GRAIN YIELD OF SOME TRITICALE GENOTYPES IN THE PEDOCLIMATIC CONDITIONS OF ARDS SIMNIC

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Abstract

The increase in temperatures and the frequency of droughts are the most visible aspects of climate change, aspects that are felt in all agricultural crops through yield losses. Among cereal crops, triticale is recognized as a crop with high adaptability to climate and soil conditions. This paper presents the results obtained for ten genotypes (eight varieties and two lines) of Romanian triticale in the pedoclimatic conditions of A.R.D.S. Simnic, in terms of grain yield, plant height, 1000-grain weight and test weight. The analysis of the data obtained showed a different behavior of the tested genotypes. The triticale line 14346T2-01 (9528 kg/ha), followed by the line 14187T1-1 (9172 kg/ha) and the varieties Cascador (9016 kg/ha), Vifor (8815 kg/ha) and Utrifun (8800 kg/ha) achieved the best yields. These genotypes showed good adaptability, which recommends them for the pedoclimatic conditions in the area of influence of the ARDS Simnic.
Key words**: **line, test weight, triticale, varieties

INTRODUCTION

Triticale (× *Triticosecale* Wittmack) is a cereal obtained from the hybridization of wheat (*Triticum spp*.) with rye (*Secale cereale*). It has a dual use due to its potential for both high-quality cereal production and forage production. The superior nutritional value of triticale grains is due to the high content of proteins, essential amino acids, carbohydrates, macroelements, vitamins, etc. (Bonea, 2024).

Also, previous studies have shown that Triticale is a crop with high potential for increasing yield per unit area, especially in areas less favourable to other cereals, as a result of its stress tolerance and superior water use efficiency (Oettler, 2005; Pintilie et al., 2023).

Current climate change, which already poses a significant challenge to cereal producers, is expected to intensify in the future. Temperature and precipitation play a significant role in plant development and especially in the allocation of nutrients to grains, thus highlighting the need for rigorous selection of genotypes based on specific soil and climatic conditions (Cui et al., 2025).

Dolj County has a temperate-continental climate with Mediterranean influences specific to the plain area. The average annual temperature is between 11°C and 12°C and the annual precipitation amounts vary between 530 - 600 mm (Rădutoiu et al., 2024; Boruz, 2024).

In this area, drought and scorching are frequent, leading to significant yield losses (Bonea and Urechean, 2019; Bălan, 2023; Bălan, 2024; Dunăreanu and Bonea, 2024).

The development and identification of new cultivars more valuable than those existing in the crop is one of the characteristic features of modern agriculture, because the cultivar directly participates in increasing production, using other agro-

technical measures more efficiently (Meluca et al., 2016).

In this context, this paper presents the grain yields and several productivity parameters of ten Romanian triticale genotypes, tested in pedoclimatic conditions of A.R.D.S. Simnic, Dolj County.

MATERIALS AND METHODS

The biological material studied in this study was represented by 10 Romanian triticale genotypes (8 varieties and 2 lines).

The trial was carried out in the 2021-2022 growing season in the research field of S.C.D.A. (A.R.D.S.) Simnic under rainfall conditions.

In order to compare the yield performances of the 10 genotypes, the trial was designed in a completely randomized block design with three replications.

Fertilization was done in autumn with 200 kg/ha - NPK 20.20.0 and in spring with ammonium nitrate 200 kg/ha.

Weed control was carried out with Mustang 0.5 l/ha and Axial 0.75 l/ha, and pest control was done with Decis Expert 0.15 l/ha.

At maturity stage, grain yield (to 14% moisture), plant height, 1000-grain weight and test weight were determined.

Rainfall use efficiency (RUE) was calculated by dividing the grain yield on the sum of rainfalls during crop growth.

Test weight was determined on the grain samples by automatic instrument Infratec Grain Analyzer 1225.

The experimental data for grain yield were processed statistically by analysis of variance (Săulescu and Săulescu, 1967), and significance of yield differences was established by the Duncan test. The 2021/2022 growing season was characterized as dry from December to February and May. From a thermal point of view, it is warm in winter and the first month of summer and close to normal in autumn and spring.

