

RESEARCH ABOUT EXPLORING OF NEW WHEAT AND RYE GERMPLASM FROM TRANSYLVANIA TO BREEDING FOR PRODUCTIVITY, IN BRAILA PLAIN CONDITIONS

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Abstract

The paper presents the results of research caring out in the years 2014 and 2015 who were tested seven local populations of Transylvania, in the climatic conditions of Braila Plain. The seed was received from the Suceava Gene Bank, with the purpose of studying their potential in terms of regional production, breeding, acclimatization and hybridization use in breeding the varieties zoned. We studied the coincidence both flowering and morphology in correlation with yields obtained. They were also made some hybridization, so that in the coming years to study characters of the F1 generation. Productions were between 3733 kg/ha (A3) and 7952 kg/ha (A7) for wheat and between 3524 kg/ha (C1) and 6807 kg/ha (C3), the best results were recorded at variants A7 (Baisoara 1) – 7952 kg/ha and A1 (Vima Mare) – 6792 kg/ha for wheat and at variants C3 (SVGB-5106) – 6807 kg/ha and 6 (SVGB-16510) – 6373 kg/ha for rye. Thousand grain mass, the highest values were recorded for variant A1 (Vima Mare) – 45.73 g wheat and C4 variant (SVGB-16116) – 36.04 g, while the highest values of hectolitre mass were recorded at variant A6 (Baisoara) – 78.2 kg/hl for wheat and at variant C4 (SVGB-16116) – 69.3 kg/ha for rye.

Key words: wheat, rye, breeding, production.

INTRODUCTION

Wheat is the most important cereal, providing food to more than 40% of the population, but is used in animal feed, due to much higher nutritional value than maize. Also, rye is increasingly appreciated bakery, especially when mixed with wheat, and lately tends to introduce new varieties of triticale, which may become an alternative wheat variety for baking (Nădășan, 2014). From the genetic standpoint, the production capacity in wheat, rye and triticale is a complex character, strongly influenced by environmental conditions and having a reduced stability. Genetic determinism of production capacity is polygenic type, effects additivity dominant super-dominant or epistasis, which involve inclusive and modificatory oligo-genes or gene amplification effect, inhibiting or reducing (Madoșă, 2005). We can say that genetic determinism form two components of production capacity, one morphological and physiological another, which are influenced by environmental conditions at a rate of 50-60%. It is therefore very important genetic stability of the

components production, the TGV characters with high stability, density and number of spikelets on the ear. A stable middle ear length shows, no. of grain from the ear, and the smallest number of genetic stability is represented by fertile tillers grain weight per ear, number of grains per ear and number of grains in the plant. All these characters were studied in the 7 local populations of wheat and seven rye local populations in the crop years 2014-2015 and 2015-2016.

In the same time, there were performed hybridizations using inter- and intra- parent material that presented coincidence on the blossoming, and seeds obtained represent biological material of F1 generation to study next year. The research objectives were: O1 - study of biological material which comes from the north and west of the country on regional adaptability to climatic conditions; O2 - Observing the flowering coincidence and choice of the parents for hybridization; O3 - Making hybridization between plants elite, chosen from each experimental variant; O4 - Evaluation of production; O5 - Keeping hybrid seeds for later study obtained hybrids.

Requirements of a new variety of wheat for conditions of our country, are: maximum production capacity - over 10 t/ha, the high protein content - over 15-17%, dry gluten content - over 10 - 12%, compared flour/bread - 1.00/1.35, active resistance to climatic stresses and phytopathogenic, intensification favourable reaction conditions (Leonte, 2010).

MATERIALS AND METHODS

The biological material used was represented by seven local populations of wheat and seven local populations of rye, purchased from Gene Bank of Suceava and 4 registered varieties of wheat, a variety of barley and two varieties of triticale, for comparison and testing by hybridization (Table 1).

