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RESEARCH ARTICLE

The level of adaptability of perspective samples of soft and durum spring wheat in Ukrainian forest-steppe

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In the Eastern Forest-Steppe zone of Ukraine, which is characterized by a sharp change in weather conditions during the growing season of agricultural crops, it is very important to grow hybrids that are most adapted to frequent weather anomalies during the growing season. This can significantly reduce their negative impact on the productivity of spring wheat.
The results of a study of 20 samples (soft spring wheat *Triticum aestivum* L.) and (durum spring wheat *Trīticum durum*) of different ecological and geographical origin for adaptability when changing environmental conditions (Ukraine, Russia, Kazakhstan, Mexico, Sweden) are presented. Adaptability indicators were determined by the following characteristics: mass of one spike, mass of grain from one spike, number of grains from one spike, mass of 1000 seeds, mass of grain from 1 m^2. Samples that have high plasticity and stability by these characteristics have been identified. 3As a result of the conducted studies, the dependence between the main signs of productivity were established: the number of grains from one spike, the mass of grains from one spike, the mass of 1000 seeds, the mass of one spike, the mass of seeds from 1 m^2 of *Triticum aestium* and *Triticum durum* samples. We have considered the adaptability of selection characteristics of samples by years with different environmental conditions: air temperature, relative humidity, precipitation amount, and hydrothermal coefficient.
Keywords: Spring wheat; sample; yield; adaptability; plasticity; cropping

Introduction

The issues related to the study of adaptability and plasticity of agricultural crops are becoming increasingly relevant. The Eastern Forest-Steppe zone of Ukraine is characterized by a sharp change in weather conditions during the growing season of agricultural crops. Therefore, it is important to grow agricultural crops that are most adapted to frequent weather anomalies during the growing season, which can significantly reduce the negative impact and meteorological conditions of spring wheat samples productivity. Studying of ecological plasticity and stability makes it possible to characterize the adaptive properties of an organism, to trace the dynamics of changes in the genotype reaction to changes in environmental conditions. Conducting such environmental studies allows us to identify the effect of abiotic and biotic factors of a certain environment on the genotype and determine the degree of their influence on the growth, development and yield of cropping, especially introduced samples that have a different reaction and yield potential. Accumulation of changes in the external environment is evinced in the variability of certain quantitative features of phenotype structure − morphological features of plant structure, yield, product quality, resistance to biotic and abiotic factors, which are determined by the initial form (Finley, 1963; Adamenko, 2007). The high sensitivity of individual samples to unfavorable growing conditions often narrows the area of their distribution to other ecological zones and limits their overall distribution.
The aim of our research was to assess the adaptability and ecological plasticity of soft spring wheat (*Triticum aestivum* L.) and durum wheat (*Triticum durum* Desf.)

Materials and Methods

Field research was conducted in 2018–2019 at the Educational Research and Production Center "Experimental Field of V.V. Dokuchaiev Kharkiv National Agrarian University (KhNAU named after V.V. Dokuchaiev). The experimental field is located within the land use of the educational and experimental farm of V.V. Dokuchaiev Kharkiv National Agrarian University in the north-eastern part of Kharkiv region. 20 samples of the genus *Triticum* were used as the source material. In particular, *Triticum* section was represented by species *Triticum aestivum L.,* section *Dicoccoides Flaksb* by species *Triticum durum Desf* (Table 1). The source material is obtained from the National the Center for Plant Genetic Resources of Ukraine and has a number of economically valuable features. Samples were introduced from different ecological and geographical areas.

Table 1. Characteristics of the studying samples *Triticum aestivum* and *Triticum durum.*

	National catalog number	Sample number	Variety	Country of origin
		Triticum aestivum		
1	UA 0100098	Sunnan	*var. lutescens*	SWE*
2	UA 0101113	Prokhorovka	*var. lutescens*	RUS
3	UA 0104110	Kharkiv 30	*var. lutescens*	UKR
4	UA 0106145	L 501	*var. lutescens*	RUS
5	UA 0110938	Simkodamironovskaya	*var. lutescens*	UKR
6	UA 0111008	Yrym	*var. erythrospermum*	KAZ
7	UA 0105661	CIGM.250-	*var. erythrospermum*	MEX
8	UA 0110937	Phyto 14/08	*var. erythrospermum*	UKR
9	UA 0110936	Phyto 33/08	*var. erythrospermum*	UKR
10	UA 0111123	L 685-12	*var. lutescens*	UKR
		Triticum durum Desf		
11	UA0201229	Zolotko	*var. muticohordeiforme*	UKR
12	UA0201199	Orenburgskaya 21	*var. hordeiforme*	RUS
13	UA0201431	Nurly	*var. hordeiforme*	KAZ
14	UA0201201	Slavuta	*var. leucomelan*	UKR
15	UA0200923	Bukuría	*var. melanopus*	UKR
16	UA0201428	Altun Segus	*var. hordeiforme*	KAZ
17	UA0201386	Metiska	*var. melanopus*	UKR
18	UA0201452	Novacia	*var. hordeiforme*	UKR
19	UA0201453	Diana	*var. hordeiforme*	UKR
20	UA0201426	Kustanayskaya 30	*var. hordeiforme*	KAZ

* SWE – Sweden; RUS – Russia; UKR – Ukraine; KAZ – Kazakhstan; MEX – Mexico.

Sowing was carried out at the optimal time for the eastern part of the Forest–Steppe of Ukraine (April I-II), collection samples were sown manually under a marker, in rows of 1 m long each with row spacing of 0.15 m, at the rate of 100 grains per linear meter. All phenological observations were carried out in accordance with the guidelines for studying wheat collections (Zykin, 1984). Its predecessor is autumn fallow. The placement of land plots is standard. To assess the intraspecific and interspecific ecological variability of spring wheat, 30 plants of each studying sample were analyzed annually. To determine the adaptability of samples, we have calculated the average arithmetic values of the trait, maximum (*max*) and minimum (*min*) values, the coefficient of agronomic stability (*As*), the coefficient of variation (*Ve*), selection value (*Sc*), homeostasis (*Hom*) (Zhivotkov, 1997). The Levis stability coefficient (*SF*) was determined as SF = HE/LE, where NE and LE - the value of the trait for the maximum and minimum levels, respectively, n -an indicator of the experiments duration (Zhuchenko, 1980).

Results

During the research period (2018 – 2019), weather conditions differed from the average many years' indicators in terms of temperature, precipitation, and their distribution in individual months. To estimate the environmental conditions for the soil formation and durum spring wheat productivity, the hydrothermal coefficient (HTC) was determined (Fig.1) according to the method of G.T. Selyaninov (Snedekor, 1961).

