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BREEDING OF COMON WHEAT (*TRITICUM AESTIVUM*) IN THE CENTRAL PART OF RM

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Abstract. *During 2023-24 year we have studied 920 lines of wheat in selection field and the best of them were sowed in control and competition field. The best of them Bijuteria Zîmbrenilor as productivity and quality have been transferred to the State Commission for Crops Variety Testing. This sort of wheat has a productivity potential of 8,4- 9,0 t/ha and is zoned in all 3 agricultural parts of the Republic Moldova since 2025. It had gotten the volume of bread 646 cm^3 with porose crumb and smooth upper crust on the bread, better than M 5.*

Keywords: high productivity, resistance to abiotic and biotic factors, protein, gluten, baking qualities.

INTRODUCTION

Common wheat (*Triticum aestivum*) is the main bread-making cereal crop cultivated in our country and in many other regions of the globe (approximately 100 countries). Metaphorically speaking, it is the backbone of life because it is found daily on the table of every person in our country as a bakery, pastry or confectionery product. According to statistical data from our country, wheat is the second cereal crop after corn in terms of sown area and harvested production volume. According to several authors, the contribution of breeding to increasing production capacity per hectare is from one percent to 50-60%. The continuous increase in the number of common wheat varieties created (diversification of the assortment) is one of the most effective measures that can contribute to the growth and stabilization of yields of this crop (Starodub, V. 2015). In the Applied Genetics Laboratory of IGFPP, several new varieties of common winter wheat have been created from the beginning to the present: Basarabianca, Moldova 77, 79, 16, 5, 11, 66, Moldova 614, etc. Of which the last 4 varieties have been approved in our country.

That is why the problem of creating new varieties of common winter wheat

that are more productive, of better quality, and more resistant to abiotic and biotic factors of the environment than the existing ones approved at the present time is always relevant.

MATERIALS AND METHODS

To create new lines of common wheat, we used intraspecific hybridization. We used as initial material the varieties of common winter wheat created in our laboratory, both domestic and from other countries (varieties, lines, forms).

In the selection field during the year 2023-2024, we studied 920 lines of common wheat from which we selected the best forms, which were sown in the control and competition fields. The length of the plots in the selection field was 1.5 m. and the distance between the rows was 40 cm. As a control variety, the Kuialnic variety from Odessa, Ukraine was sown. The control field was 5 m2, the competition field – 10m2, and the demonstration and multiplication field was 100 m2. The selection field was sown manually and the control, competition, demonstration and multiplication field of the variety seed was sown mechanized. Sowing was done from the end of September to October 20. Phenological observations were made during the ontogenesis period. The harvesting of the lines in the selection field was done manually with subsequent sorting of the sheaves harvested at the batose. The yield from the control, competition, demonstration and multiplication fields was collected using the Sampo combine. The yield was recorded for all genotypes and varieties harvested. The protein percentage was determined according to Childall's method. The gluten content by washing the dough. We also determined the volume of bread from 100 g of flour.

REZULTS AND DISCUSIONS

As the initial material for the creation of new varieties, the best geographically distant varieties in terms of productivity, quality, and resistance to abiotic and biotic factors were used - Blogodarca Odesskaia, Polevic, Pisanca, Epoha Odesskaia Kuialnic Zolotocolosa, Bezostaia 100, Trublion, Căpriana, Lăutar, Meleag, Moldova 5, 11, 79, 66, 614 and others. Starting with the second generation, due to individual selection, a whole set of lines belonging to the semi-intensive ecotype were identified and studied at different stages of the breeding process. Our varieties Moldova 5, 11, 66, 614, approved in our Republic, meet the requirements of semi-intensive varieties. We selected elite spikelets with a number of spikelets in the spikelet not less than 20 and with fertile spikelets one hundred per spikelet. Elite spikes were selected from plants with a height of 80 to 105 cm, resistant to falling, diseases, drought, with well-filled grains and a weight of 1000 grains from 36 g to 46 g. During the 2023-2024 growing season, 920 lines and forms