Table 1. Biological material used in experience and experimental factors

Factor A		Factor B		Factor C	
A1	VIMA MARE	B1	SVGB-10264	C1	LITERA
A2	ACMARIU 1	B2	SVGB-16113	C2	BOEMA
A3	AGRIS	B3	SVGB-5106	C3	IZVOR
A4	VALEA BRADULUI 1	B4	SVGB-16116	C4	GLOSA
A5	SARMAS 1	B5	SVGB-5093	C5	CARDINAL
A6	BAISOARA	B6	SVGB-16510	C6	ODA
A7	BAISOARA 1	B7	SVGB-16770	C7	STIL

Experience occurred in crop years 2014 - 2015 and 2015 - 2016, with basic applied technologies. There were made observations about rising, density, number of fertile tillers, plant height, ear length, no. spikelets/ear, no. kernel/ear, no. kernels/spikelet, no. kernels/plant, grains mass/ear, grains weight/plant, production at standard humidity of 14%, the weight of a thousand grains and hectolitre mass.

RESULTS AND DISCUSSIONS

Number of fertile tillers per plant has shown that local populations of wheat from Transylvania have a degree of tillers much higher than varieties approved (Figure 1), the

highest number of tillers on the plant being registered at A2 variant (Acmarium 1) with four tillers/plant, followed by a solution of A3 (Agris) with three tillers/plant, and the variant A1 (Vima Mare) with two tillers/plant.

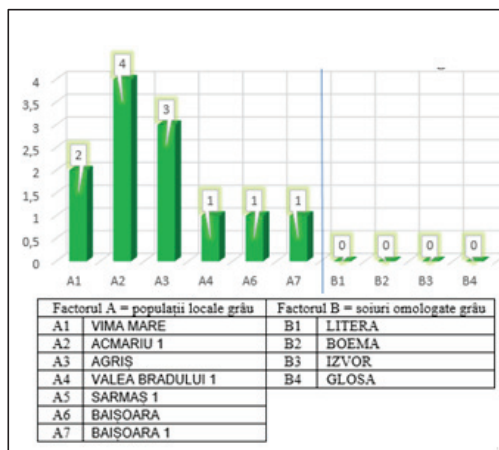


Figure 1. The graph for the average number of fertile tillers at local populations and approved varieties of winter wheat and rye

The highest average number of fertile tillers was obtained at variant C1 (SVGB- 10264) - 7 brothers/plant followed by variant C7 (SVGB-16770) - 6 tillers/plant and variant C5 (SVGB-5093) 5 tillers/plant (Figure 2).

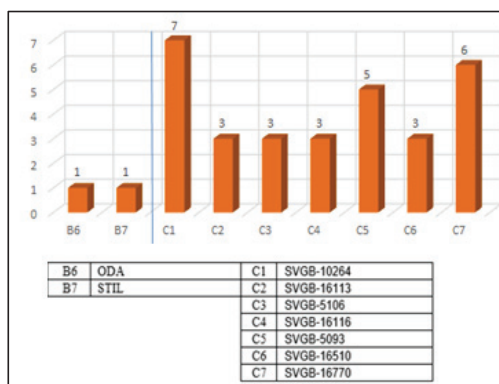


Figure 2. The graph for the average number of fertile tillers per plant at local populations of rye and triticale varieties

For the average height of the plant at winter wheat, the highest values were recorded throughout the local populations in Transylvania, compared to varieties zoned, the highest values being the variant A6 (Baisoara)

125 cm, followed in descending order by variant A7 (Baisoara 1) – 123 cm, variant A3 (Agris) – 120 cm, and variant A2 (Acmarium 1) – 117 cm (Figure 3).