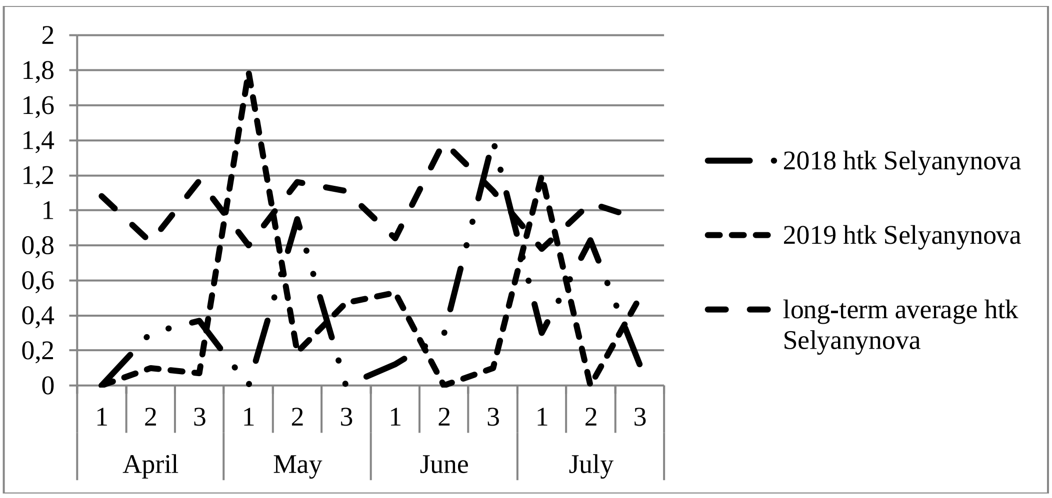

Fig. 1. The dynamics of the hydrothermal coefficient of Selyaninov during the growing season of spring wheat (Educational Research and Production Center "Experimental Field" of KhNAU, 2018-2019).

Thus, in 2018 and 2019, the sowing-germination period (09.04–21.04) was characterized by dry conditions (HTC=0.3; 0.1, respectively). In 2018 stalk shooting phase took place in three periods of weather conditions and was characterized by arid and dry conditions (HTC=0.37, 0, 0.95, respectively). Accordingly, in 2019, this period was marked by dry conditions, excessive moisture and arid conditions (HTC=0.07, 1.79, 0.19, respectively). The period of the beginning of tult formation in 2018 was characterized by dry conditions (HTC=0). In 2019, the period of milk-wax ripeness was dry (HTC=0), which did not contribute to the shaping and wheat grain formation. In general, during the study period, the humidity level was insufficient and was characterized in 2018, 2019 (HTC=0.47, 0.41). According to the method of A.V. Kilchevsky and L.V. Khotyliova (Goncharenko, 2005; Domashnev, 1992), the first stage of a comprehensive assessment of environmental parameters, phenotypic stability, and adaptive potential is disperse analysis to establish reliable differences between different effects (tables 2 and 3).

Table 2. The results of disperse analysis of crop structure elements of *Triticum aestium L.* spring wheat genotypes (2018-2019).

Dispersion	SS	df	mS	F_{fact}	F_{theor}
Mass of one ear					
General	1.57	19.00	0.08	3.48	-
Repetitions	0.07	1.00	0.07	2.98	5.12
Options	1.28	9.00	0.14	6.01	3.18
Random deviations	0.21	9.00	0.02	-	-
LSD_{05}			0.84		
Mass of grains from one ear					
General	1.15	19.00	0.06	3.25	-
Repetitions	0.02	1.00	0.02	0.96	5.12
Options	0.97	9.00	0.11	5.75	3.18
Random deviations	0.17	9.00	0.02	-	-
LSD_{05}			0.75		
Grains per ear					
General	702.5	19.0	36.95	694.08	-
Repetitions	8.66	1.00	8.66	162.66	5.12
Options	692.91	9.00	76.99	1446.22	3.18
Random deviations	0.48	9.00	0.05	-	-
LSD_{05}			19.8		
Weight of 1000 seeds					
General	1221.31	19.00	64.28	2.21	-
Repetitions	144.72	1.00	144.72	4.98	5.12
Options	815.08	9.00	90.56	3.12	3.18
Random deviations	216.52	9.00	29.06	-	-
LSD_{05}			21.51		
Grain mass per 1m^2					
General	210816.55	19.00	11095.61	6.07	-
Repetitions	5140.18	1.00	5140.18	2.81	5.12
Options	189229.75	9.00	21025.53	11.51	3.18
Random deviations	16446.62	9.00	1827.40	-	-
LSD_{05}			327.7		

The results of the conducted disperse analysis by the indicators of one spike mass, grain mass from one spike, number of grains from one spike, mass of 1000 seeds, grain mass from 1 m^2 confirm high reliable differences between the effects of genotypes of spring wheat samples (Tables 2 and 3). When assessing the influence of the studied factors (year, genotype) on the formation of productivity elements of various species of spring wheat, it was found that the greatest influence was: by the studied indicator, genotype had 72.41 % (mass of one spike); 93.1 % (mass of grain from one spike); 85.08 % (number of grains from one spike); 57.91 % (mass of 1000 seeds); 83.75% (mass of grain from 1 m^2) in soft wheat. Accordingly, in durum wheat, the influence of genotype was: 77.96 % (mass of one spike); 81.43 % (mass of grain from one spike); 71.12 % (number of grains from one spike); 73.08 % (mass of 1000 seeds); 93.05 % (mass of grain from 1 m^2).

Analyzing the reaction of collection samples of spring wheat of various ecological and geographic origin, we have found that the average value of the mass of one spike in the experiment in soft wheat was 1.23 g, with a minimum (*min*) – 0.83 g in the sample of Phyto 33/08 and maximum (*max*) – 1.90 g in the sample of Sunnan (2018), accordingly in durum wheat – 1.4 g, with a minimum (*min*) – 0.85 g in Metyska sample and maximum (*max*) – 2.14 g for variety of Orenburgskaya 21. In 2019 the average indicator for all samples was 1.10 g, at the minimum value – 0.63 g in L 501 sample, maximum – 1.60 g in Sunnan (soft wheat), and 1.44 g, 0.84 g (min) in Metyska sample, 2.14 g (max) in Nurla in durum wheat.

Among the studied samples of the 2018-2019 collection, the best in terms of one spike mass (g) were Sunnan (1.75 g), Prokhorovka (135 g), Kharkivska 30 (1.27 g) and Simkodamyronivska (1.24 g), among awned samples – Phyto 14/08 (1.21 g) – soft wheat; Orenburgskaya 21 (2.14 g), Nurly (1.69 g), Novatsiia (1.55 g) and Diana (1.51 g) – durum wheat (table 4).

Table 3. The results of disperse analysis of crop structure elements of *Triticum durumL.* spring wheat genotypes (2018-2019).

