RESEARCH ON THE IMPACT OF VARIETY ON GRAIN YIELD OF TRITICALE IN THE SPECIFIC CONDITIONS OF THE CENTRAL MOLDAVIA REGION

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Abstract

Choosing the right variety is one of the most critical factors in achieving successful agricultural yield. Varieties are selected according to several criteria, such as adaptability to climatic conditions, resistance to diseases and pests, yield, and product quality.

The paper presents the results of research to evaluate the impact of different triticale varieties on grain yield under the specific pedoclimatic conditions of the central region of Moldova. The study aimed to identify the most productive varieties, adapted to local conditions such as soil fertility, rainfall, and temperatures in this area. The research was conducted during 2023-2024, assessing indicators such as yield and resistance to biotic and abiotic stress factors.

During the analyzed period, the average grain yields for triticale ranged from 4767 $kg \cdot ha^{-1}$ (Negoiu) to 8390 $kg \cdot ha^{-1}$ (17241T1) in the fertilized system, and from 4592 $kg \cdot ha^{-1}$ (Negoiu) to 7358 $kg \cdot ha^{-1}$ (16026T1).

The results contribute to optimizing the selection of triticale varieties, providing valuable recommendations for increasing agricultural production efficiency in the central region of Moldova.

Keywords: triticale, grain yield, varietals impact

In recent years, agriculture has been facing soil drought, which worsens yearly. The triticale species, due to its strong root system and tolerance to abiotic stresses inherited from rye (Niedziela *et al*, 2014), can thrive on sandy and low-fertility soils, in dry and marginal conditions, giving it an increasing advantage over wheat. Triticale shows superior drought resistance compared to barley, wheat, and oats. Additionally, triticale adapts well to slightly acidic soils, with salinity and toxic aluminum ion content.

According to Bîlteanu, Gh. and collaborators (1988), high-yielding varieties of cereal grains have a medium tillering capacity. Plants shouldn't form a large number of tillers, as not all will reach maturity to produce grains, thereby unnecessarily consuming mineral resources and water. During periods of rainfall deficit, these tillers can become harmful to the main plant. To achieve a high number of ears per unit area and, consequently, high yields, it is preferable to have more plants with reduced tillering, rather than fewer plants with a large number of tillers.

Among all cereals available to farmers, triticale adapts best to soils with high pH (alkaline soils) or slightly lower pH (acidic soils), with water deficit or surplus, regardless of soil texture, being able to grow well on sodic soils and tolerate soils rich in boron. However, wet weather conditions close to harvest maturity can cause pre-harvest sprouting issues for triticale (Arseniuk E. *et al*, 2015).

Many scientists, along with farmers and growers from countries with advanced agriculture, have repeatedly demonstrated over the past decades that high agricultural yield is largely influenced by the quality of seeds used for planting production fields. The same view is supported by researchers and farmers in our country who work in this field. This is because high-quality seeds have superior genetic and biological value, varietal and physical purity, a high germination index, TKW (Thousand Kernel Weight), and test weight, as well as health and vigor, all of which contribute to increasing agricultural production (Păcurar I. *et al*, 2007).

In the second half of the last century (1950s-1970s), numerous researchers began studying genetic variability in populations of self-pollinating and cross-pollinating plants. Thus, from the definition of a variety in self-pollinating plants, it was determined that it is "a population

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composed of a mixture of homozygous lines" (Briggs *et al*, 1967). Research conducted in this field led to the formulation of a widely accepted concept, according to which a variety is considered a population, regardless of whether it belongs to a self-pollinating or cross-pollinating plant species (Ceapoiu N., 1976).

MATERIAL AND METHOD

The research was conducted during the 2023/2024 season and aimed to evaluate the performance of various Romanian triticale genotypes under conditions in the Moldova region.

At A.R.D.S. Secuieni, two mono-factorial experiments were set up: one unfertilized and one fertilized with NPK 18:46:0 in the autumn and ammonium nitrate in the spring. The autumn doses of NPK applied were 36 kg/ha of N and 92 kg/ha of P_2O_5, while in the spring, an additional 80 kg/ha of N was administered.

The soil used for the research is a typical cambic chernozem, characterized as being well-supplied with phosphorus (P_2O_5 - 39 ppm), calcium, and magnesium; moderately supplied with active humus (2.3%) and nitrogen; and poorly supplied with potassium (K_2O - 161 ppm), with a slightly acidic pH of 6.29% (Leonte *et al*, 2021).

The experimental layout was a randomized block design with 3 replications. The data obtained were analyzed using the analysis of variance method (Leonte C. and Simioniuc V., 2018).