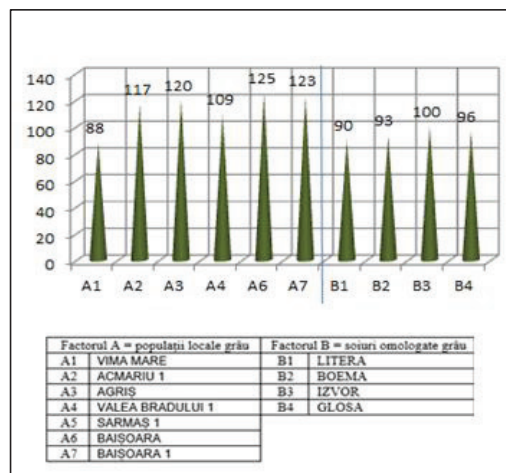


Figure 3. Height average of plant wheat at local populations compared to zoned varieties approved

Regarding the average height of the rye and triticale plants studied, the highest value was recorded in variant C1 (SVGB - 10264) - 203cm, followed in descending order by variant C3 (SVGB-5106) – 184 cm and variant C5 (SVGB-5093) - 180 cm. The variant with the lowest height was C6 (SVGB-16510) – 157 cm (Figure 4).

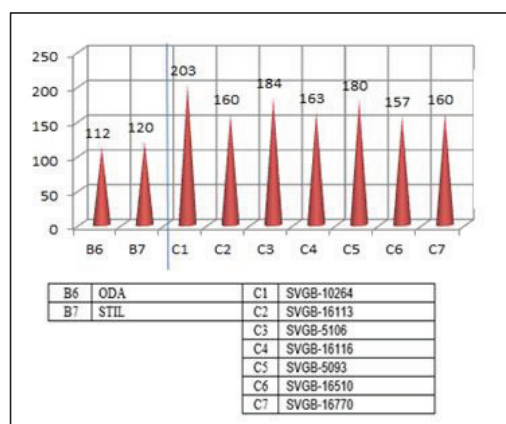


Figure 4. Average height of local plant populations of rye and triticale varieties

Determinations regarding the average length of the matures ear within local populations of

wheat in Transylvania, compared to approved zoned varieties, showed that local populations are potentially very high, the highest values being recorded of variants A2 (Acmarium 1) – 9.3 cm, followed by the A7 variant (Baisoara 1) – 9 cm and A6 (Baisoara) – 8.4 cm (Figure 5).

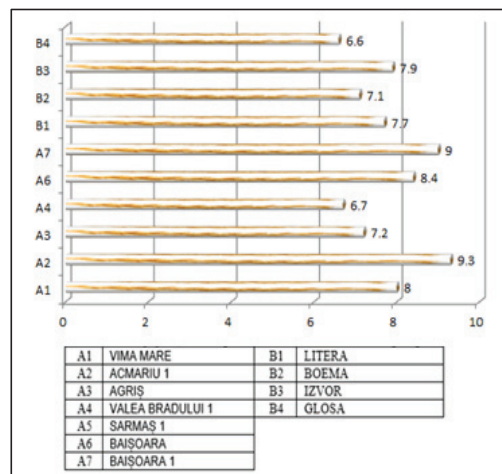


Figure 5. Average length of the ear to local populations compared with approved wheat varieties

For rye, the highest average length of the ear was registered at variant C1 (SVGB-10264) – 14 cm, followed by C7 (SVGB-16770) – 12.8 cm and C2 (SVGB-16113) – 12.3 cm (Figure 6).

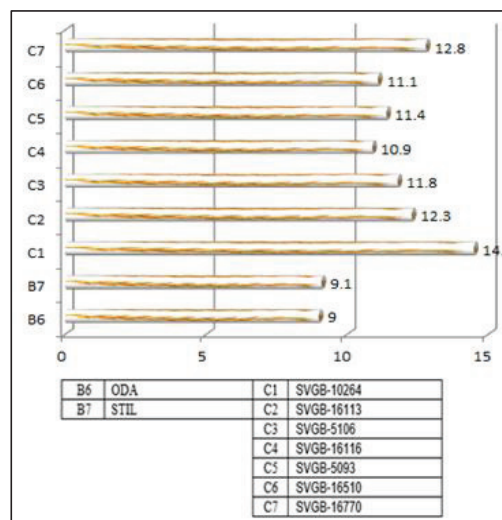


Figure 6. The graph of the average length of the ear to local populations of rye and triticale varieties

