfa directly related to habitat ecology, methods of cultivation and use. In nature, the localization characteristics and properties depending on the ecological and geographical areas of origin of the samples.

Currently, based on the generalization of the results of studying an extensive set of world collection of alfalfa Scientific Research Institute of Agriculture and crop production by N.I. Vavilov (VIR) mapped the localization of geneplazms important characteristics and properties of alfalfa perennial species of subgenus Falcago the centers of origin of plants [4].

MATERIALS AND METHODS

Selection and genetic basis for the study of problems and selection of the raw material should be alfalfa ecological principle to take better advantage in the selection of a single eco-geographical groups, each ecotype. Such an approach would greatly facilitate the search for relevant features and properties of a huge variety of alfalfa, as samples of each eco-geographical groups are complex and the most characteristic features in common, accumulated in the course of evolution.

Objects of study were 1078 samples of alfalfa, relating to 12 species, which cover 32 eco-geographical groups of 34 according to the classification of VIR. 961 of them - on irrigation and 117 - without irrigation [5]. Collection of the most fully represented by seed samples (M. sativa L.) and variable (M. varia Mart.) alfalfa, amount in 935 samples, which cover 32 eco-geographical groups of 34 according to the classification of VIR.

These types and samples of alfalfa were studied in different nurseries years of sowing by comparing them with the standard variety. As standard variety used local Semirechinsk that is widely cultivated in Kazakhstan, occupying an area of about 1 million hectares. Bookmark nurseries carried out by the method of Scientific Research Institute of Agriculture and crop production by N.I. Vavilov [6] with the placement of standard grade after every 6 to 10 samples studied, with 1-3 replicates and multistoried locations plots.

Plots dimensions 1m2 - (length 1.7 m, width 0.6 m). Sowing Terraced row spacing of 15 cm with a sowing rate of 2 g of seeds per 1 m2. The distance between plots - 0.6 m study and evaluation of the samples were carried out 2 - 4 mowing for economically - valuable attributes and properties of interest for selection: the productivity of green and dry weight, height, tillering, number of leaves of plants, symbiotic nitrogen fixation activity chemical composition of forage, resistance to major diseases. This article presents the results of studies on dry weight yield of alfalfa.

Table 1 . Level of alfalfa yields samples in the context of eco-geographical groups

Ecological- geographic group	Number studied samples	Of these samples compared with the harvest standard grade			
		exceeding over 20%	guides exceeding 6-20%	at the level 95-105%	yields
1	2	3	4	5	6
Alfalfa (M. sativa L.) sowing and variable (M. varia Mart.)					
Khiva	11	-	1	-	10
Plain- Turkestan	85	6	10	16	53
Semirechinskaya	66	9	6	12	39
Turkmenskaya	21	2	3	2	14
North Kazakhstanskaya	17	1	4	4	8
China Plain	18	1	2	3	12
Chinese foothill	9	1	1	2	5
Kashgarskaya	10	-	1	3	6
Kandahar- kabulskaya	11	-	-	2	9
Transcaucasian flat	38	2	2	10	24
Asia Minor	9	-	3	1	5
West European	136	6	12	32	86
South European	80	2	7	24	47
Ukrainian	59	1	6	9	43
North Caucasus	50	2	3	4	41
North Caucasian	11	-	1	1	9
South East	17	2	2	3	10
Northwestern	7	-	-	-	7
Fair Russian	19	1	1	1	16
East Siberian	21	1	1	1	18
West Siberian	15	-	1	-	14
C North American	95	1	4	17	73
Canada	8	-	-	2	6
Chilean- peruvian	28	-	2	5	21
Mexico -Brazilian	25	-	2	3	20
Argentine	9	-	-	3	6
Indian	28	2	4	3	19
Continue Table 1					
North	42	4	3	10	25
Mesopotamian	9	1	-	3	5
Syrian	7	1	2	-	4
Yemen	7	-	1	2	4
Ladakhi	17	1	-	1	15
Total	985	47	85	179	674
Ecotypes of wild yellow alfalfa (M. falcata L.)					
Ukrainian steppe	3	-	-	-	3
North Caucasian	16	1	-	-	15
De Sales steppe	4	-	-	-	4
South-east	16	-	-	2	14
North Russian	1	-	-	-	1
West Siberian	7	-	-	-	7
East Kazakhstan	11	-	-	-	11
Total	58	1	-	2	55
Other wild alfalfa					
Alfalfa blue (M. coerulea Less.)	12	-	-	-	12
A.polutsiklicheskaya (M. hemicycla Grossh)	3	-	-	1	2
A.adhesive (M. glutinosa M.B.)	2	-	-	-	2
A.colored (Subsp. Poluchroa Sinsk.)	10	1	-	2	7
A.Tien Shan (M. tianshanica Vass.)	2	-	-	1	1
A.Lavrenko (M. Lavrenko Vass.)	1	-	-	1	-
A.pyreynaya (M. agropyretorum Vass.)	2	-	-	2	-
A.Trautfettera (M. Trautvetteri Sumn.)	2	-	-	2	-
A. glandular (M. glandulosa David)	1	-	-	-	1
Total	35	1	-	9	25
Total	1078	49	85	190	754