RESULTS AND DISCUSSIONS

Grain yield and Rainfall use efficiency

The ANOVA results for grain yield showed significant differences between genotypes. Triticale line 14346T2-01 (9528 kg/ha) followed by line 14187T1-1 (9172 kg/ha) and the varieties Cascador (9016 kg/ha), Vifor (8815 kg/ha) and Utrifun (8800 kg/ha), recorded the highest yields, compared to the rest of the genotypes studied. The lowest yield was recorded for variety TF2 (6321 kg/ha) – Figure 1.

Therefore, in this growing season, the yields obtained by the studied genotypes were good, our results being in line with those previously reported by Wójcik-Gront and Studnicki (2021), Lalevic et al. (2022), who state that, in general, starting from May, triticale prefers drier conditions, with higher solar radiation, to obtain higher yields.

Rainfall use efficiency (RUE), especially in semi-arid and arid areas, is closely linked to rainfall use efficiency, therefore, assessing RUE is essential for addressing the challenges of climate change and food security (Ochieng et al., 2023).

RUE provides a useful criterion for breeders and farmers to compare the performance of cultivars under rain fed conditions.

In our study, RUE values ranged from 15.7 kg/ha/mm to 23.7 kg/ha/mm. In addition to the highest yield, the triticale line 14346T2-01 also had the highest RUE value (23.7 kg/ha/mm), followed by the line 14346T2-01 (22.8 kg/ha/mm) and the varieties: Cascador (22.8 kg/ha/mm), Vifor and Utrifun (21.9 kg/ha/mm) – Figure 2.

Plant height

The results obtained regarding plant height showed that the Plai and Titan varieties were the tallest (117 cm). The rest of the genotypes presented heights ranging between 80 cm (Vultur) and 109 cm (line 14187T1-1) - Figure 3.

According to Yakymchuk et al. (2022), in Ukraine, for triticale of universal use (food or fodder), at the current stage of selection the aim is to obtain genotypes with medium height, with good baking qualities and increased foliage, which at the same time exhibit a complex resistance to adverse factors.

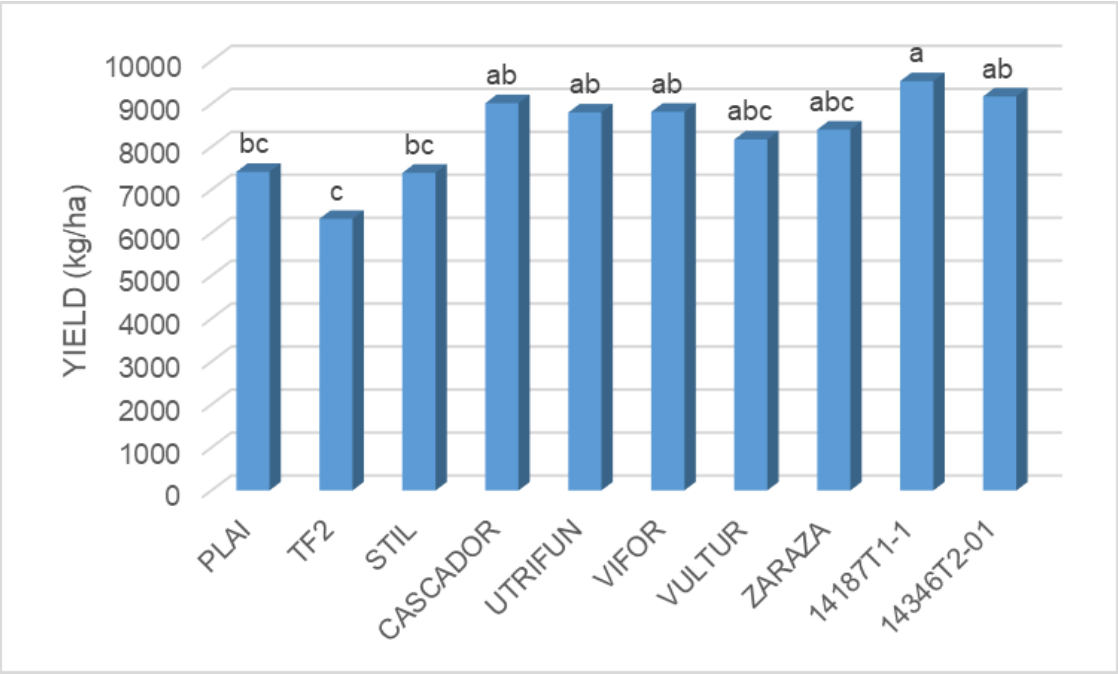

Figure 1. Grain yield for the triticale genotypes studied (ANOVA)