The climatic conditions recorded during the growing season of the triticale species showed significant deviations compared to the multiannual average, with the growing season being characterized as hot and very dry.

The temperatures recorded from October 1, 2023, to July 31, 2024, deviated from the multiannual average by 3.1°C (Table 1). The average monthly deviations during the growing season of triticale ranged between 0.4°C, recorded in May, and 7.7°C, recorded in February (Table 1).

Table 1

Temperatures (ºC) and multiannual average (1962-2022) recorded at A.R.D.S. Secuieni, in the 2023/2024 year

Month	X	XI	XII	I	II	III	IV	V	VI	VII	Average
2023/2024	13	6.0	-0.9	-1.8	5.8	6.4	13	16	22	25	10.4
MM (1962-2023)	9.2	3.6	-1.5	-3.7	-1.9	2.8	9.6	15.4	18.9	20.4	7.3
Deviation	3.9	2.4	0.6	1.9	7.7	3.6	3.6	0.4	3.0	4.1	3.1

Rainfall recorded during the growing season of the cereals showed a deviation of -135.2 mm compared to the multiannual average of 429.6 mm for the same period (Table 2). The recorded monthly deviations ranged from an average of 23.9 mm in November to -61.6 mm in July (Table 2).

Table 2

Rainfall (mm) and multiannual average (1962-2022) recorded at A.R.D.S. Secuieni, in the 2023/2024 year

Month	X	XI	XII	I	II	III	IV	V	VI	VII	Sum
2023/2024	8.8	51.6	2.8	8.4	9.4	40.6	33.4	36.0	84.4	19.0	294.4
MM (1962-2023)	36.9	27.7	25.4	19.6	19.2	26.3	44.9	64.3	84.7	80.6	429.6
Deviation	-28.1	23.9	-22.6	-11.2	-9.8	14.3	-11.5	-28.3	-0.3	-61.6	-135.2

Based on the information presented, it can be stated that the research was conducted in the context of increasingly frequent climate changes, with average monthly temperatures exceeding the multiannual average through a decline in precipitation.

RESULTS AND DISCUSSIONS

This research focused on analyzing the factors influencing the productivity of triticale and identifying methods for optimizing production. Various parameters were considered, including seed quality, agro-climatic conditions, agricultural practices, and cultivation technologies. The study analyzed 25 native triticale cultivars to assess their performance under different growth and development conditions.

The research results provide an overview of how these factors contribute to increasing grain yield and open new perspectives for improving agricultural output in the future.

The number of grains per ear and the weight of grains per ear are important indicators of cultivar productivity.

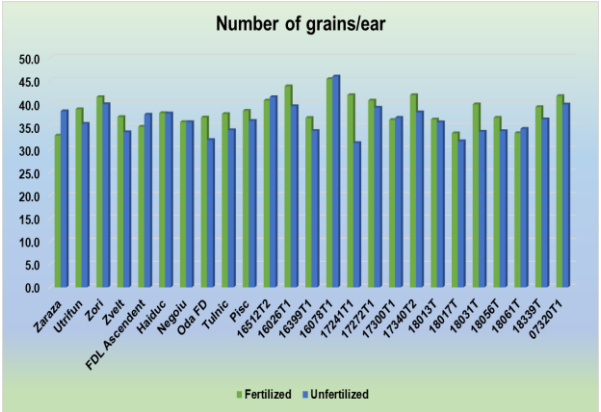

Figure 1. **The number of grains/ears registered at ARDS Secuieni in the period 2023/2024**

In the research conducted at SCDA Secuieni, the number of grains per ear in triticale ranged from 33.0 (Zaraza) to 45.3 (16078T1) in the fertilized system, and from 31.8 (18017T) to 41.4 (16512T2) in the unfertilized system (Figure 1).

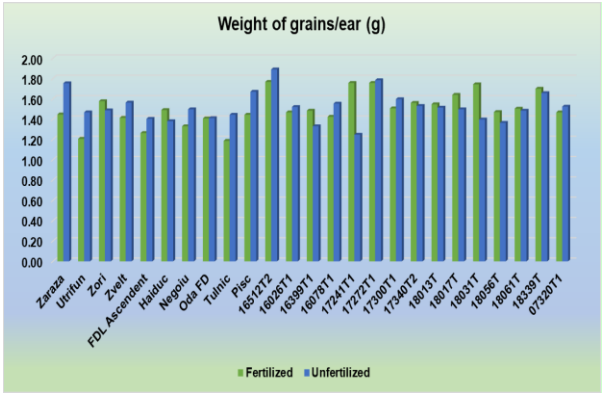

Figure 2. **The weight of grains/ear registered at ARDS Secuieni in the period 2023/2024**

Regarding the grain weight per ear, the average values ranged from 1.21 g for the Utrifun variety to 1.77 g for the 16512T2 line in the fertilized system. In the unfertilized variants, the grain weight per ear ranged between 1.25 g for the 17241T1 line and 1.78 g for the 17272T1 line (Figure 2).