Measurements on the number of spikelets at local populations wheat studied ranged from the minimum of 14 (variant A1 - Vima Mare) and a maximum of 19 (variant A7 - Baisoara 1), while the varieties approved zoned value in the spikelets number was between 13.3 B4 (Glosa) and 14.7 (the letter B1 - Litera and B3 - Izvor) (Figure 7).

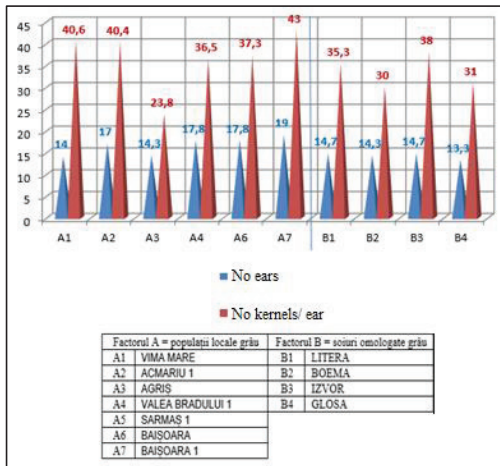


Figure 7. Average values of ear number and kernels number per ear of the local populations of wheat, compared with approved varieties zoned

In the same time, the average number of grains per ear maximum was 45.0, the solution A7 (Baisoara 1), followed in descending order of variant A1 (Vima Mare - 40.6) and A2 variant (Acmarium 1 to 40.4) while the varieties approved, the maximum on the number of grains per spikelets was obtained at B3 variant (variety Izvor – 38.0), followed in descending order of variants B1 (variety Litera - 35.3) and B4 (variety Glosa - 31).

At rye, the highest number of spikelets was recorded in variant C1 (SVGB-10264) - 35.9, followed by C2 variant (SVGB-16113) - 33.8 and C7 variant (SVGB-16770) - 31.9. The number of kernels per ear largest was recorded at C3 solution (SVGB-5106) - 57.5, followed by C7 variants (SVGB-16770) - 55.4 and C6 (SVGB - 16770) - 55 (Figure 8).

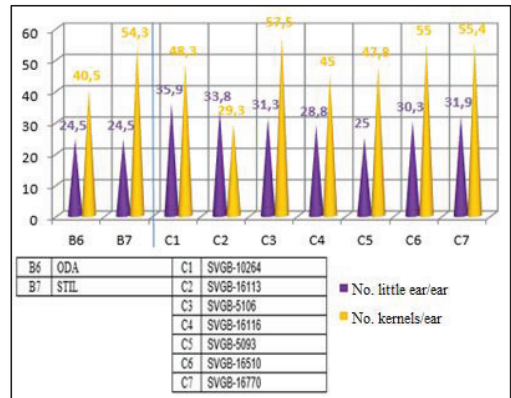


Figure 8. The number of kernels per ear

Measurements on the average number of grains per plant local populations of wheat, compared to the approved varieties, emphasized that all local wheat populations from Transylvania are more productive than approved varieties zoned due to the increased number of siblings fertile, the highest value being 202 kernels/plant to variant A2 (Acmarium 1), followed by A1 variant (Vima Mare) - 122 kernels/plant and A3 (Agris) - 95 kernels/plant (Figure 9).