selected from different hybrid populations were studied in the selection field. In 2024, the best lines were lines selected from hybrid combinations, SI from M55-1, SI from M55-2, SI pop 57/17, SI pop Arctic and others. Compared to the control variety Kuialnic (200 g 0.6 sq m), 17 lines had a yield from 200 to 350 g 0.6 sq m. The highest yield in the selection field was in the line selected from the spontaneous hybrid combination SI M55-1 = 350 g 0.6 sq m, which constitutes an increase of 150 g compared to the control variety. According to the control field data from 2024, out of 40 genotypes sown in a single repetition, 10 lines had a yield at the level of the control variety Kuialnic (4.2 t/ha) or higher. The best 2(two genotypes in this field were the lines KK 23/24 and KK 39/24 which had a yield equal to 4.96 t/ha, higher by 0.76 t/ha than the control variety Kuialnic. The lines named above were resistant to rust, powdery mildew, drought and had a height of 100 and 97 cm respectively. In the field with comparative competition crops, 6 lines were sown in 3 repetitions, of which the most fruitful was the line KK11/23 – 4.7t/ha, and in the control variety Kuialnic- 4.0 t/ha, which is 0.7 t/ha more than in the control variety. This line is tolerant to rust, powdery mildew, drought, falling and has a height of 90 cm. The best lines in the control and comparative competition fields in autumn 2024 were sown in the following links of the breeding process (competition and multiplication).

Table 1. Productivity of the best lines and varieties of common winter wheat from the multiplication field and demonstration

Name	Plant height	Resistance, points		Average	
		lodging	drought	t/ha	+control
Kuialnic, martor	0,80	9	9	3,6	-
Pisanca	0,82	9	9	3,7	+0,1
SI pop 47/20	0,73	9	9	3,9	+0,3
SI pop 42/20	0,71	9	9	3,6	-
Moldova 614	1,07	8	9	3,8	+0,2
Bijuteria Zîmbrenilor	0,70	9	9	3,9	+0,3

In 2023-24, 12 varieties, lines and forms of wheat selected from the comparative competition field were sown in this field. According to the data in Table 1, only 3 (three) varieties and one line surpassed the Kuialnic control variety. Our varieties approved in the RM, Moldova 5,11 and 66 are more resistant to lodging than the Kuialnic variety and had a yield at the level of the control variety. The Moldova 614 variety, which was approved in the northern area of the Republic of Moldova in 2024, is weaker to lodging than the control variety in years with a lot of moisture. This variety had a high resistance to wintering, drought, grain shaking, brown rust, powdery mildew, septoria, fusarium. The Kuialnic and M 614 varieties doubled and tripled their yield in years favorable for humidity. This

variety, Moldova 614, was submitted to the State Commission in the fall of 2019. It had a yield of 9.2 t/ha at the Pelenia CSTS state sector in 2023. The highest yield during multiplication was the Bijuteria Zimbrenilor variety of 3.9 t/ha, which is 0.3 t/ha more than the control variety (table 1). According to the State Commission data, it is resistant to lodging, shaking, drought, wintering, brown rust, powdery mildew, fusarium and grain bug.

Table 2. Regeneration capacity and green mass and grain yield of different varieties of cereal crops in 2024, IGFPP

Name of the cereal variety	Plant height, m	Green mass yield at earing, kg/m2	Full maturity grain yield, g/m2	Grain yield after first harvest, g/m2	Ratio between first harvest and second harvest, %	Level of adaptability and drought resistance
Zîmbreni 70 (secară)	1,70	5,0	784	162	20,7	high
Kuialnic	0,80	3,4	836	92	11,0	good
Bijuteria Zîmbren	0,70	3,6	873	97	11,1	good
Moldova 5	0,72	3,5	791	81	10,3	average
Mold. 614	1,10	5,6	859	94	10,9	good

In order to detect common wheat varieties with a high degree of adaptability, and with a vigorous root system, resistant to drought, the studied varieties were harvested for multiplication on plots of 1 m2 in 3 repetitions in the earing phase when 50-60% of ears appeared and were cut at a height of 5-6 cm from the soil surface. As a control, the same varieties harvested at full grain maturity (1st mowing) - 1 m2 were taken. Also, the plots that gave ears after the 1st mowing were harvested. As can be seen from Table 2, the Bijuteria Zimbrenilor variety (3.6 kg/m2) had a higher green mass yield than the control variety Kuialnic (3.4 kg/m2). The Bijuteria Zîmbrenilor variety has an adaptability level approximately the same as the control variety Kuialnic. This variety has a yield ratio between the first and second harvest of 11.1% and the control of 11% (tab 2)

Table 3. Biological and economic properties of the common wheat variety Bijuteria Zîmbrenilor (3-year average)