The yields obtained from the studied triticale genotypes were influenced by the applied fertilization.

In the fertilized system, the average yields ranged from 4,767 kg· ha^{-1}, recorded in the variants sown with the Negoiu variety, to 8,390 kg· ha^{-1}, recorded in the variants sown with the 17241T1 line (Figure 3).

The Haiduc, Negoi, and Pisc varieties achieved average yields that, when analyzed statistically, were interpreted as highly significantly negative, with yield differences compared to the control (the experiment's average) ranging between 71% and 82% (Figure 3).

Among the 25 triticale genotypes studied, only the 17241T1 line achieved very statistically significant production increases, with an average yield of 8,390 kg· ha^{-1}, while the Zvelt variety registered statistically distinct significant increases, with an average yield of 7,933 kg · ha^{-1} (Figure 3).

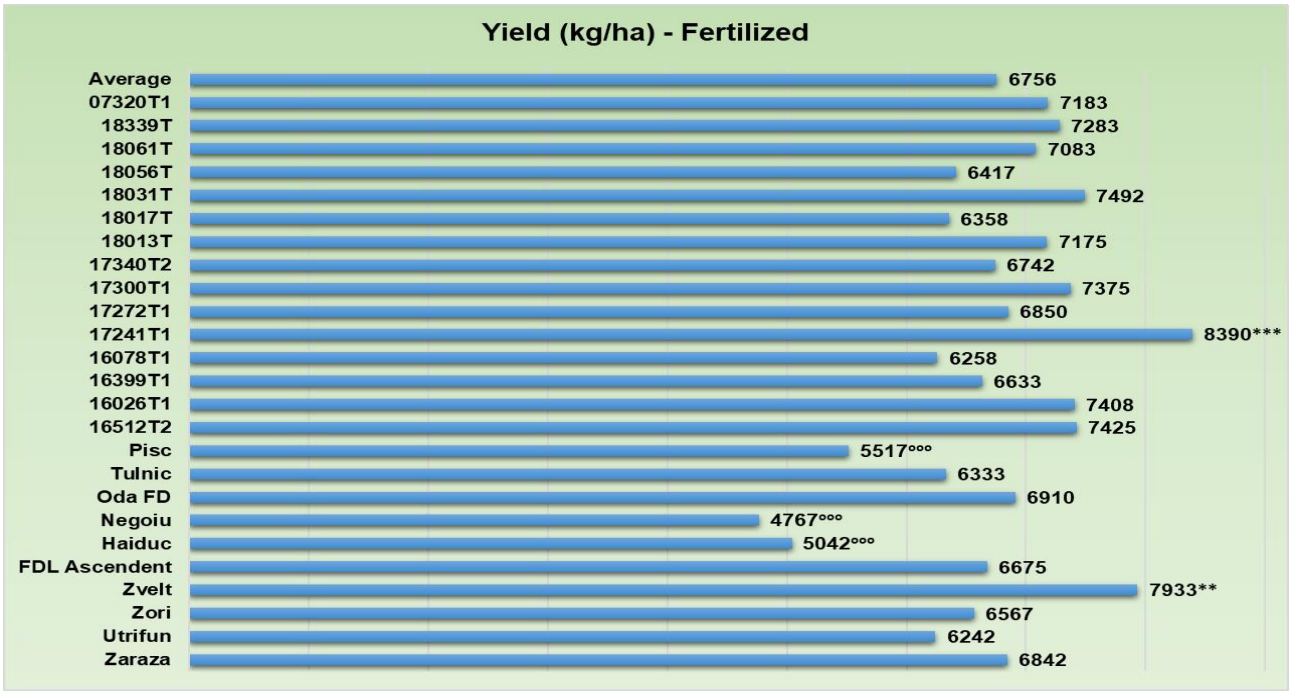

Figure 3. **The average productions obtained by the studied triticale genotypes in the fertilized system**

In the unfertilized system, the average yields ranged from 4,592 kg/ha, recorded in the variants sown with the Negoiu variety, to 7,358 kg/ha, recorded in the variants sown with the 16026T1 line (Figure 4).

