

## Assessment of initial stock of soft summer wheat on parameters of quality of grain in conditions of foreststeppe

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**The purpose.** To select collection samples of world genofund of soft summer wheat with high parameters of quality of grain for use in scientific programs as initial stock. **Methods.** Field, laboratory and statistical. **Results.** Possibility of combination in one genotype of high parameters of quality of grain which is not below those parameters of valuable kinds of wheat with increased efficiency is proved on the basis of determination of correlation links. **Conclusions.** Sources of collection samples of soft summer wheat of various ecological-and-geographical origins with high parameters of quality of grain which are recommended as parental components for crossings are selected.

**Key words:** *soft summer wheat, parameters of quality of grain, correlation.*

The increased production of spring wheat grain can not be achieved without new breeding achievements. Creating high-yielding varieties that combine high performance and grain quality is considered to be the main direction of research in plant breeding for grain quality. When improving the quality of cereals, identification of genetic sources of valuable traits in existence and new ones as well is extremely urgent problem for breeders in many countries [1]. In the last decade plant breeding aimed at improving productivity, which was not always accompanied by improved grain quality [2]. The reason for the low efficiency of breeding for grain quality lies in simultaneous selection of genotype on performance, resistance to biotic and abiotic factors being a difficult task through the inverse relationship between these characteristics [3]. Success in breeding and prospects of its development are determined by many factors, but using genetic resources as source material is the fundamental one. Therefore, examination of new gene pool was and remains a topical problem.

**The purpose of the research was** to select collection samples of the global gene pool of bread spring wheat with high indices of grain quality to involvement into breeding program as source (initial) material.

**Materials and methods of the research.** The study was conducted during 2013-2015 at spring wheat breeding laboratory of the V.M. Remeslo Myronivka Institute of Wheat of NAAS of Ukraine. There were studied 145 collection samples of bread spring wheat of various ecological and geographical origin. They were sown in optimal dates on experimental fields with cassette seed drill SKS-6-10 with three replication. Plot area was 1 m<sup>2</sup>. Elehiia Myronivska was used as standard variety. The standard was seeded across 25 numbers. Technological indices of grain quality were determined at grain quality laboratory of the V.M. Remeslo Myronivka Institute of Wheat of NAAS of Ukraine in accordance with conventional methods [4]. Statistical indicators and their errors were calculated by B.A Dosphehov [5].

**Results.** Creation of wheat genotypes that are characterized with the high quality crop requires extensive knowledge of the genetic basis for the formation of grain quality indices including protein content. According to several studies [6, 7], which studied the collections of wheat samples of different species and ecological origin it was shown that variation of protein content was in the range of 8 to 30 %. Instead, the average protein content in grain of cultivated wheat species is 12-15 %. On average in the experiment higher levels of protein content in the grain the samples have formed in the arid conditions in 2013 (13.6 %) with variation from 10.5 % to 15.3 % as compared to 2014 (11.1 %) and 2015 (12.4 %) which were characterized with optimal moisture conditions in the phase of earing and ripening grain, that gas affected the protein content in bread spring wheat (tab. 1). The coefficient of variation was on average level (12.1 %).

In terms of wet gluten content in 2013 the samples had better average indices (27.5 %) compared with 2014 (16.2 %) and 2015 (23.7 %), it can be explained by the fact that period of earing–waxy grain maturity was distinguished with higher average air temperature. The coefficient of variation was significant degree of variability (21.3 %) with deviations from 12.4 % to 29.2 %.

**Table 1. Indices of protein content in grain of the best collection samples of bread spring wheat (MIW, 2013-2015)**

The name of the sample, variety-standard	Origin	Protein content, %				Statistical parameters	
		2013	2014	2015	X	R, %	V, %
Elehiia myronivska – St	UKR	11.7	12.0	12.6	12.1	0.9	5.8
MIG	UKR	15.2	13.8	13.6	14.2	1.6	9,9
Prohresyvna	UKR	15.2	13.7	13.5	14.1	1.7	10.5
Omskaya 34	RUS	15.0	14.1	13.2	14.1	1.8	9.0
Pamyati Vavenkova	RUS	15.2	13.7	13.1	14.0	2.1	12.2
Katyusha	UKR	14.9	13.8	13.2	14.0	1.7	9.6
Polyushko	RUS	15.3	13.6	13.2	14.0	2.1	12.6
Omskaya 37	RUS	14.8	13.9	13.1	13.9	1.7	8.5
Nedra	UKR	15.3	12.9	13.2	13.8	2.4	15.4
Adams	CAN	14.7	13.3	13.1	13.7	1.6	10.3
Aletch	DEU	14.7	12.9	13.3	13.6	1.8	9.8
Lavrusha	RUS	14.7	12.9	12.9	13.5	1.8	12.6
Ester	RUS	14.1	13.1	13.1	13.4	1.0	6.8
Boevchanka	RUS	14.1	13.1	13.1	13.4	1.0	6.8
Estivum 1509	RUS	14.2	12.8	12.8	13.3	1.5	10.1
Koksa	POL	14.1	12.8	12.7	13.2	1.4	9.6
Tarskaya 7	RUS	14.0	12.7	12.6	13.1	1.4	9.6
Carrizo	MEX	14.0	12.6	12.6	13.1	1.4	10.2
X*	-	13.6	11.1	12.4	12.4	1.5	12.1
min**	-	10.5	9.6	9.5	9.7	0.8	4.9
max***	-	15.3	14.1	13.5	14.2	2.4	16.7
R****	-	4.8	4.5	4.0	4.5	1.6	11.8

