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YIELD PERFORMANCE OF TEN MAIZE HYBRIDS UNDER THE PEDOCLIMATIC CONDITIONS OF JUCU, ROMANIA

M. Mal[1], A. ZGAIBA[1], A. MIHALCEA[1], Cristina MOLDOVAN,[1] Roxana VIDICAN[1]
[1]University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Agriculture, Cluj-Napoca, Romania
Corresponding author: adrianzgaiba117@gmail.com

Abstract. *Maize (Zea mays L.) is one of the most important crops, owing to its high yield potential and multiple uses in human nutrition, animal feed, and processing industries. In Romania, maize holds an important place among field crops and is grown under diverse soil and climatic conditions. Grain yield is influenced by the genetic characteristics of hybrids, climatic conditions, and crop management practices. Selecting hybrids adapted to the growing region is essential for achieving high and stable yields. The study was conducted in 2024–2025 at the experimental field of the Faculty of Agriculture in Jucu, under conventional crop management. The biological material comprised ten maize hybrids: Hypolito, Oltenio, P9889, P9944, P9975, Orinoco, Gloriette, Amurg, LG 31377, and Fabulo. The effects of hybrid and year, as well as the yield performance of the hybrids within each experimental year, were assessed. The results were analysed using analysis of variance (ANOVA) and Duncan's multiple range test. The overall mean grain yield was 9,541.97 kg/ha. In 2025, the mean yield reached 9,777.95 kg/ha, compared with 9,305.98 kg/ha in 2024, with a highly significant difference of 471.97 kg/ha. Averaged across the two years, the highest yields were recorded for P9944 (10,943.99 kg/ha), Gloriette (10,457.50 kg/ha), and P9975 (10,424.19 kg/ha). Hybrid rankings varied between years: P9944 achieved the highest yield in 2024 (11,938.77 kg/ha), whereas P9975 and Gloriette were the highest-yielding hybrids in 2025, producing 11,052.47 and 10,969.06 kg/ha, respectively. During the study period, the soil and climatic conditions at Jucu supported mean grain yields exceeding 9.3 t/ha in both experimental years. P9944, Gloriette, and P9975 stood out for their superior mean yields, indicating their potential for cultivation in the region. Variation in performance between years highlights the need for further multi-year testing to assess yield stability.*

Keywords*: Maize, hybrids, yield*

INTRODUCTION

Maize is cultivated worldwide and serves as a major source of food, livestock feed and industrial raw material (RANUM et al., 2014; SHIFERAW et al., 2011). Production is determined by interactions among genotype, environment and crop management. Hybrid selection is therefore a central management decision, particularly where growing conditions vary between seasons. Long-term yield gains in maize have been associated with genetic improvement and management advances, including improved tolerance to environmental and agronomic stresses (DUVICK, 2005; TOLLENAAR and WU, 1999; TOLLENAAR and LEE, 2002).

Weather during the growing season can alter crop development and yield formation (MUNTEAN et al., 2014). High temperatures and water deficits may reduce grain yield, while hybrid responses to stress are not uniform (LOBELL et al., 2011; SCHLENKER and ROBERTS, 2009; BÄNZIGER et al., 1999; CAIRNS et al., 2013). Modern hybrids may also differ in their response to plant density and resource availability, reinforcing the need to evaluate them under the local crop management system (TOKATLIDIS and KOUTROUBAS, 2004). Hybrid performance trials from Romania and neighbouring Central and Eastern European environments have documented differences in yield among genotypes and seasons (DJUROVIĆ et al., 2014; POPA et al., 2026). Multienvironment studies further show that genotype-by-environment interaction can change hybrid rankings and must be considered when

recommendations are made beyond a single site (SHOJAEI et al., 2021; BOCIANOWSKI et al., 2024).

The objective of this study was to compare the grain yield of ten maize hybrids grown at Jucu in 2024 and 2025, describe the year-to-year differences, and identify hybrids with high mean yield for further local testing. The study is intended as a site-specific comparison; the two-year record is not treated as a formal estimate of long-term stability.