Statistically significant yield increases were obtained in the variants sown with the Zvelt variety and the lines 16026T1, 17241T1, and 17272T1, which achieved yields ranging from 7,200 kg/ha (17272T1) to 7,358 kg/ha (16026T1) (Figure 4).

Similar to the fertilized system, in the unfertilized system, the Haiduc, Negoiu, and Pisc varieties achieved statistically highly significant negative yield increases compared to the control, while the Oda FD variety showed statistically distinct negative increases in yield compared to the control (Figure 3).

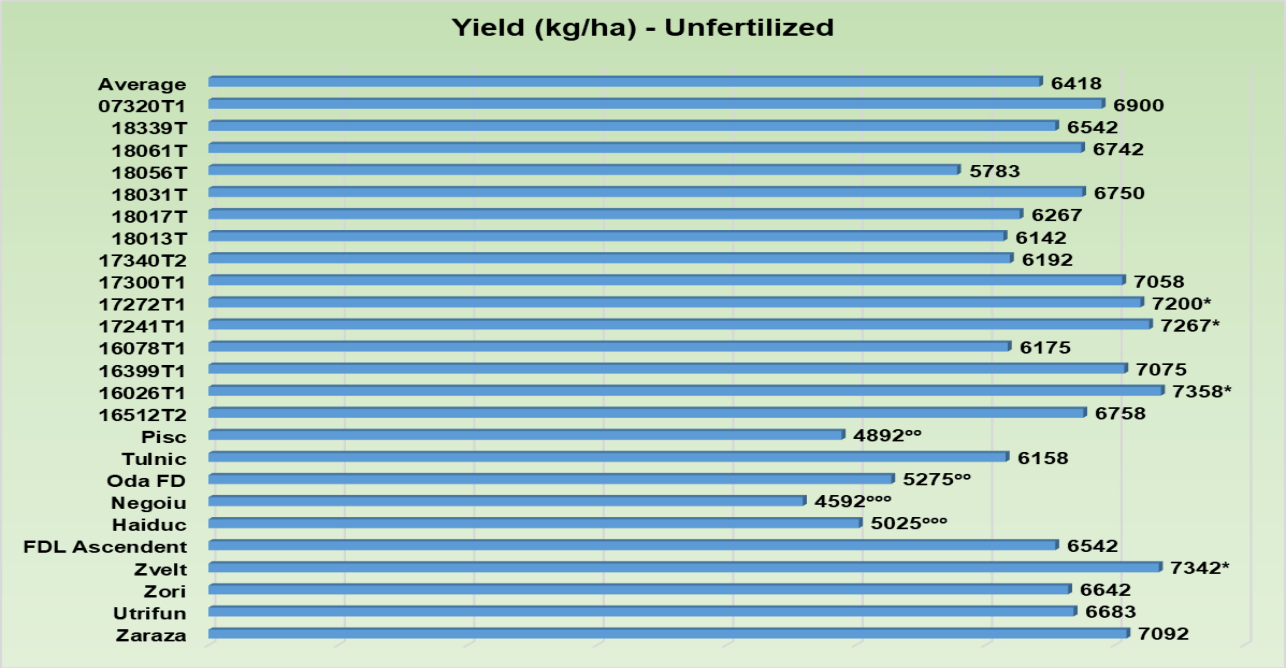

Figure 4. **The average productions obtained by the studied triticale genotypes in the unfertilized syste**

CONCLUSIONS

From the presented information, it follows that the yield of grains in triticale is influenced both by climatic conditions and by the variety.

The average temperature during the growing period of triticale showed a deviation of 3.1°C from the multiyear average, while the rainfall regime recorded a deviation of -135.2 mm from the multiyear average.

In the fertilized system, the number of grains per ear ranged from 33.0 (Zaraza) to 45.3 (16078T1), and from 31.8 (18017T) to 41.4 (16512T2) in the unfertilized system.

The average grain weight per ear varied from 1.21 g for the Utrifun variety to 1.77 g for the 16512T2 line in the fertilized system. In the unfertilized variants, the grain weight per ear ranged from 1.25 g for the 17241T1 line to 1.78 g for the 17272T1 line.

The yields ranged from an average of 4,767 kg/ha for the Negoiu variety to 8,390 kg/ha for the 17241T1 line in the fertilized system. In the unfertilized system, the average grain yields ranged from 4,592 kg/ha for the Negoiu variety to 7,358 kg/ha for the 16026T1 line.

Based on the information presented, it can be stated that the research was conducted in the context of increasingly frequent climate changes, with average monthly temperatures exceeding the multiannual average through a decline in precipitation.

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