Dispersion	SS	df	mS	F_{fact}	F_{theor}
			Mass one ear		
General	2.58	19.00	0.14	3.21	
Repetitions	0.03	1.00	0.03	0.82	5.12
Options	2.16	9.00	0.24	5.69	3.18
Random deviations	0.38	9.00	0.04	-	
LSD_{05}			1.13		
			Mass of grain from one ear		
General	2.21	19.00	0.12	3.81	-
Repetitions	0.02	1.00	0.02	0.78	5.12
Options	1.91	9.00	0.21	6.96	3.18
Random deviations	0.27	9.00	0.03	-	
LSD_{05}			1.04		
			Number of grains per ear		
General	541.17	19.00	28.48	29.38	-
Repetitions	4.43	1.00	4.43	4.57	5.12
Options	528.02	9.00	58.67	60.52	3.18
Random deviations	8.72	9.00	0.97	-	
LSD_{05}			17.31		
			Weight of 1000 seeds		
General	1469.93	19.00	77.36	3.74	
Repetitions	44.55	1.00	44.35	2.16	5.12
Options	1239.45	9.00	137.72	6.67	3.18
Random deviations	185.93	9.00	20.66	-	
LSD_{05}			26.5		
			Grain mass per $1m^2$		
General	84290.46	19.00	4436.34	13.94	
Repetitions	618.66	1.00	618.66	1.94	5.12
Options	80808.20	9.00	8978.69	28.22	3.18
Random deviations	2.863.60	9.00	318.18	-	
LSD_{05}			214.13		

By the range of variation (the difference between the maximum and minimum values of the feature), we can conclude about the degree of sample stability to the impact of changes in environmental conditions in the region: the lower this indicator, the more stable the sample is. The range of variability by mass of one spike in soft wheat was the highest in L 501 (0.68 g) and the smallest in Prokhorovka, Yrym, Phyto 14/08, Phyto 33/08 (0.01 g), which is reflected in terms of coefficients of indicator variations, 0.53, 0.63, 0.59 and 0.86 %, respectively. According to this indicator, the varieties were distributed in the following sequence: Prokhorovka, Phyto 14/08, Yrym and Phyto 33/08.

Accordingly, in durum wheat Nurla was the highest range of variability by this indicator (0.91 g), the vast majority of samples had a low range of variability (0.01 g). The coefficient of variation for the collection varied between 0.33–38.2 %. Samples that reacted to the improvement of conditions in susceptible years and insignificantly in limited conditions can serve as a source material for increasing plant productivity in the Forest-Steppe of Ukraine. Among the studied samples, the greatest fluctuations by the mass of one spike (coefficient of variation V ≥ 20 %) had L 501 (V=49.5 %) – in soft wheat and Nurla sample (V=38.19 %) – in durum wheat.

Stability coefficient from the agronomic point of view (As) characterizes the economic value of the source material: according to it, variety samples with a stability coefficient exceeding 70% are most valuable for production. According to this criterion, the presented variety samples of soft wheat belong to stable ones, except for L 501 (As=50.4 %), respectively in durum wheat Nurla sample is not stable (As=61.81 %).

Assessment of the best collection samples of soft spring wheat for homeostaticity, that is, the ability of the genotype to minimize the effects of unfavourable environmental conditions in different periods of plant growth and development, gives grounds to assert that the most homeostatic (stable) by mass of one spike were samples: Prokhorovka, Phyto 14/08 and Yrym, which had the highest levels of homeostaticity (Hom1=255.8, 205.4 and 175.8, respectively) and agronomic stability (As=99.5 %, 99.4 % and 99.4 %).

Accordingly, in durum wheat among the studied collection, the best samples were: Orenburgskaya 21, Novatsiia, Diana, which had the highest levels of homeostaticity (Hom 1=644.6, 337.6 and 320.3, respectively) and agronomic stability (As=99.7 %, 99.5 % and 99.5 %). The above-mentioned samples most stably realized their potential under changing growing conditions. The least stable among the studied variety samples was L 501 (Hom1=1.96; As=50.4 %), in soft wheat and Zolotko sample (Hom1=6.93; As=79.8 %) – in durum wheat. A similar regularity was observed by the *Hom2* indicator.

The selection value index (*Sc*) allowed us to distinguish samples that combine the high or medium mass of a single spike and its stable realization under changing growing conditions, which is most important in production. Among the studied samples, the highest indicators of selection value had: Sunnan (Sc=1.47), Prokhorovka (Sc=1.34), Kharkivska 30 (Sc=1.23) and Phyto 14/08 (Sc=1.20) – in soft wheat and samples of Nurla (Sc=2.93), Orenburgskaya 21 (Sc=2.13), Novatsiia (Sc=1.54) and Diana (Sc=1.50) – in durum wheat. The sample of soft wheat L 501 was significantly inferior to other studied samples in terms of selection value (Sc=0.47), in durum wheat – a sample of Metyska (Sc=0.84), respectively.

A sample is considered stable by manifestation of productivity characteristics if their stability coefficient is close to unity. In our studies, the following samples of soft wheat were more stable in terms of the mass indicator of one spike: Prokhorovka, in which the Levis phenotypic stability coefficient was 1.01, Yrym (SF=1.01), Phyto 14/08 (SF=1.01), Phyto 33/08 (SF=1.01); durum wheat – Orenburgskaya 21 (SF=1.00), Slavuta (SF=1.01), Bucuria (SF=1.01), Altyn Shygys (SF=1.01) and others (table 4). Samples Kharkivska 30 and L 685-12 were slightly less stable by the studied indicator: respectively, the stability coefficients were 1.03 and 1.04 (soft wheat), in durum wheat of sample Zolotko (1.03). The data are coordinated with the agronomic stability coefficient (*As*).

Table 4. Adaptability parameters of spring wheat samples of various ecological and geographic origin by mass of one spike (2018–2019).

Sample name	The mass one ear , g			*R*	*Ve*	*As*	*Hom1*	*Hom2*	*Sc*	*SF*
	2018	2019	$\bar{x} \pm S_x$							
			Triticum aestivum							
Sunnan	1.90±0.07	1.60±0.22	1.75±0.21	0.30	12.12	87.88	14.44	48.1	1.47	1.19
Prokhorovka	1.35±0.03	1.34±0.03	1.35±0.01	0.01	0.53	99.47	255.83	25583.5	1.34	1.01
Kharkiv 30	1.29±0.16	1.25±0.16	1.27±0.03	0.04	2.23	97.77	57.02	1425.6	1.23	1.03
L 501	1.31±0.29	0.63±0.16	0.97±0.48	0.68	49.57	50.43	1.96	2.9	0.47	2.08
Simkodamironovskaya	1.30±0.13	1.18±0.13	1.24±0.08	0.12	6.84	93.16	18.12	151.0	1.13	1.10
Yrym	1.12±0.01	1.11±0.01	1.12±0.01	0.01	0.63	99.37	175.82	17581.9	1.11	1.01
CIGM.250-	0.91±0.19	0.83±0.19	0.87±0.06	0.08	6.50	93.50	13.38	167.3	0.79	1.10
Phyto14/08	1.21±0.03	1.20±0.03	1.21±0.01	0.01	0.59	99.41	205.35	20534.7	1.20	1.01
Phyto 33/08	0.83±0.02	0.82±0.02	0.83±0.01	0.01	0.86	99.14	96.25	9625.5	0.82	1.01
L 685-12	1.04±0.04	1.00±0.04	1.02±0.03	0.04	2.77	97.23	36.78	919.6	0.98	1.04
$\bar{x} \pm S_x$	1.23±0.30	1.10±0.28	1.16±0.27	0.13						
R	1.07	0.97	0.93		-					
Ve	24.15	25.96	23.27		-					
			Triticum durum							
Zolotko	1.60±0.07	1.20±0.07	1.40±0.28	0.40	20.20	79.80	6.93	17.32	1.05	1.33
Orenburgska 21	2.14±0.03	2.13±0.03	2.14±0.01	0.01	0.33	99.67	644.63	64463.04	2.13	1.00
Nurli	1.23±0.20	2.14±0.01	1.69±0.64	-0.91	38.19	61.81	4.41	-4.85	2.93	0.57
Slavuta	1.38±0.16	1.37±0.16	1.38±0.01	0.01	0.51	99.49	267.37	26737.48	1.37	1.01
Bucuria	1.14±0.01	1.13±0.01	1.14±0.01	0.01	0.62	99.38	182.18	18218.25	1.13	1.01
Altun Segus	1.36±0.05	1.35±0.1	1.36±0.01	0.01	0.52	99.48	259.65	25965.31	1.35	1.01
Metisca	0.85±0.22	0.84±0.22	0.85±0.01	0.01	0.84	99.16	100.98	10097.84	0.84	1.01
Novasia	1.55±0.43	1.54±0.43	1.55±0.01	0.01	0.46	99.54	337.58	33757.63	1.54	1.01
Diana	1.51±0.04	1.50±0.04	1.51±0.01	0.01	0.47	99.53	320.32	32032.29	1.50	1.01
Kustanayskaya 30	1.25±0.11	1.24±0.02	1.25±0.01	0.01	0.57	99.43	219.21	21920.66	1.24	1.01
$\bar{x} \pm S_x$	1.40±0.34	1.44±0.41	1.42±0.34	-0.04						
Ř	1.29	1.30	1.29		-					
Ve	24.33	28.70	24.05		-					