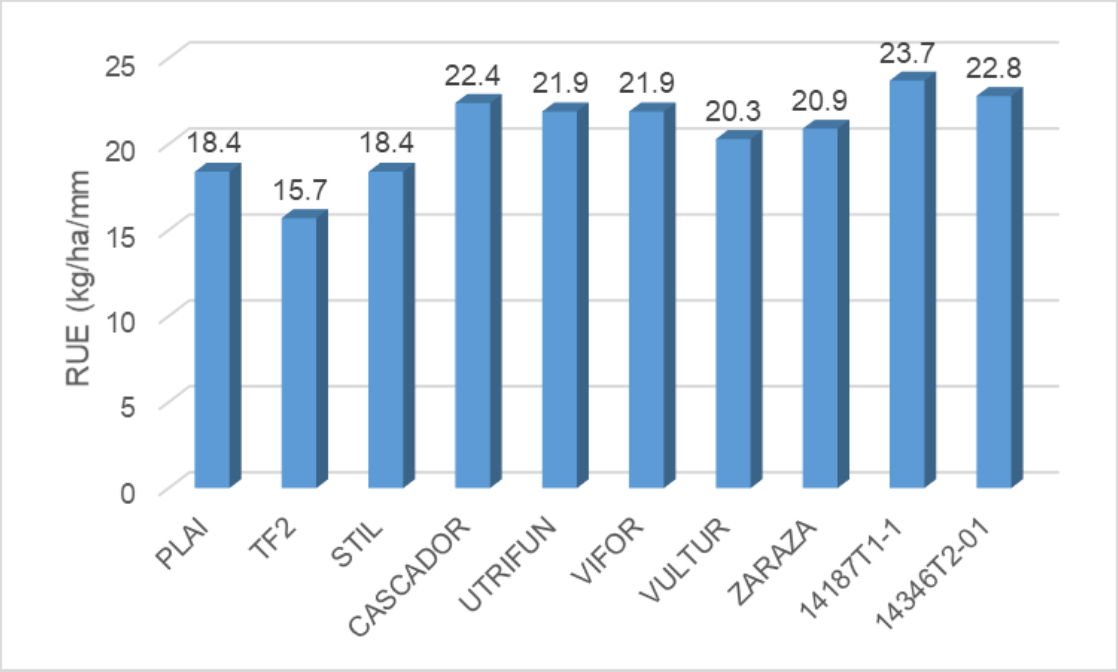

Figure 2. RUE for the triticale genotypes studied

1000-grain weight

The 1000-grain weight is a direct component of grain yield that depends primarily on the characteristics of the genotype, but can change under the influence of environmental factors. It indicates the size of the grains and is an important criterion in triticale breeding (Dekic et al., 2018).

In our study, for TGW, the highest value was recorded in the Vultur variety (51 g), while the lowest value was recorded in the TF2 variety (44 g) - Figure 4.

Test weight

According to Blakeney et al. (2009), test weight reflects the extent of grain-filling and the potential for flour yield.

Test weight depends on many factors, such as grain shape, degree of filling,

chemical composition, moisture and impurity content (Dekic et al., 2018).
In our study, among TW, the highest value was recorded for the Zaraza variety (75 kg/hl), while the lowest value was recorded for the Vultur variety (68 kg/hl) – Figure 5.

According to the wheat grading plan from CNGSC (2017) the Zaraza variety falls into Grade 2 (HM 75) and the other 2 genotypes (Utrifun and 14187T1-1), fall into Grade 3 (HM <75,>72).