Indices	Unit of measurement	Kuialnic	Bijuteria Zîmbrenilor	+ - relative to the control variety
Producţia de boabe	t/ha	5,0	5,2	0,2
Masa hectolitrică	1 litru	76,0	76,0	-
Masa la 1000 boabe	Grame	41,0	38,0	-3,0
Sticlozitatea	%	68,0	69,0	1,0
Conţinutul glutenului brut	%	26,8	27,0	0,2
Conţinutul proteinei brute	%	13,8	14,1	0,3
Calitatea de panificaţie	puncte	5	5	-

On average over 3 years of study, the Bijuteria Zîmbrenilor variety in the competition field had an average yield of 5.2 t/ha compared to the Kuialnic variety - 5.0 t/ha. It has a better protein, gluten and glassiness content than the control variety Kuialnic (tab. 3). The volume of bread in the Bijuteria Zîmbrenilor variety is 646 cm3 from one hundred grams of flour, which is higher than in Moldova 11 and Moldova 5 but lower than in Moldova 614 and Kuialnic. It has a Romanian bread crust with good porosity and superior taste qualities than the other 2 varieties M 5 and Kuialnic (tab. 4).

Table 4. Analysis of the baking qualities of common winter wheat varieties

№	Variety name	Bread volume, cm3
1	Kuialnic	663
2	Moldova 11	530
3	Bijuteria Zîmbrenilor	646
4	Moldova 614	665
5	Moldova 5	544
6	Secară, Tetram	220

The Bijuteria Zîmbrenilor (M55) variety was tested at the State Commission for 2 (two) years -2023,2024 and had positive results on average per republic of 6.73 t/ha, and the control 6.62t/ha which is 1.7% more and was approved for the republic, all 3 agricultural zones. It is a variety of semi-intensive and universal ecotype. (tab 5)

Table 5. Results of testing the common winter wheat variety Bijuteria Zîmbrenilor in Zones (RM) in 2023-24 (t/ha)

Soiul	Northern area			Central area			Southern area	Average per country	
	2023	2024	Media pe 2 ani	2023	2024	Media pe 2 ani	Media pe 2 ani	Pe 2 ani, țară	% față de martor
Media mr.pe an	7,03	7,57	7,3	8,75	7,58	8,17	4,39	6,62	100,0
Bijuteria Zîmbrenilor	6,7	8,1	7,4	8,68	8,13	8,41	4,37	6,73	101,7



Fig.1 Bread volume.

According to CSTS data, the Bijuteria Zîmbrenilor (BZ) variety had an average of 2 years in the North of 7.4 t/ha, and the control - 7.3 t/ha. On average for 2 years, in the northern zone, the Bijuteria Zîmbrenilor (BZ) variety exceeded the control variety by 1.4%. Central zone, control - 8.17t/ha, BZ -8.41t/ha. South Zone, the control-4.39t/ha, and BZ-4.37t/ha almost equal. Year of Registration in the CSTS catalog- 2025 This variety is part of the Lutescens variety. The Bijuteria Zimbrenilor variety was obtained by the method of individual selection from the selected hybrid population of the Moldova 5 variety that blooms openly, more than 50%. White spike, cylindrical, without awns at the tip of the spike, short awns of 1-2 cm., length (9.0-10.5cm) and density (20-24 spikelets per 10 cm) average. Red grain, the mass of 1000 grains varies from 36-40gr, in a spikelet 2-3 grains. The length of the vegetation period is 270-274 days and it is part of the group of plants with medium precocity. The height of the plants is 60-80cm, the number of siblings per plant is 2-3. It is resistant to drought, wintering and diseases (powdery mildew, brown rust, fusarium, septoria, etc.). The productivity potential is 8.4-9.0t/ha. It has good biochemical and baking qualities. It has vigorous roots and is well adapted to changing climate conditions. Therefore, since 2025, the Bijuteria Zîmbrenilor variety has been approved in the republic, in all 3 agricultural zones.

CONCLUSIONS

In the selection field in 2023-24, we studied 920 lines of common wheat. As a result of phenological observations and biometric measurements, several lines resistant to wintering, drought, diseases and others and with higher productivity than the control variety (200g/0.6mp) were selected. They were sown in the control field and then the best ones in the competition field. As a result of the tests, one of the best varieties Bijuteria Zîmbrenilor (in terms of productivity, resistance to various abiotic and biotic factors) was submitted to the State Commission in the fall of 2022, having a productivity potential of 8.4-9.0 t/ha. It is approved in all 3 agricultural zones of the Republic of Moldova since 2025. The varieties Bijuteria Zîmbrenilor (BZ), Moldova 5, and Kuialnic had a bread volume of 646, 544, and 663 cm3. The bread of the (BZ) variety had a smooth crust and uniform porosity of the core.

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