MATERIAL AND METHODS

The field experiment was conducted in 2024 and 2025 at the experimental field of the Faculty of Agriculture, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, in Jucu, Cluj County, Romania (figure 1). The crop was managed using a conventional production system.

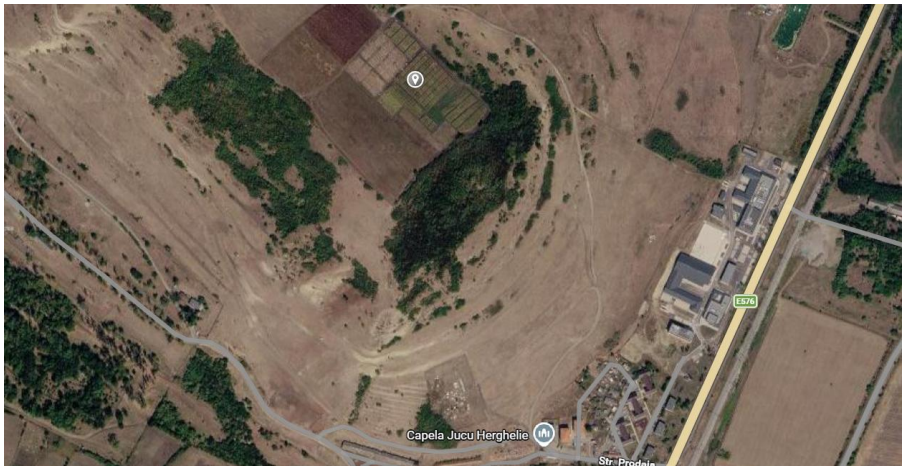


Figure 1. Experimental site (www.google.com/maps)

Sowing was carried out on 6 May 2024 and 4 May 2025. These dates were selected in consideration of soil temperature and prevailing weather conditions, with the aim of promoting rapid germination and uniform crop emergence. The target plant density was 63,500 plants ha^{-1}. Weed control in both experimental years included the herbicide Adengo, containing isoxaflutole (225 g l^{-1}), thiencarbazone-methyl (90 g l^{-1}) and cyprosulfamide (150 g l^{-1}). Fertilizer applied during seedbed preparation was 350 kg ha^{-1} of a 20:20:0 compound fertilizer enriched with 0.05% Zn. A further 150 kg ha^{-1} of 27:13.5:0 compound fertilizer was applied during crop growth. The applied crop management practices were intended to provide favourable conditions for plant development and to make effective use of the genetic potential of the hybrids under study, with the aim of achieving high-quality yields. In both experimental years, grain moisture was measured before harvest to determine the optimal harvest date.

Ten commercial maize hybrids were evaluated. Their company and FAO maturity group, are presented in Table 1.

Table 1

Maize hybrids, companies and FAO maturity groups

Hybrid	**Company**	**FAO maturity group**
Hypolito	KWS	350
Oltenio	KWS	360
P9889	Corteva	350
Hybrid	**Company**	**FAO maturity group**
P9944	Corteva	360
P9975	Corteva	370
Gloriette*	RWA	380
Orinoco	RWA	350
Amurg	INCDA	360
Fabulo	Soufflet	340
LG 31377**	Limagrain	370

During the April–October vegetation period, mean air temperature was 17.54°C in 2024 and 16.12°C in 2025, indicating that the first experimental year was warmer by 1.42°C. In both years, temperatures increased from April and reached their highest values in July, at 23.6°C in 2024 and 21.4°C in 2025. Temperatures subsequently declined, reaching 8.9°C in October in both years. The monthly temperature values are presented in Table 2.