The best in the period of the collection research (grain mass indicator per spike) were Sunnan (1.25 g), Prokhorovka (1.03 g), Kharkivska 30 (1.0 g) and Simkodamironivska (0.94 g) – soft wheat; and, respectively, Orenburgskaya 21 (1.63 g), Nurly (1.24 g), Novatsiia (1.17 g) and Zolotko (1.13 g) – durum wheat (table 5). The range of variability in the studying of one spike mass in soft wheat was highest in L 501 (0.51 g) and lowest in Prokhorovka, CIGM.250 – (0.01 g), which is reflected in terms of coefficients of variation – 0.69, 1.35, 1.70 and 2.13 %. According to the indicator of variation, the samples were distributed in the following sequence: Prokhorovka, CIGM.250-, Sunnan, Kharkivska 30, Yrym, Simkodamironivska, Phyto 14/08, L 685-12, and Phyto 33/08. In durum wheat, the range of variability was highest in Nurla (0.77 g).

The vast majority of samples had a low R value (0.01 g). The coefficient of variation for the collection as a whole varied between

0.44–44.09 %. Among the studied samples, the greatest fluctuations by the indicator (coefficient of variation V ≥ 20 %) had: L 501 (V=53.43 %) – in soft wheat and Nurla sample (V=44.09 %) – in durum wheat.
Analysis of the stability coefficient showed that the presented varieties sample of soft wheat according to this criterion belong to stable, except for L 501(As=46.57 %), respectively, in durum wheat, Nurla sample is not stable (As=55.91 %).
Assessment of the best collection samples of soft spring wheat for homeostaticity, gives grounds to assert that the most homeostatic (stable) by grain mass from one spike were samples: Prokhorovka, Sunnan and Kharkivska 30. Accordingly, their homeostaticity indicator was (Hom1= 148.6; 73.1 and 46.7, respectively), and agronomic stability (As = 99.3 %, 98.3 % and 97.9 %). In durum wheat, the best samples were: Orenburskaya 21, Novatsiia, Kustanayska 30, which had the level of homeostaticity Hom1= 373.4; 96.8 and 76.4, respectively, and agronomic stability As=99.6 %; 98.8 % and 99.0 %. These samples most stably realized their potential under changing growing conditions. The least stable among the studied variety samples were L 501 (Hom1 = 1.26, As = 46.6 %), in soft wheat and Nurla sample (Hom1 = 2.8, As = 55.9 %) – in durum wheat. A similar regularity was observed by the *Hom2* indicator.

Table 5. Adaptability parameters of spring wheat samples of various ecological and geographical origin by grain weight from one ear (2018−2019).

Sample name	The weight of grain from one ear 2018	2019	$\bar{x} \pm S_x$	R	Ve	As	Hom1	Hom2	Sc	SF
			Triticum aestivum							
Sunnan	1.23±0.03	1.26±0.17	1.25±0.02	-0.03	1.70	98.30	73.07	-2435.63	1.28	0.98
Prokhorovka	1.03±0.03	1.02±0.03	1.03±0.01	0.01	0.69	99.31	148.58	14858.08	1.02	1.01
Kharkiv 30	0.98±0.15	1.01±0.12	1.00±0.02	-0.03	2.13	97.87	46.67	-1555.67	1.03	0.97
L 501	0.93±0.20	0.42±0.09	0.68±0.36	0.51	53.43	46.57	1.26	2.48	0.30	2.21
Simkodamironovskaya	0.97±0.11	0.91±0.11	0.94±0.04	0.06	4.51	95.49	20.83	347.11	0.88	1.07
Yrym	0.62±0.02	0.59±0.02	0.61±0.02	0.03	3.51	96.49	17.25	575.15	0.58	1.05
CIGM.250-	0.53±0.08	0.52±0.08	0.53±0.01	0.01	1.35	98.65	38.98	3897.93	0.52	1.02
Phyto14/08	0.83±0.02	0.77±0.02	0.80±0.04	0.06	5.30	94.70	15.08	251.42	0.74	1.08
Phyto 33/08	0.61±0.01	0.53±0.01	0.57±0.06	0.08	9.92	90.08	5.74	71.79	0.50	1.15
L 685-12	0.63±0.04	0.57±0.04	0.60±0.04	0.06	7.07	92.93	8.49	141.42	0.54	1.11
$\bar{x} \pm S_x$	0.84±0.23	0.76±0.28	0.80±0.24							
$\check{R}$	0.70	0.84	0.72							
Ve	27.46	36.53	30.36							
			Triticum durum							
Zolotko	1.11±0.01	1.14±0.03	1.13±0.02	-0.03	1.89	98.11	59.66	-1988.74	1.16	0.97
Orenburgska 21	1.63±0.08	1.62±0.08	1.63±0.01	0.01	0.44	99.56	373.44	37344.08	1.62	1.01
Nurli	0.85±0.22	1.62±1.10	1.24±0.54	-0.77	44.09	55.91	2.80	-3.64	2.35	0.52
Slavuta	0.78±0.13	0.71±0.13	0.75±0.05	0.07	6.64	93.36	11.21	160.19	0.68	1.10
Bucuria	0.81±0.01	0.79±0.02	0.80±0.01	0.02	1.77	98.23	45.25	2262.74	0.78	1.03
Altun Segus	0.65±0.02	0.64±0.02	0.65±0.01	0.01	1.10	98.90	58.83	5883.48	0.64	1.02
Metisca	0.59±0.25	0.58±0.15	0.59±0.01	0.01	1.21	98.79	48.40	4839.79	0.58	1.02
Novasia	1.18±0.08	1.16±0.08	1.17±0.01	0.02	1.21	98.79	96.80	4839.79	1.15	1.02
Diana	1.12±0.01	1.09±0.01	1.11±0.02	0.03	1.92	98.08	57.56	1918.66	1.08	1.03
Kustanayskaya 30	0.74±0.03	0.73±0.03	0.74±0.01	0.01	0.96	99.04	76.40	7639.94	0.73	1.01
$\bar{x} \pm S_x$	0.95±0.31	1.01±0.38	0.98±0.33							
$\check{R}$	1.04	1.04	1.04							
Ve	33.28	38.12	33.60							