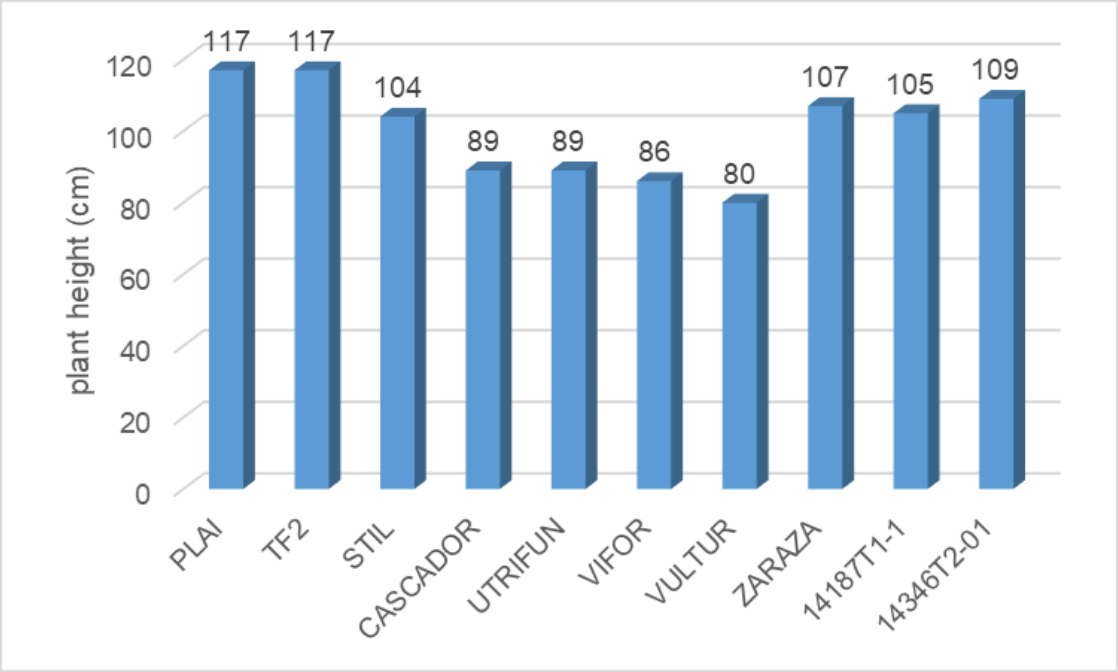

Figure 3. Plant height for the triticale genotypes studied

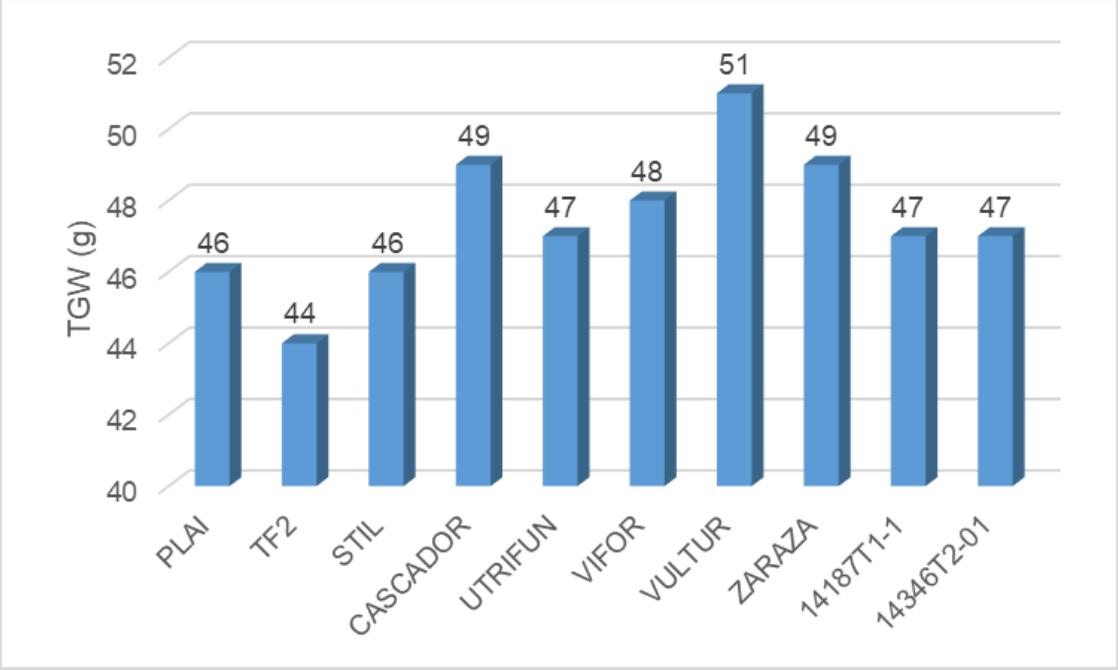

Figure 4. 1000-grain weight (TGW) for the triticale genotypes studied

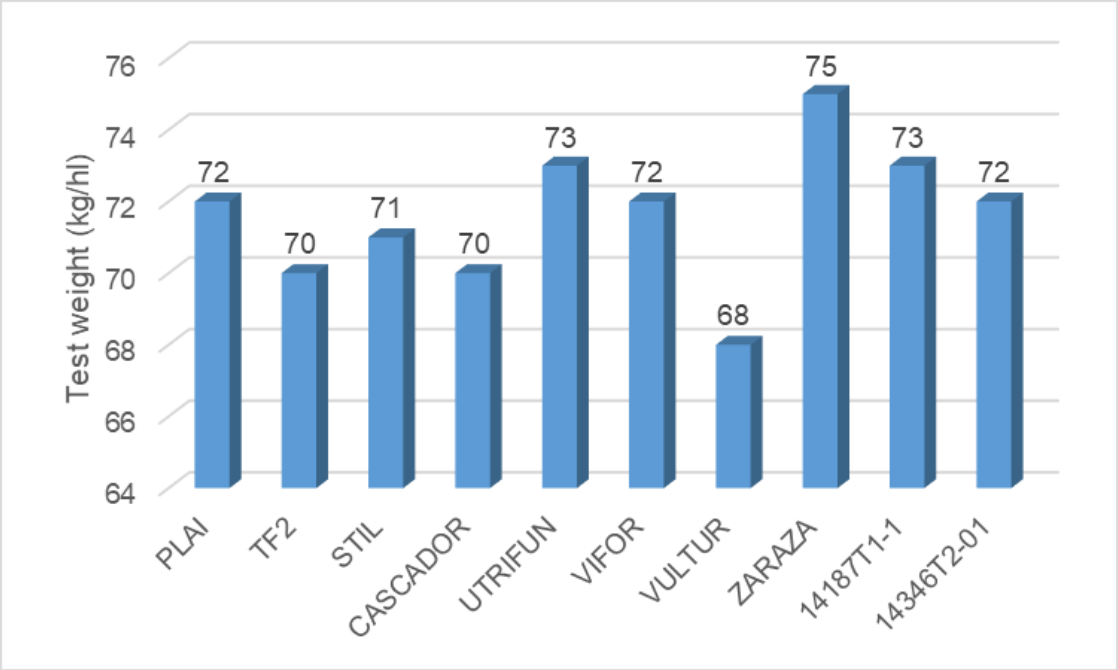

Figure 5. Test weight for the triticale genotypes studied

CONCLUSIONS

This study evaluated the response to the pedoclimatic conditions of ARDS Simnic and the yield of 10 triticale genotypes. According to the results of the analysis of variance, significant differences were found between the genotypes.

The best grain yield results were recorded for the triticale line 14346T2-01 (9528 kg/ha), followed by the line 14187T1-1 (9172 kg/ha) and the varieties: Cascador (9016 kg/ha), Vifor (8815 kg/ha) and Utrifun (8800 kg/ha). These genotypes showed good adaptability, which recommends them for the pedoclimatic conditions in the area of influence of ARDS Simnic.

All tested genotypes recorded good values of the 1000-grain weight (44 - 51 g).

For the test weight, the values ranged between 68 kg/hl (Vultur) and 75 kg/hl (Zaraza).

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