Table 2

Monthly mean air temperature during the maize vegetation period at Jucu

Month	2024 (°C)	2025 (°C)
April	12.5	11.3
May	16.1	12.8
June	21.9	21.0
July	23.6	21.4
August	22.8	20.5
September	17.0	17.0
October	8.9	8.9
Mean for April–October	17.54	16.12

Total precipitation during April–October was 397.93 mm in 2024 and 376.38 mm in 2025, a difference of 21.55 mm. Rainfall was distributed more evenly in 2024, with the highest monthly totals recorded in June (84.33 mm) and September (88.15 mm). In 2025, precipitation was concentrated in May, when 147.09 mm was recorded, while June and July received only 9.18 mm and 24.10 mm, respectively. Thus, the two years differed not only in total precipitation but also in its distribution during the growing season. Monthly precipitation totals are shown in Table 3.

Table 3

Monthly precipitation during the maize vegetation period at Jucu

Month	2024 (mm)	2025 (mm)
April	49.33	29.93
May	45.23	147.09
June	84.33	9.18
July	65.50	24.10
August	42.90	50.49
September	88.15	28.96
October	22.49	86.63
Total for April–October	397.93	376.38

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RESULTS AND DISCUSSIONS

Grain yield is the main indicator used to evaluate the productive performance of maize hybrids. In the experiment conducted at Jucu in 2024–2025, the mean yield of the ten hybrids was 9,541.97 kg/ha. The statistical analysis revealed differences among the hybrids, demonstrating the important influence of the genetic factor on yield under the pedoclimatic conditions characteristic of the Transylvanian Plain.

The highest yield was obtained by hybrid P9944, which produced 10,943.99 kg/ha, exceeding the experimental mean by 1,402.02 kg/ha. This difference was highly significant, confirming the hybrid's ability to make effective use of the growing conditions at the experimental site. Hybrids Gloriette and P9975 also recorded high yields of 10,457.50 kg/ha and 10,424.19 kg/ha, respectively, both exceeding the experimental mean. At the other end of the range was hybrid P9889, which produced 8,686.22 kg/ha and had a highly significant negative difference from the experimental mean. Yields below the mean were also obtained by Hypolito and Oltenio, indicating lower adaptability to the pedoclimatic conditions at the experimental site.The Duncan test showed that hybrid P9944 differed from most of the hybrids analysed and ranked highest in terms of yield. This result confirms the high yield potential and stability of this hybrid under the experimental conditions studied (Table 4).

Table 4

Results on the effect of hybrid on maize yield (Jucu, Cluj County)

Hybrid	Yield	Procentage	Difference/significance	Duncan test
Mean of hybrids	9541.97	100	Control	-
Hypolito	8890.49	93	-651.48^{00}	ab
Oltenio	8989.50	94	-552.47^{00}	ab
P9889	8686.22	91	-855.75^{000}	a
P9944	10943.99	115	1402.02***	e
P9975	10424.19	109	882.22***	d
Orinoco	9484.03	99	-57.94^{-}	c
Gloriette	10457.50	110	915.54***	d
Amurg	9156.96	96	-385.00^{0}	bc
LG 31377	9192.27	96	-349.69^{-}	bc
Fabulo	9194.53	96	-347.43^{-}	bc
LSD (p 5%)			380.36	380.38-438.01
LSD(p 1%)			521.63	
LSD(p 0,1%)			710.00	

Climatic conditions are among the most important factors influencing maize yield. In this experiment, a comparison of the two growing seasons revealed significant differences in mean yield. In 2024, the mean yield was 9,305.98 kg/ha, whereas in 2025 it increased to 9,777.95 kg/ha. This represented a yield increase of 471.97 kg/ha, and the difference was highly significant and positive.These results may be explained by the more favourable climatic conditions in 2025. Although total precipitation was slightly lower than in 2024, temperatures and the distribution of rainfall throughout the growing season favoured more efficient use of the hybrids' yield potential.The Duncan test confirmed the higher yield in 2025 (Table 5), which was assigned to a statistically distinct group from 2024.