Among the studied samples, the highest indicators of selection value had: Sunnan (Sc = 1.3), Kharkivska 30 (Sc = 1.0), Prokhorovka (Sc = 1.0) – in soft wheat and Nurla samples (Sc = 2.3), Orenburgskaya 21 (Sc = 1.6), Zolotko (Sc = 1.1) and Novatsiia (Sc=1.2) – in durum wheat. The sample of soft wheat Kharkivska 30 was significantly inferior to other studied samples in terms of selection value (Sc = 1.0), in durum wheat – sample of Nurla (Sc = 0.5), respectively.
In the conducted studies, more stable in terms of grain mass from one spike were the following samples of soft wheat: Prokhorovka, (Levis phenotypic stability coefficient SF = 1.0; CIGM.250 (SF = 1.0); Yrym (SF = 1.0); durum wheat – Orenburgskaya 21 (SF = 1.0), Kustanayska 30 (SF = 1.0), Altyn Shygys (SF = 1.0), Metyska (SF=1.0), and others (table 5). Less stable in terms of the studied indicator were the samples of Sunnan and Kharkivska 30: (SF=0.9 and 0.9) in soft wheat, in durum wheat the sample of Zolotko (1.0) and Nurla (0.5). The obtained data are coordinated with the agronomic stability coefficient (As).
When analyzing the indicator of the number of grains from one spike, the following regularities were established: the average value of this indicator for the experiment in soft wheat in 2018 was 23.9 pieces, with a minimum (min) – 15.8 pieces (example of CIGM.250-) and maximum (max) – 32.4 pieces – Prokhorovka. Accordingly, durum wheat has 24.8 pieces, (min) –14.0 pieces in Metyska sample and (max) – 33.3 pieces in Zolotko sample. In 2019, the indicator was 23.3 pieces, respectively, at the minimum value – 15.4 pieces in CIGM.250 sample, maximum – 31.6 pieces in Prokhorovka (soft wheat), and 24.4 pieces, 13.4 pieces (min) in a Metyska sample, 32.4 pieces (max) in Zolotko sample in durum wheat.
Among the studied samples of the collection, by the studied indicator, the best were: Prokhorovka (31.6 pieces), L 501 (29.0

pieces), Sunnan (27.9 pieces), and Kharkivska 30 (27.9 pieces) – soft wheat; Zolotko (32.4 pieces), Slavuta (28.5 pieces), Orenburgskaya 21 (27.2 pieces), Novatsiia (26.2 pieces) – durum wheat (table 6). The range of variability by the studied indicator in soft wheat was the highest in Sunnan (1.8 pieces) and the smallest in CIGM.250 (0,8 pieces), Yrym (1,0 pieces), Phyto 33/08 (1.0 pieces), L 685-12 (1.0 pieces). Accordingly, the coefficients of variation were 3.8, 4.2, 4.2 and 4.3 %. According to this indicator, the samples were distributed in the following sequence: – CIGM.250-, Phyto 33/08, Yrym and L 685-12. The range of variability in durum wheat was the highest in the sample of Nurla (3.0 pieces), the lowest indicators were shown by samples: Metyska (1.1 pieces), Altyn Shygys (1.2 pieces), Kustanayskaya 30 (1.3 pieces), Bucuria (1.3 pieces). The coefficient of variation for the collection varied between 3.15 – 8.44 %. Among the studied samples, the greatest fluctuations (coefficient of variation V ≥ 20 %) by the number of grains had Phyto 14/08 sample (V = 5.1 %) in soft wheat and Nurla sample (V = 8.4 %) in durum wheat. All presented varieties of soft and durum wheat are considered stable in terms of stability (As), because all indicators exceed 70 %.

Assessment of collection samples of soft spring wheat by homeostaticity allowed to reveal more stable samples in terms of the number of grains from one spike, namely: Prokhorovka, L 501 and Simkodamironovska (Hom1= 918.7; 814.6 and 779.8, respectively) and agronomic stability (As = 96.6 %, 96.4 % and 96.5 %). In durum wheat, these are samples: Slavuta, Zolotko, Novatsiia (Hom1 = 906.7, 824.7 and 726.1, respectively) and the coefficient of agronomic stability (As = 96.8 %, 96.1 % and 96.4 %). The above-mentioned samples most stably realized their potential under changing soil and climatic conditions. Less stable in the collection were the following samples: Yrym (Hom1=394.4, As=95.7 %) of soft wheat and Metyska sample (Hom1 = 231.54, As=94.20 %) – durum wheat. A similar regularity was observed by the *Hom2* indicator.

Table 6. Adaptability parameters of spring wheat samples of various ecological and geographical origin by the number of spikelets per ear (2018−2019).

Sample name	Number of spikelets per ear 2018	2019	$\bar{x} \pm S_x$	*R*	*Ve*	*As*	*Hom1*	*Hom2*	*Sc*	*SF*
			Triticum aestivum							
Sunnan	28.83±20.14	27.03±46.03	27.93±1.27	1.80	4.56	95.44	612.89	340.50	26.19	1.07
Prokhorovka	32.40±4.39	30.86±3.36	31.63±1.09	1.54	3.44	96.56	918.74	596.58	30.13	1.05
Kharkiv 30	28.63±56.7	27.13±56.19	27.88±1.06	1.50	3.80	96.20	732.84	488.56	26.42	1.06
L 501	29.73±97.37	28.27±93.79	29.00±1.03	1.46	3.56	96.44	814.63	557.96	27.58	1.05
Simkodamironovskaya	28.17±40.07	26.80±30.34	27.49±0.97	1.37	3.52	96.48	779.80	569.20	26.15	1.05
Yrym	17.20±5.82	16.20±5.82	16.70±0.71	1.00	4.23	95.77	394.41	394.41	15.73	1.06
CIGM.250-	15.80±44.58	14.97±40.59	15.39±0.59	0.83	3.81	96.19	403.30	485.91	14.58	1.06
Phyto14/08	23.40±15.97	21.77±18.87	22.59±1.15	1.63	5.10	94.90	442.56	271.51	21.01	1.07
Phyto 33/08	17.53±3.64	16.53±3.64	17.03±0.71	1.00	4.15	95.85	410.15	410.15	16.06	1.06
L 685-12	17.60±13.42	16.57±12.32	17.09±0.73	1.03	4.26	95.74	400.78	389.11	16.09	1.06
$\bar{x} \pm S_x$	23.93±6.34	22.61±6.07	23.27±6.20							
Ř	16.60	15.89	16.25							
Ve	26.51	26.83	26.66							
			Triticum durum							
Zolotko	33.30	31.50	32.40±1.27	1.80	3.93	96.07	824.77	458.21	30.65	1.06
Orenburgska 21	28.10	26.37	27.24±1.22	1.73	4.49	95.51	606.35	350.49	25.56	1.07
Nurli	23.40	26.37	24.89±2.10	-2.97	8.44	91.56	294.87	-99.28	28.04	0.89
Slavuta	29.17	27.90	28.54±0.90	1.27	3.15	96.85	906.71	713.94	27.29	1.05
Bucuria	22.83	21.53	22.18±0.92	1.30	4.14	95.86	535.17	411.67	20.92	1.06
Altun Segus	18.40	17.23	17.82±0.83	1.17	4.64	95.36	383.62	327.88	16.68	1.07
Metisca	13.97	12.87	13.42±0.78	1.10	5.80	94.20	231.54	210.49	12.36	1.09
Novasia	26.90	25.56	26.23±0.95	1.34	3.61	96.39	726.12	541.88	24.92	1.05
Diana	26.63	25.23	25.93±0.99	1.40	3.82	96.18	679.19	485.14	24.57	1.06
Kustanayskaya 30	25.40	24.13	24.77±0.90	1.27	3.63	96.37	682.95	537.75	23.53	1.05
$\bar{x} \pm S_x$	24.81±5.52	23.87±5.40	24.34±5.42							
Ř	19.33	18.63	18.98							
Ve	22.26	22.62	22.25							