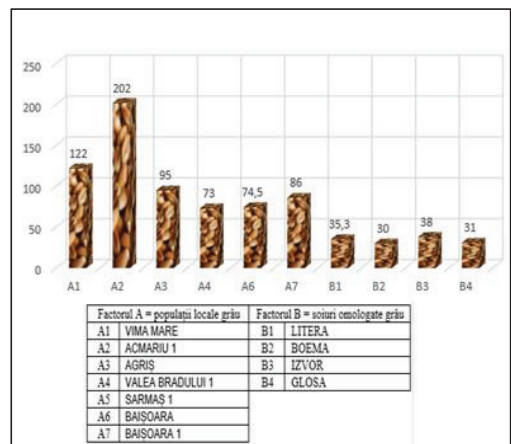


Figure 9. The graph of the average number of kernels / plant at local populations wheat from Transylvania, compared to zoned varieties approved

The highest values of the average number of kernels per plant at rye were obtained by C7 variant (SVGB - 16770) - 388 kernels/pl. and C1 (SVGB - 10264) - 386 kernels/plant (Figure 10).

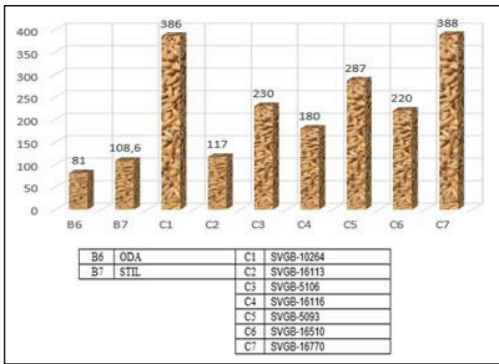


Figure 10. The graph of the average number of kernels per plant at approved varieties of triticale and rye local populations in Transylvania

Regarding the average weight of grains per ear and plant wheat the experimental variations, the highest values were obtained variants A1 (Vima Mare) – 2.202 g/spike and 6.606 g/plant followed by A2 variant (Acmarium 1) – 1.536 g/spike and 7.684 g/plant (Figure 11), while rye experimental variants, the highest values were obtained C7 variants (SVGB-16770) – 2.063 g/spike and 14.444 g/plant and C1 (SVGB-10264) - with 1.333 g/spike and 10.67 g/plant (Figure 12).

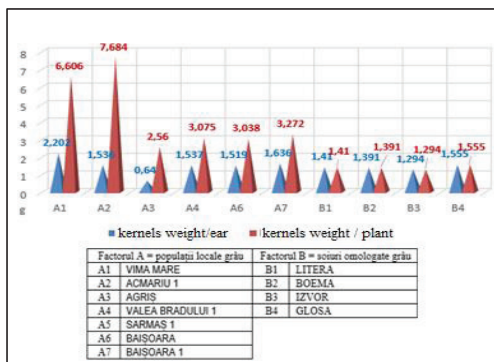


Figure 11. Graph for the average weight of kernels per ear and plant at wheat local populations from Transylvania comparative to zoned varieties

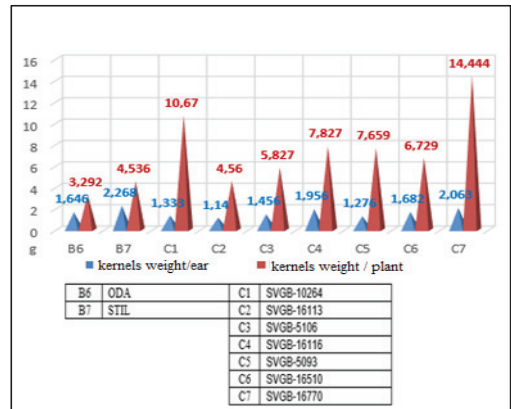


Figure 12. The graph of the average kernels mass per ear and per plant for varieties of triticale and rye local populations from Transylvania

The highest yields experimental variants of wheat, compared with the average experience were obtained variants A7 (Baisoara 1) - 7952 kg/ha and A1 (Vima Mare) - 6792 kg/ha, while varieties approved zoned, the highest production was achieved by Gloasa variety - 6989 kg/ha (Figure 13).

