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# RESEARCH ON THE ADAPTABILITY AND PERFORMANCE OF SEVERAL WHEAT VARIETIES IN A NO-TILL FARMING SYSTEM UNDER RAINFED CONDITIONS IN THE MERENI AREA, CONSTANȚA COUNTY (2021–2024)

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**Abstract**: In the context of accelerated climate change, characterized by rising average temperatures and decreasing water resources, modern agriculture is compelled to adopt sustainable and adaptive technologies. This study evaluates the agronomic performance of three winter wheat varieties (Avenue, Glosa, and Artico) cultivated under a no-till system, in rainfed conditions, in the semi-arid area of Mereni, Constanța County, during the 2021–2024 period.The research integrated relevant climatic data (precipitation, average temperature, number of hot days) with agronomic parameters (plant density at emergence and harvest, number of grains per spike, thousand-kernel weight – TKW, and theoretical yield). The results highlighted the superior performance of the Avenue variety, with consistent yields and high adaptability to abiotic stress. Glosa showed good stability under moderate conditions, while Artico, although promoted as drought-tolerant, exhibited a significant decline in performance during dry years.Regression and correlation analyses revealed a negative relationship between temperature and TKW, as well as between the number of hot days and yield per hectare. The no-till technology played an important compensatory role, supporting plant density and yield maintenance under unfavorable climatic conditions. The study confirms the importance of selecting adapted varieties and implementing conservation technologies to sustainably maintain production in areas at high risk of aridification.

## • Introduction

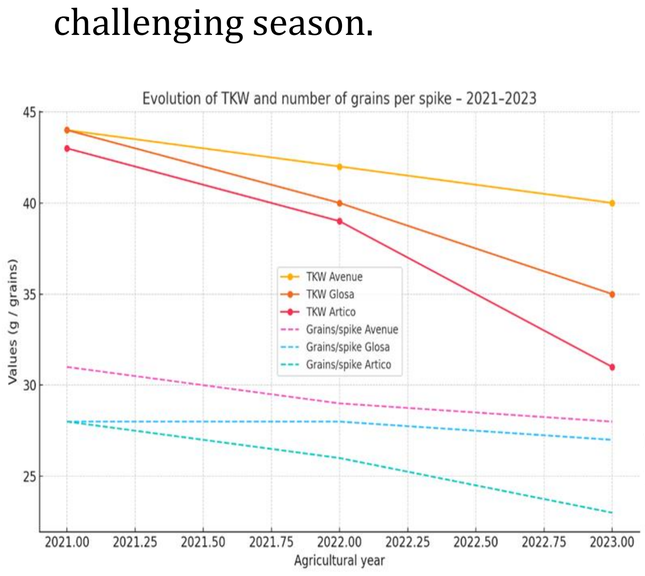
Climate change is rapidly transforming the agricultural potential of temperate regions like Dobrogea, pushing them toward semi-arid conditions marked by increasing average temperatures, declining precipitation, and more frequent extreme weather events. Under these circumstances, maintaining stable wheat yields becomes increasingly difficult, especially in rainfed systems. No-till farming, by minimizing soil disturbance and preserving soil moisture, offers a potential solution for sustaining production in such vulnerable areas. The current study evaluates three wheat varieties: Avenue, Glosa, and Artico, under a no-till, rainfed regime in the commune of Mereni, Constanța County. It aims to analyze the interplay between varietal genetics, local climate conditions, and conservation technology over three agricultural years (2021–2024), focusing on yield, density, grain quality, and responsiveness to climatic stressors.

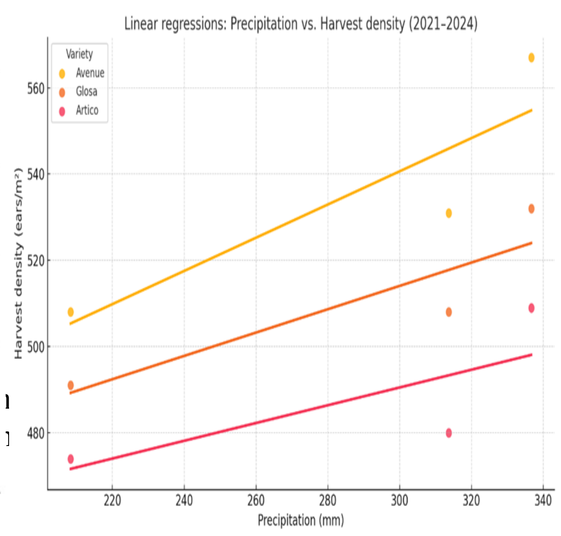
## • Material and method

The trial was conducted on a no-till farm in Mereni, southeastern Romania, using uniform technological inputs across three winter wheat varieties cultivated under rainfed conditions: Avenue (high-yielding and stress-tolerant), Glosa (Romanian, stable under moderate stress), and Artico (marketed as drought-tolerant). Sowing was performed in October each year using double rows at 19 cm spacing and 322 viable seeds/m². The same crop rotation, fertilization, and phytosanitary protocols were applied to ensure comparability. Plant emergence and harvest densities were measured in standardized field plots. Thousand-kernel weight (TKW), number of grains per spike, and test weight were analyzed in laboratory conditions. Yield per hectare was calculated from field data. Climatic data: including rainfall, temperature, and number of hot days, were collected and correlated with agronomic performance. The statistical evaluation included ANOVA for assessing varietal differences, Pearson correlation for climate, trait relationships, and linear regression to explore the influence of temperature and drought on key indicators like TKW and yield.

## • Results and discussions

All three varieties exhibited distinct responses to annual climatic variability. The 2021–2022 season was relatively favorable, with evenly distributed rainfall and moderate temperatures, resulting in peak yields: Avenue reached 7,733 kg/ha, Glosa 6,554 kg/ha, and Artico 6,128 kg/ha. In contrast, the 2023–2024 season was severely dry and hot (208.3 mm rainfall, 18 hot days), and yields dropped sharply, especially for Artico, which recorded only 3,379 kg/ha. Regression analysis confirmed strong negative relationships between the number of hot days and yield, particularly for Glosa and Artico (r = –1.00), while Avenue showed greater resilience (r = –0.94). TKW followed a similar trend, with higher temperatures correlating negatively with grain weight. The ANOVA results confirmed statistically significant differences ($p < 0.05$) in yield and grain quality across varieties. Avenue consistently maintained the highest plant density, TKW, and test weight, while Glosa displayed moderate stability, and Artico proved sensitive to extreme drought. The no-till system itself had a stabilizing effect across all years, helping conserve soil moisture and reduce productivity losses, even in the most challenging season.




The study confirms that no-till technology, when paired with well-adapted varieties, can sustain wheat production under rainfed conditions in arid and semi-arid regions like Dobrogea. Among the tested varieties, Avenue demonstrated superior adaptability, yield potential, and stability across climatic scenarios. Glosa, a locally bred variety, showed moderate resilience but was more vulnerable to heat-induced reductions in TKW. Artico, despite being positioned as drought-tolerant, performed inconsistently, with significant declines in both density and grain quality in dry years. Statistical analysis validated these differences and highlighted the critical role of hot days in limiting yield. The no-till system emerged as an effective mitigation strategy, maintaining viable yields and grain quality even in seasons of water scarcity and heat stress.