The indicator of selection value (*Sc)* allowed us to identify samples that realize high productivity, namely: Prokhorovka (Sc = 30.1), L 501 (Sc = 27.6), Sunnan (Sc = 26.2), Kharkivska 30 (Sc = 26.4) and Simkodamironovska (Sc = 26.1) – in soft wheat and samples of Zolotko (Sc = 30.6), Nurly (Sc = 28.0), Slavuta (SC = 27.3) and Orenburgskaya 21 (SC = 25.6) – in durum wheat. Sample of soft wheat CIGM.250-, was significantly inferior to other studied samples in terms of selection value (Sc =14.6), respectively, in durum wheat – Metyska sample (Sc = 12.4).

In the conducted studies, the following samples were more stable in terms of the number of grains in one spike: soft wheat Prokhorovka, respectively, the coefficient of phenotypic stability of Levis was SF=1.0; L 501 (SF=1.0), Simkodamyronovska (SF=1.0); durum wheat – Slavuta (SF=1.0), Novatsiia (SF=1.0), Kustanayskaya (SF=1.05) and others (table 6). Sunnan and Phyto samples 14/08 (SF= 1.07 and 1.07) (soft wheat), durum wheat of Orenburgskaya 21 sample (1.1) were slightly inferior in stability by the indicator.

Analyzing the reaction of collection samples of spring wheat of various ecological and geographic origin, we have found that the average value of 1000 seeds mass in the experiment in soft wheat was – 34.5 g, with a minimum (min) – 28.3 g in the sample of Phyto 14/08 and a maximum (max) – 45.0 g in the sample of Sunnan (2018), respectively in durum wheat – 37.7 g, with a minimum (min) – 24.6 g in the sample of Zolotko and maximum (max) – 58.6 g for Novatsiia sample. In 2019 the indicator was 39.8 g, at the minimum value – 28.1 in Prokhorovka sample (RUS), the maximum – 55.7 in Yrym (KAZ) (soft wheat), and 34.8 g, 25.5 g (min) in Kustanayskaya 30 sample, 44.7 g (max) in Novatsiia, durum wheat.

Among the studied samples of the collection during 2018–2019, we can distinguish the best samples in terms of 1000 seeds mass (g): Sunnan (49.10 g), Yrym (47.20 g), Simkodamironovska (39.90 g) and Kharkivska 30 (39.4 g) – soft wheat; Novatsiia (51.6 g), Orenburgskaya (49.2 g), Altyn Shygys (37.3 g) and Diana (36.8 g) – durum wheat (table 7).

The most stable samples to changes in environmental conditions were samples from soft wheat: Yrym (17.0 g), studying of the mass indicator of 1000 seeds showed that less stable and at the same time dependent on changes of growing conditions were: L 685-12 (0.80 g), CIGM.250- (1.4 g), Phyto 33/08 (3.0 g), Simkodamironovska (5.2 g), the obtained data are confirmed by the coefficient of variation: respectively, in soft wheat it was: 1.81, 3.32, 6.16 and 9.22 %, and in durum wheat Novatsiia (13.90 g). According to this indicator, the samples were distributed in the following sequence: L 685-12, CIGM.250-, Phyto 33/08, Simkodamironivska. Accordingly, the range of variability by this indicator in durum wheat was the highest in Novatsiia (13.90 g), the vast majority of samples had a low range of variability. The coefficient of variation for the collection varied between 0.67 – 13.90 %. The largest fluctuations in the mass of 1000 seeds (coefficient of variation V ≥ 20 %) among the studied samples had Kharkivska 30 (V = 29.12 %) – in soft wheat and Novatsiia sample (V = 19.03 %) – in durum wheat.

When describing the economic value of the source material, it is worth noting samples in which the stability coefficient exceeds 70 %. All presented collection samples of spring wheat are considered stable by this criterion.

Table 7. Adaptability parameters of spring wheat samples of various ecological and geographical origin by weight of 1000 seeds (2018−2019).

Sample name	Weight of 1000 seeds			R	Ve	As	Hom1	Hom2	Sc	SF
	2018	2019	$\bar{x} \pm S_x$							
			Triticum aestivum							
Sunnan	45.00	53.20	49.10±5.80	-8.20	11.81	88.19	415.78	-50.70	58.05	0.85
Prokhorovka	36.40	28.10	32.25±5.87	8.30	18.20	81.80	177.21	21.35	24.90	1.30
Kharkiv 30	31.30	47.53	39.42±11.48	-16.23	29.12	70.88	135.37	-8.34	59.85	0.66
L 501	32.55	39.40	35.98±4.84	-6.85	13.46	86.54	267.19	-39.01	43.55	0.83
Simkodamironovskaya	37.30	42.50	39.90±3.68	-5.20	9.22	90.78	432.97	-83.26	45.46	0.88
Yrym	38.70	55.70	47.20±12.02	-17.00	25.47	74.53	185.33	-10.90	67.93	0.69
CIGM.250-	30.50	29.10	29.80±0.99	1.40	3.32	96.68	897.06	640.75	28.43	1.05
Phyto14/08	28.33	34.50	31.42±4.36	-6.17	13.89	86.11	226.21	-36.66	38.26	0.82
Phyto 33/08	33.50	36.55	35.03±2.16	-3.05	6.16	93.84	568.82	-186.50	38.21	0.92
L 685-12	30.90	31.70	31.30±0.57	-0.80	1.81	98.19	1731.86	-2164.83	32.11	0.97
$\bar{x} \pm S_x$	34.45±4.96	39.83±9.75	37.14±6.73							
Ř	16.67	27.60	19.30							
Ve	14.40	24.48	18.12							
			Triticum durum							
Zolotko	24.66	28.90	26.78±3.00	-4.24	11.20	88.80	239.21	-56.42	31.38	0.85
Orenburgska 21	55.20	43.20	49.20±8.49	12.00	17.25	82.75	285.28	23.77	38.50	1.28
Nurli	36.10	29.70	32.90±4.53	6.40	13.76	86.24	239.18	37.37	27.07	1.22
Slavuta	30.83	31.50	31.17±0.47	-0.67	1.52	98.48	2050.10	-3059.85	31.84	0.98
Bucuria	34.30	36.20	35.25±1.34	-1.90	3.81	96.19	924.87	-486.77	37.20	0.95
Altun Segus	35.30	39.40	37.35±2.90	-4.10	7.76	92.24	481.19	-117.36	41.69	0.90
Metisca	37.16	31.50	34.33±4.00	5.66	11.66	88.34	294.47	52.03	29.10	1.18
Novasia	58.60	44.70	51.65±9.83	13.90	19.03	80.97	271.42	19.53	39.40	1.31
Diana	36.50	37.10	36.80±0.42	-0.60	1.15	98.85	3191.97	-5319.96	37.40	0.98
Kustanayskaya 30	28.90	25.50	27.20±2.40	3.40	8.84	91.16	307.73	90.51	24.00	1.13
$\bar{x} \pm S_x$	37.76±10.85	34.77±6.38	36.26±8.30							
Ř	33.94	19.20	24.87							
Ve	28.74	18.34	22.88							

