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YIELD OF WHEAT (*Triticum aestivum* L.) DEPENDING ON THE CULTIVARS

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Abstract

This experiment has analyzed the following biometric and qualitative parameters: the number of cobs per m², plant height, number of grains per cob, cob weight, grain weight per cob, yield, yield per hectare, moisture, hectoliter weight, proteins, gluten, sediment, energy, and gluten elasticity.

The study included four wheat cultivars: Moisson, Apache, Amazon, and Orovçanka. The experiment was set up according to a randomized block design with three replications in the 2023 vegetative year. After biometric measurements, the data were statistically processed to draw conclusions and provide recommendations for the most suitable cultivar.

Following the ANOVA test, the post-hoc Tukey HSD analysis highlighted statistically significant differences ($p < 0.05$) in yield among the wheat cultivars. The results showed that the Moisson cultivar had the highest yield compared to all other cultivars. The differences between Moisson and Apache ($p = .000$), Amazon ($p = .004$), and Orovçanka ($p = .000$) were statistically significant, reflecting the superior performance of this cultivar for this agronomic indicator. Additionally, Amazon exhibited a significantly higher yield than Orovçanka ($p = .000$) and Apache ($p = .001$). The Orovçanka cultivar ranked last in terms of yield, with significantly lower values compared to all other cultivars.

These results suggest that cultivar selection considerably impacts production levels (kg/ha) and that using cultivars with high genetic potential, such as Moisson and Amazon, may significantly contribute to increased wheat productivity under similar agroecological conditions.

Keywords: testing, cultivar, variant, nutrition, indicators, yield.

1. Introduction

Wheat (Triticum vulgare) is one of the most widely cultivated cereals in the world. Agricultural production is one of the main pillars of the global economy, accounting for 3% of the world's GDP and nearly 30% of global employment. The ten countries with the highest wheat production are: China (134.3 million tons), India (107.6 million tons), Russia (85.9 million tons), the USA (49.7 million tons), Canada (35.2 million tons), France (30.1 million tons), Pakistan (25.2 million tons), Ukraine (24.9 million tons), Germany (22.2 million tons), and Turkey (20.5 million tons). Wheat is used to produce over 350 food items that are widely consumed worldwide. The creation and testing of new cultivars in different ecological zones has contributed to the increase in global wheat yield.

In North Macedonia, wheat is also a staple crop in the country's agriculture, cultivated on 80,000 hectares with an average yield of 3,500 kg/ha, covering over 40% of the population's needs for this crop.

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2. Materials and Methods

The study was conducted during the 2023 growing season. Four wheat cultivars were included in this study: Moisson, Apache, Amazon, and Orovčanka. As indicated by their names, these cultivars originate from different regions and have diverse genetic backgrounds. Testing is essential to determine their adaptability to various climatic and soil conditions and to select the best-performing cultivar for specific areas.
The experiment was set up using a randomized block design with four cultivars and three replications. Biometric measurements and yield indicators were recorded according to standard methodology. The analyzed parameter was the yield depending on the cultivar.
The objective of this research was to evaluate the yield per unit area depending on the wheat cultivar under identical climatic and agronomic conditions.

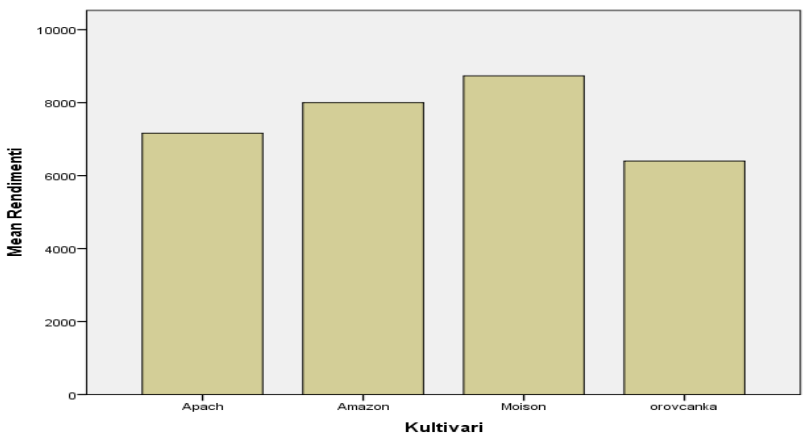
Results and discussion

Tab.1 Descriptives

Yield

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Apache	3	7161.33	51.868	29.946	7032.49	7290.18	7104	7205
Amazon	3	8001.33	190.579	110.031	7527.91	8474.76	7814	8195
Moisson	3	8734.00	271.553	156.781	8059.43	9408.57	8453	8995
Orovcanka	3	6399.00	73.627	42.509	6216.10	6581.90	6328	6475
Total	12	7573.92	928.035	267.901	6984.27	8163.56	6328	8995