By fodder isolated from alfalfa and volatile 47samples and wild species only 2 sample with efficiency exceeding the standard variety (spot of the Semirechinsk) more than 20%, 49 samples - from 6 to 20%, 85 samples at the level of the standard, while the 754 sample productivity was below standard. More productive samples were isolated more often from plain - Turkestan, Semirechinsk, Southern European and North African ecology - geographical groups.

In one of the collection of nursery studied a large set of alfalfa gene pool consisting of 500 accessions belonging to alfalfa and changeable. Based on the study for the first three years of use, on yield of green mass, was isolated 31 and 4-6 years of use - 16 accessions, exceeding the standard by more than 20%. In

accordance with the scheme of crop rotation in irrigated agriculture alfalfa, as a rule, use no more than 3 years by leveraging its biological features. Many farmers working in the south and south-east of Kazakhstan stands of alfalfa tend to keep as long as possible, that is to use old-growth crops with reduced harvest.

In our experiments [7] tracked productivity of green mass from the first to the sixth year of use in order to allocate more productive perennial alfalfa accessions (Table 2). Virtually all high-yielding accessions, subsequently reduced yield of green mass.

If at the end of the study in the first three years they exceeded standard - Semirechensk local average by 15-35% with yields 7,63-8,96 kg/m2, then the further use of the grass in 4-6 years of use, the excess over standard in some samples was 5-32% with a yield of 2,48-3,14 kg/m2, and many accessions sharply reduced productivity.

RESEARCH RESULTS

The long-term studies on the collection of samples from different years in the nursery seeding at 2-4 mowing hay annually for 3-4 years it possible to identify high-yield samples that served as the original forms in breeding synthetic varieties. They have been used in breeding populations by partitioning on genotypes and bookmark them inbred lines to the second and third generations. On the basis of inbred lines with high general combining ability were synthesized high productive new varieties such as Darkhan 90, Turkestan 15, Kokoray, Osimtal and Kokbalausa.

Table 2. The change of productivity of green mass of high-yielding examples of alfalfa with many years use of grass