Analysis of soft spring wheat samples for homeostaticity and agronomic stability, gives grounds to assert that the most homeostatic and stable by mass of 1000 seeds were samples: L 685-12, CIGM.250- and Phyto 33/08, (Hom1=1731.9, 897.1 and 568.8, respectively, As = 98.2 %, 96.7 % and 93.8 %). In durum wheat, according to these indicators, the following samples were identified: Diana, Slavuta, Bucuria, (Hom1= 3192.0, 2050.1 and 924.9, respectively) and agronomic stability (As = 98.8, 98.5 % and 96.2). Less stable are: Kharkivska 30 (Hom1 = 135.4, As = 70.8 %) in soft wheat and Nurla sample (Hom1 = 239.2, As = 86.2%) – in durum wheat. A similar regularity was observed for the *Hom2* indicator.

According to the indicator of selection value (*Sc*), samples that combine a high or average mass of 1000 seeds and its stable realization are identified: Yrym (Sc = 67.9), Kharkivska 30 (Sc = 59.8), Sunnan (Sc = 58.0) and Simkodamironovska (Sc = 45.5) – in soft wheat and samples of Altyn Shygys (Sc = 41.7), Novatsiia (Sc = 39.4), Orenburgskaya 21 (Sc=38.5) and Diana (Sc = 37.4) – in durum wheat. Soft wheat samples were the most stable in terms of the mass indicator of 1000 seeds: CIGM.250 (SF = 1.1), Phyto 33/08 (SF = 0.9), L 685-12 (SF = 1.0); in durum wheat – Slavuta (SF = 1.0), Diana (SF = 1.0), Bucuria (SF = 1.0) and others (Gable 7). Analyzing the reaction, collection samples of spring wheat showed a different reaction in terms of seed mass from 1 m^2 on average, according to the experiment, soft wheat had an indicator of 309.2 g, with a minimum (min) – 184.5 g for Phyto 33/08 sample and a maximum (max) – 548.8 g for L 501 variety (2018), respectively, for durum wheat – 200.5 g, with a minimum (min) – 87.0 g for Metyska sample (UKR) and maximum (max) – 352.1 g for Kustanayskaya 30 variety. In 2019 on average, for all samples, the indicator was 277.1 g, with the minimum value – 150.6 in Phyto 33/08 sample (UKR), the maximum – 411.0 in L 501 (soft wheat), and 189.4 g, 112.4 g (min) in Metyska sample, 290.5 g (max) in Kustanayskaya 30 in durum wheat. Among the studied samples of the 2018–2019 collection, the best in terms of seed mass from 1 m^2 (g) were L 501 (479.9 g), Simkodamironovskaya (455.9 g), Prokhorovka (299.5 g) and Kharkivska 30 (295.5 g) – soft wheat; Kustanayskaya 30 321.3 g, Orenburgskaya 21 269.4 g, Novatsiia 243.4 g and Nurly 199.2 g – durum wheat (Table 8).

Table 8. Adaptability parameters of spring wheat samples of various ecological and geographical origin by seed weight 1 m^2 (2018−2019).

Sample name	Seed weight s 1m^2			R	Ve	As	Hom1	Hom2	Sc	SF
	2018	2019	$\bar{x} \pm S_x$							
			Triticum aestivum							
Sunnan	290.97	235.79	263.38±39.02	55.18	14.81	85.19	1777.87	32.22	213.43	1.23
Prokhorovka	288.65	310.42	299.54±15.39	-21.77	5.14	94.86	5828.43	-267.73	322.13	0.93
Kharkiv 30	313.98	276.97	295.48±26.17	37.01	8.86	91.14	3336.09	90.14	260.65	1.13
L 501	548.85	410.96	479.91±97.50	137.89	20.32	79.68	2362.07	17.13	359.34	1.34
Simkodamiron	513.15	398.56	455.86±81.03	114.59	17.77	82.23	2564.61	22.38	354.06	1.29
Yrym	251.75	280.69	266.22±20.46	-28.94	7.69	92.31	3463.36	-119.67	296.82	0.90
CIGM.250-	263.65	315.84	289.75±36.90	-52.19	12.74	87.26	2274.89	-43.59	347.10	0.83
Phyto14/08	247.91	210.95	229.43±26.13	36.96	11.39	88.61	2014.11	54.49	195.23	1.18
Phyto 33/08	184.55	150.65	167.60±23.97	33.9	14.30	85.70	1171.83	34.57	136.81	1.23
L 685-12	188.65	180.65	184.65±5.66	8.00	3.06	96.94	6027.31	753.41	176.82	1.04
$\bar{x} \pm S_x$	309.21±124.28	277.15±86.07	293.18±102.5							
$\check{R}$	364.30	260.31	312.3							
Ve	40.19	31.05	35.0							
			Triticum durum							
Zolotko	184.70	205.45	195.08±14.67	-20.75	7.52	92.48	2593.58	-124.99	216.99	0.90
Orenburgska 21	283.02	255.70	269.36±19.32	27.32	7.17	92.83	3755.78	137.47	243.36	1.11
Nurli	209.82	188.60	199.21±15.00	21.22	7.53	92.47	2644.79	124.64	179.06	1.11
Slavuta	179.49	184.60	182.05±3.61	-5.11	1.98	98.02	9171.74	-1794.86	187.23	0.97
Bucuria	147.25	125.50	136.38±15.38	21.75	11.28	88.72	1209.28	55.60	116.23	1.17
Altun Segus	162.48	150.50	156.49±8.47	11.98	5.41	94.59	2892.00	241.50	144.95	1.08
Metisca	87.01	112.45	99.73±17.99	-25.44	18.04	81.96	552.90	-21.73	128.89	0.77
Novasia	251.12	235.75	243.44±10.87	15.37	4.46	95.54	5452.64	354.76	228.54	1.07
Diana	147.75	144.50	146.13±2.30	3.25	1.57	98.43	9291.39	2858.89	142.91	1.02
Kustanayskaya 30	352.15	290.50	321.33±43.59	61.65	13.57	86.43	2368.49	38.42	265.07	1.21
$\bar{x} \pm S_x$	200.48±76.81	189.36±58.29	194.92±67.00							
$\check{R}$	265.14	178.05	221.60							
Ve	38.31	30.78	34.37							