From Table 1, it can be observed that the average yield varies among cultivars, ranging from 6,399 kg/ha for the Orovčanka variety to 8,734 kg/ha for the Moisson variety. The other two cultivars had yields between these values: Apache with 7,161.33 kg/ha and Amazon with 8,001.33 kg/ha.
In total, twelve measurements were made, three for each variety, resulting in an average yield of 7,573.92 kg/ha for all four cultivars.
The minimum and maximum yield values per variety were as follows:
Apache: Minimum 7,104 kg/ha; Maximum 7,205 kg/ha
Amazon: Minimum 7,814 kg/ha; Maximum 8,195 kg/ha
Moisson: Minimum 8,453 kg/ha; Maximum 8,995 kg/ha
Orovčanka: Minimum 6,328 kg/ha; Maximum 6,475 kg/ha
Overall, the varieties ranged from a minimum of 6,328 kg/ha to a maximum of 8,995 kg/ha.



ANOVA Yield

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9237397.583	3	3079132.528	104.225	.000
Within Groups	236345.333	8	29543.167		
Total	9473742.917	11			

Between groups, df = 3, indicating comparison among four different wheat cultivars. The F-value is very high (104.225) with p = 0.00, suggesting significant differences in yield among the cultivars. These significant differences are attributed to the cultivar factor, since the cultivation conditions were the same for all.

Tab2. Multiple Comparisons Tukey HSD

Dependent Variable: Yield
Tukey HSD

(I) cultivar	(J)cultivar	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Apache	Amazon	-840.000*	140.340	.001	-1289.42	-390.58
	Moisson	-1572.667*	140.340	.000	-2022.09	-1123.25
	Orovcanka	762.333*	140.340	.003	312.91	1211.75
Amazon	Apache	840.000*	140.340	.001	390.58	1289.42
	Moisson	-732.667*	140.340	.004	-1182.09	-283.25
	Orovcanka	1602.333*	140.340	.000	1152.91	2051.75
Moisson	Apache	1572.667*	140.340	.000	1123.25	2022.09
	Amazon	732.667*	140.340	.004	283.25	1182.09
	Orovcanka	2335.000*	140.340	.000	1885.58	2784.42
Orovcanka	Apache	-762.333*	140.340	.003	-1211.75	-312.91
	Amazon	-1602.333*	140.340	.000	-2051.75	-1152.91
	Moisson	-2335.000*	140.340	.000	-2784.42	-1885.58

*. The mean difference is significant at the 0.05 level.

The results showed that the Moisson variety achieved the highest yield. The differences between Moisson and Apache (p = .000), Amazon (p = .004), and Orovčanka (p = .000) were statistically significant, reflecting the superior performance of this cultivar for the given agronomic indicator.
Similarly, Amazon showed a significantly higher yield than Orovčanka (p = .000) and Apache (p = .001). On the other hand, Orovčanka had the lowest yield, significantly lower than all other varieties.
These results indicate that the choice of cultivar has a considerable impact on yield and that using high-potential cultivars such as Moisson and Amazon can contribute to increased wheat production under similar agro-ecological conditions.

3. Conclusion

The Tukey HSD post-hoc analysis, following the ANOVA test, revealed statistically significant differences ($p < 0.05$) in yield among the wheat cultivars. According to the ANOVA table, sig. = 0.000, which is less than 0.05, confirming that the differences are statistically significant. Therefore, the variety has a significant impact on yield.
These findings show that the selection of cultivars greatly affects yield and that the use of high-potential cultivars such as Moisson and Amazon contributes to increased wheat production under similar agro-ecological conditions.

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