Note: X\* – average value, min\*\* – minimum value, max\*\*\* – maximum value, R\*\*\*\* – variation range (max - min) for 145 samples

For the collection samples sedimentation index was better during the growing season in 2013 (50.2 ml) varying from 25 to 88 ml compared with 2014 (26.6 ml) – from 20.0 to 59.0 ml and 2015 (41.2 ml) – from 23.0 to 63.3 ml. The coefficient of variation was characterized by considerable volatility (28.3 %).

The sources of collection samples of bread spring wheat of various ecological and geographical origin with high grain quality have been identified and recommended as parental components for crosses: Nedra, MIG, Kharkivska 34 (UKR), Gerkules, Ekada 43, Tulaykovskaya 100, Debut, Lavrusha, Omskaya 37, Pamyati Vavenkova (RUS), Turbo, Bruncka, Aletch (DEU), TW 21311 (GBR), Lulana (CZE), Furio (FRA), Koksa (POL) (tab. 2).

**Table 2. Sources of collection samples of bread spring wheat in terms of grain quality (MIW, 2013-2015)**

Indices of grain quality	The name of the sample and country of origin
Protein content	Prohresyvna, Nedra, MIG, Katyusha, Vyshyvanka (UKR), Polyushko, Omskaya 34, Tarskaya 7, Tulun 15, Ester, Estivum 1509, Lavrusha, Boevchanka, Omskaya 37, Pamyati Vavenkova (RUS), TW 21311 (GBR), CMSS96M0287S, Carrizo (MEX), Aletch (DEU), Koksa (POL), Adams (CAN)
Sedimentation index	Simkoda mironivska, Prohresyvna, Nedra, MIG (UKR), Polyushko, Pamyati Vavenkova, Tulaykovskaya 10, Novosibirskaya 15, Ester, Lavrusha, Boevchanka, Omskaya 34, Omskaya 37, Estivum 1509, L 503, Omskaya 36, Ekada 6 (RUS), Shamshi (IND), TW 21311 (GBR), Dandy, Adams (CAN), Aletch (DEU), Koksa (POL)
Wet gluten content	Nedra, Katyusha, Prohresyvna, MIG (UKR), Omskaya 34, Lavrusha, Polyushko, Tulaykovskaya 10, Tarskaya 6, Boevchanka, Omskaya 37, Pamyati Vavenkova, Ester, Estivum 1509 (RUS), Aletch (DEU), Shamshi (IND), TW 21311 (GBR), Dandy, Adams (CAN), Koksa (POL)

As constantly changing, weather conditions significantly affect the wheat grain quality formation, resulting in changes of relationships of all technological parameters. Wheat breeding for grain quality is associated with exceptional difficulties caused, primarily, by the existence of negative correlations between grain quality traits and productivity and phenotypical variability of traits [8]. Possibility of simultaneous increase in protein content and grain harvest is low ( $r = 0.128$ ) [9, 10].

There were no significant correlations between yield and grain quality indices (tab. 3).

**Table 3. Correlations between yield and grain quality indices for collection samples of bread spring wheat (MIW, 2013-2015)**

Number of trait	Trait	Traits		
		2	3	4
1	Yield	0.22±0.08	0.39±0.07	0.31±0.07
2	Protein content	x	0.43±0.07	0.47±0.07
3	Sedimentation index		x	0.41±0.07
4	Wet gluten content			x

A weak, but positive correlation was revealed between yield and protein content ( $r = 0.22 \pm 0.08$ ), moderate one – wet gluten content ( $r = 0.31 \pm 0.07$ ) and sedimentation index ( $r = 0.39 \pm 0.07$ ). Moderate correlation was marked between protein content and sedimentation index ( $r = 0.43 \pm 0.07$ ). So, we have not found a reliable high negative relationship between the variables studied, indicating the possibility of selection of highly productive form with quality indices of not lower than valuable wheat.

### Conclusions

Resulted from the researches the sources of collection samples of bread spring wheat of various ecological and geographical origin with high grain quality have been identified and recommended as parental components for crosses: Nedra, MIG, Kharkivska 34 (UKR), Gerkules, Ekada 43, Tulaykovskaya 100, Debut, Lavrusha, Omskaya 37, Pamyati Vavenkova (RUS), Turbo, Bruncka, Aletch (DEU), TW 21311 (GBR), Lulana (CZE), Furio (FRA), Koksa (POL). By evaluation of the correlations between yield and grain quality indices it was not found a reliable high negative relationship between the variables studied, indicating the possibility of selection of highly productive form with quality indices of not lower than valuable wheat.

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