Experimental variants rye highest production compared with the average experience was obtained experimental variant C3 (SVGB - 5106) – 6807 kg/ha, followed by the variety of triticale Oda - 6695 kg/ha and the local population C6 (SVGB - 16510) - 6373 kg/ha (Figure 14).

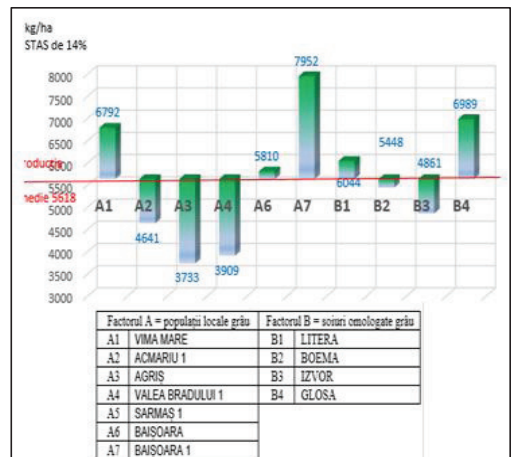


Figure 13. Average yield of wheat obtained experimental variant, compared to the zoned varieties

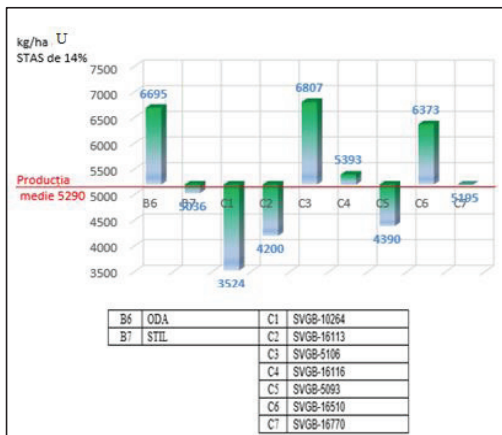


Figure 14. Average yield obtained in experimental variants of triticale and rye, compared with the average of experience



Figure 16. The graph of the average values of thousand grain weight (TGW) and hectolitre mass (HM) obtained by local populations rye from Transylvania and triticale varieties zoned

The determinations of thousand grains mass showed that local populations A1 (Vima Mare) 45.73 g and A3 (gooseberry) 43.99 g have the highest values compared to approved varieties zoned, while determinations of the hectolitre mass recorded higher values at zoned approved varieties, the highest value being the variety Glosa (82.2 kg/hl), and from local populations of wheat, the highest value of hectolitre mass was obtained by A6 variant (Baisoara) (78.2 kg/hl) (Figure 15).

For rye, the higher thousand grain weight and hectolitre mass was obtained by C4 variant (SVGB - 16116) 36.04 g, respectively 69.3 kg/hl (Figure 16).

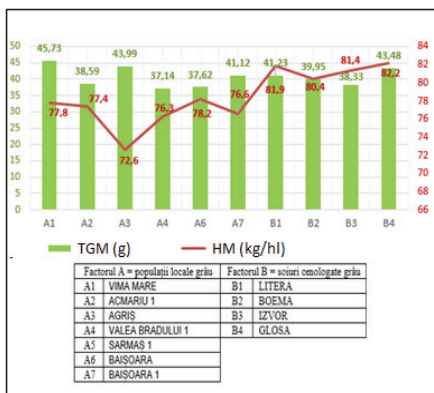


Figure 15. The graph of the average values of a thousand grain weight (TGW) and hectolitre mass (HM) of local populations wheat from Transylvania, compared to zoned varieties

CONCLUSIONS

Local populations of wheat and rye in Transylvania is a very precious biological material from genetically, standing out elements of productivity in wheat variants A7, A1, A2 and A6, and the rye variants C3, C6 and C4. The objectives of improving both the wheat and the rye is pursuing a complex, for increasing production capacity, limiting environmental conditions, with stability harvest mechanization technology adapting and improving the quality of the harvest.

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