№ Catalogy of VIR	Origin	Green weight from 1kg / m ² years of use			average for the first 3 years of use	in % of standard	years of use			average for the 4-6 years of use	in % of standard
		1	2	3			4	5	6		
1	2	3	4	5	6	7	8	9	10	11	12
45335	Kyrgyzstan	3,5	15,1	7,9	8,82	132	4	3,5	1,3	2,94	124
46528	Estonia	2,6	14,7	9,6	8,96	135	3,5	3	1,7	2,73	115
36049	Kazakhstan	3,4	15,3	8,4	9	135	2,8	3	1,2	2,33	98
43782	Ukraine	2,2	14,7	8,7	8,49	127	3,5	2,7	1,9	2,7	114
43821	Georgia	1,6	15	9,5	8,71	131	5,2	2,1	0,2	2,5	105
44568	Russia	3,3	13,3	8,5	8,36	126	3,7	3,6	1,1	2,8	118
43784	Russia	3,4	12,6	9,6	8,51	128	3,1	3,4	1,3	2,6	110
47050	Russia	2,7	14,4	8,5	8,52	128	3	3,7	1,1	2,59	109
47049	Russia	2,9	13,9	9,1	8,63	130	2,5	3,5	1,5	2,48	105
43777	Russia	2,3	12,2	10,1	8,19	123	3,8	3,6	1,2	2,85	120
43779	Russia	2,3	13,4	9,5	8,39	126	3,5	2,6	1,9	2,66	112
44419	USA	2,2	12,9	9,2	8,1	122	4,3	3,4	1,2	2,95	124
45369	Kazakhstan	3,4	14,4	8,5	8,74	131	2,4	2,7	1,8	2,29	97
45036	Armenia	3	12,7	8	7,9	119	4,1	3,5	1,2	2,93	123
6231	Russia	1,9	13,3	8,1	7,76	117	4,1	4,1	1,1	3,1	131
62097	Kazakhstan	3,4	11,4	9,1	7,95	119	3,9	3	1,9	2,93	123
47492	Kazakhstan	3,3	10,4	9,3	7,63	115	4,4	3	2	3,14	132
22571	Russia	3	11,1	9,3	7,82	117	4,1	2,8	1,9	2,92	123
44566	Russia	3,4	11,6	9,8	8,25	124	4,4	1,6	1,6	2,51	106
33481	Finland	3	14,3	8,1	8,45	127	3,1	2,4	1,4	2,27	96
39952	Russia	2,9	12,5	9	8,13	122	4	2,3	1,2	2,51	106
6015	Malaysia	2,1	12,8	9,3	8,05	121	3	2,7	2	2,53	107
44032	Russia	3,4	10,9	8,8	7,71	116	3,4	2,8	2	2,75	116
30830	Ukraine	2,6	13,1	8,8	8,17	123	3,2	3	0,8	2,34	99
Continue Table 2											
46529	Ukraine	3,1	13,3	9,5	8,62	129	2,9	0,9	1,3	1,67	70
46249	USA	2,6	15,9	6,8	8,44	127	3	1,2	1,3	1,82	77
30071	Russia	3,2	13,8	8	8,31	125	2,1	2,8	0,8	1,9	80
6014	Malaysia	2,5	13,6	9,1	8,37	126	3,1	1,3	0,9	1,75	74
45860	Russia	1,6	15,7	7,9	8,4	126	2,8	0,9	1,3	1,65	70
47705	USA	3,2	14	7	8,05	121	3,5	0,7	1,5	1,91	80
45712	USA	2,6	15,3	6,4	8,1	122	3,1	0,9	1,3	1,73	73
45081	Georgia	2,8	12,9	8,6	8,12	122	2,7	0,8	1,1	1,53	64
28460	Ukraine	3,6	11,3	9,4	8,07	121	3,1	1,5	0,3	1,62	68
34627	Kazakhstan	2,3	13	9	8,1	122	2,3	1,9	0,4	1,53	64
46270	Ukraine	3	13,2	7,8	8,01	120	2,5	0,7	1,3	1,45	61
Standard		2,3	10,2	7,5	6,66	100	3,2	2,4	1,5	2,37	100

CONCLUSION

In Kazakhstan, conducting research on the formation of the gene pool of forage crops: registered 12834 samples, of them alfalfa - 60%, wheatgrass - 32% and for other types of herbs - 8%. The share of fodder crops in the amount of the gene pool of crops is 16.2%. In yield of alfalfa forage allocated 78 accessions at three annual herbage use and 16 accessions with many years' use (4-6 years), which exceeded the standard variety of more than 20%. They are used in the program to create synthetic varieties.

The results of tests on samples of alfalfa confirmed low productivity of wild species, although they differ in individual securities characteristics and properties important for breeding. Thus, according to the salt tolerance of alfalfa samples highlighted blue (M. coerulea Less.), For drought tolerance - (M. difalcata Sin., M. falcata L.) and others, resistance to disease - almost all kinds of wild alfalfa. Therefore, the wild species are of interest as sources and donors to improve alfalfa cultivars based becross crosses given the ploid level and the need to transfer from diploid species to tetraploid level to overcome uncrossability species, or by the use of genetic engineering techniques.

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