In terms of the range of variation in soft wheat, it was the highest in L 501 (137.9 g) and the lowest in L 685-12 (8.0), Prokhorovka (21.7), Yrym (29.0), Phyto 33/08 (33.9 g), which is reflected in the coefficients of variation of the indicator, 3.06, 5.1, 7.7 and 14.3 %, respectively. The range of variability according to this indicator in durum wheat was the highest in Kustanayskaya 30 (61.6 g), slightly less had the following samples: Diana (3.2 g), Slavuta (5.1 g), Altyn Shygys (12.9 g). The coefficient of variation for the collection varied between 1.57 and 18.0 %. Among the studied samples, the largest fluctuations in the mass of seeds from 1 m^2 per spike (coefficient of variation V ≥ 20 %) L 501 (V = 20.3 %) – in soft wheat and Metyska sample (V = 18.0 %) – in durum wheat. According to the stability coefficient, which (*As*) characterizes the economic value of the source material all presented wheat varieties samples belong to stable, so As > 70 %. Assessment of collection samples for homeostaticity showed that the most homeostatic (stable) by seed mass from 1 m^2 were the following samples: L 685-12, Prokhorovka and Yrym, (Hom1 = 6027.3, 5828.4 and 3463.4) and agronomic stability (As = 96.9, 94.9 and 92.3 %). Accordingly, in durum wheat, the best samples were Diana, Slavuta, Novatsiia (Hom1 = 9291.4, 9171.7 and 5452.6, respectively) and agronomic stability (As = 98.4, 98.0 and 95.5 %). The above-mentioned samples most stably realized their potential under changing conditions. Phyto 33/08 was the least stable among the studied samples (Hom 1 = 1171.8; As = 85.7 %), in soft wheat and Metyska sample (Hom1=552.9; as=81.96 %) – in durum wheat. Among the studied samples, the highest indicators of selection value (*Sc*) had the following samples: L 501

(Sc=359.3), Simkodamironovska (Sc = 354.0), CIGM.250 (Sc = 347.1) and Prokhorovka (Sc = 322.1) – in soft wheat, and samples of Kustanayskaya 30 (Sc = 265.1), Orenburgskaya 21 (Sc = 243.4), Novatsiia (Sc = 228.5) and Zolotko (Sc = 216.9) – in durum wheat. The sample of soft wheat Phyto 33/08 was significantly inferior to other studied samples by this indicator (Sc = 136.1), in durum wheat Bucuria sample (Sc = 116.2), respectively. In our studies, better were showed samples of soft wheat: L 685-12, in which the coefficient of phenotypic stability of Levis was 1.0, Kharkivska 30 (SF = 1.1), Phyto 14/08 (SF=1.2); among durum wheat samples – Diana (SF = 1.0), Novatsiia (SF = 1.1), Altyn Shygys (SF = 1.1), and others (table 8). CIGM.250- and Yrym samples were slightly less stable by the studied indicator: SF = 0.8 and 0.9, respectively (soft wheat), in durum wheat it was Metyska sample (0.7). Ecological plasticity is considered as the reaction of a genotype to external conditions and the stability of its features in a certain range of environmental situations. It is extremely important that a high level of yield was combined with resistance to adverse environmental factors. The potential of these indicators is genetically determined, and the degree of their realization depends on the nature of the "genotype-environment" interaction. Each genotype, when the ecological gradient changes, has its own compensatory mechanisms. Our studies can also confirm the specific nature of adaptive properties of spring wheat genotypes.

Discussion

The indicator of selection value allowed identifying samples that combine high or medium grain mass from one spike and its stable realization under changing growing conditions. Among the studied samples, samples of Swiss selection (Sunnan), samples of Russian and Ukrainian selection (Prokhorovka, Kharkivska 30) had the highest indicators (1.3, 1.0, and 1.0). The best in terms of selection value in durum wheat were samples of Kazakhstan selection (Nurly) and Russian selection (Orenburgskaya 21) (2, 3 and 1.6). Analyzing the reaction of collection samples of soft spring wheat of various ecological and geographical origin, we have found that the best were samples of Russian selection Prokhorovka (31.6 pieces). By the indicator of the number of grains per spike, we have identified one sample of Russian selection (L 501), Swiss selection (Sunnan) (29.0, 27.9). The best indicators for spring durum wheat were shown by samples from Ukrainian selection (Zolotko = 32.4 pieces and Slavuta = 28.5 pieces) and a sample of Russian selection, namely Orenburgskaya 21, which made 27.2 pieces, respectively. Among the studied samples, the highest indicators of selection value were samples of Russian selection (Prokhorovka, L 501) and samples of Ukrainian selection (Kharkivska 30, Simkodamyronovska) and made 30.1, 27.6, 26.4, and 26.1, respectively. The best indicators of selection value in durum wheat had samples of Ukrainian selection (Zolotko) and Kazakhstan (Nurla) and made 30.6 and 28.0, respectively.

Analyzing the reaction of collection samples of spring wheat of different ecological and geographical origin, we found that the sample of Swiss selection Sunnan was very high-yielding (49.10 g) by the indicator of 1000 seeds mass, we have identified one sample of Kazakhstan selection (Yrym) and two samples of Ukrainian selection (Simkodamironovska, Kharkivska) they were 47.20, 39.90, and 39.42 respectively. The best indicators of 1000 seeds mass among samples of spring durum wheat were shown by samples from Ukrainian and Russian selection (Novatsiia = 51.65 and Orenburgskaya 21 = 49.20) and a sample of Kazakhstan selection, namely Altyn Shygys, was 37.35, respectively.

According to the indicator of selection value, we have identified samples of Kazakhstan selection (Yrym) and a sample of Ukrainian selection (Kharkivska 30) (67.9, 59.8). The best indicators of selection value in durum wheat had samples of Ukrainian selection (Novatsiia) and Russian selection (Orenburgskaya 21) and made 39.4 and 38.5, respectively.

The sample of Russian selection L 501 was very high-yielding (479.9) by the indicator of 1000 seeds mass, one sample of Ukrainian selection (Simkodamironovska) and two samples of Russian and Ukrainian selection (Prokhorovka, Kharkivska) (455.9, 299.5). Among samples of spring durum wheat the best samples were the samples of Kazakhstan selection (Kustanayska=321.3 and Russian selection Orenburgskaya 21 = 269.4) and a sample of Ukrainian selection, namely Novatsiia, made 243.4, respectively. Among the studied samples, the highest indicators of selection value were samples of Russian selection (L 501) and samples of Ukrainian and Mexican selection (Simkodamironivska and CIGM.250) and made 359.34, 354.06, and 347.10 respectively. The best indicators of selection value in durum wheat were noted in samples of Kazakhstan selection (Kustanayska 30) and Russian selection (Orenburgskaya 21) and made 265.07 and 243.36 respectively.

Conclusion

According to the high level of homeostasis and selection value, the samples Kharkivska 30, Simkodamironivska, Sunnan and Prokhorovka were identified among the studied varieties, which are valuable source material for spring wheat selection according to these indicators. It was determined that samples of foreign selection were mainly inferior to samples of domestic selection both by yield level and its stability, which is caused by their less adaptability to growing conditions. We determined that Prokhorovka, Kharkivska 30, Simkodamironivska (spring soft wheat) and Zolotko, Slavuta, Bucuria (spring durum wheat) have a high selection value, while Prokhorovka and Yrym (spring soft wheat) and Orenburgskaya 21 (spring durum wheat) have a high homeostasis in their genotype under unfavorable conditions. These samples can be recommended for use in selection practice to obtain the high-yielding varieties with high adaptive ability to growing conditions.

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