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Table 5

Results on the effect of year on yield (Jucu, Cluj County)

Year	Yield	Procentage	Difference/significance	Duncan test
2024	9305.98	100	Control	a
2025	9777.95	105	471.97***	b
LSD (p 5%)			138.25	137.98
LSD (p 1%)			187.86	
LSD (p 0,1%)			254.67	

The analysis of yields in each experimental year shows that the hybrids responded differently to the climatic conditions. This indicates an important interaction between the genetic factor and the environmental conditions. In 2024, yields ranged from 7,294.64 kg/ha for P9889 to 11,938.77 kg/ha for P9944. The latter exceeded the experimental mean by 2,632.79 kg/ha, a highly significant positive difference. In the same year, Orinoco and Gloriette also yielded above the mean, indicating good adaptation to the prevailing climatic conditions.

In 2025, P9975 was the highest-yielding hybrid, with 11,052.47 kg/ha, followed closely by Gloriette, which produced 10,969.06 kg/ha. Both hybrids exceeded the experimental mean by highly significant margins. By contrast, LG 31377 had the lowest yield, at 8,718.34 kg/ha, with a highly significant negative difference from the mean.

Comparing the results for the two years, P9975 and Gloriette showed good yield consistency, producing high yields in both experimental years. P9944 also demonstrated considerable yield potential, recording the highest yield in the entire experiment in 2024. These results support the use of these hybrids under the pedoclimatic conditions of the Transylvanian Plain, where they can make effective use of environmental resources and the applied crop management practices (table 6).

Table 6

Effect of the Hybrid × Year Interaction on Maize Yield (Jucu, Cluj County)

Year	Yield	Yield	Procentage	Difference/significance	Duncan test
2024	Mean of hybrids	9305.98	100	Control	
	Hypolito	8380.48	90	-925.51^{000}	b
	Oltenio	8456.02	91	-849.96^{00}	b
	P9889	7294.64	78	-2011.34^{000}	a
	P9944	11938.77	128	2632.79***	k
	P9975	9795.91	105	489.93^{-}	ghi
	Orinoco	9997.29	107	691.31**	hi
	Gloriette	9945.95	107	639.97*	hi
	Amurg	9225.29	99	-80.69^{-}	def
	LG 31377	9666.21	104	360.23^{-}	fghi
	Fabulo	8359.26	90	-946.72^{000}	b
2025	Mean of hybrids	9777.95	100	Control	
	Hypolito	9400.50	96	-377.46^{-}	defg
	Oltenio	9522.97	97	-254.98^{-}	efgh
	P9889	10077.80	103	299.85^{-}	i
	P9944	9949.21	102	171.25^{-}	hi
	P9975	11052.47	113	1274.51***	j
	Orinoco	8970.76	92	-807.19^{00}	cd
	Gloriette	10969.06	112	1191.11***	j
	Amurg	9088.63	93	-689.32^{00}	cde
	LG 31377	8718.34	89	-1059.62^{000}	bc

	Fabulo	10029.80	103	251.85-	i
DL/DS (p 5%)				490.13	436.33-513.24
DL (p 1%)				669.73	
DL (p 0.1%)				910.12	

CONCLUSIONS

Across the two experimental years. the ten maize hybrids achieved a mean grain yield of 9.54 t ha⁻¹ at Jucu. with annual means exceeding 9.3 t ha⁻¹. Mean yield was significantly higher in 2025 than in 2024. reaching 9.78 t ha⁻¹ compared with 9.31 t ha⁻¹. a difference of 471.97 kg ha⁻¹.Yield differences were observed among the tested hybrids. P9944 recorded the highest two-year mean yield. 10.94 t ha⁻¹. and the highest yield in 2024. at 11.94 t ha⁻¹. Gloriette and P9975 also achieved high two-year mean yields of 10.46 and 10.42 t ha⁻¹. respectively. In 2025. P9975 and Gloriette produced the highest yields. at 11.05 and 10.97 t ha⁻¹.The change in hybrid rankings between years indicates that performance varied across seasons. P9944. P9975 and Gloriette are promising hybrids for further evaluation under the conditions of Jucu. Additional years and locations are needed to assess yield stability and support recommendations for the wider Transylvanian Plain.

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BIBLIOGRAPHY

BĂNZIGER, M., EDMEADES, G.O., LAFITTE, H.R., 1999 – Selection for drought tolerance increases maize yields across a range of nitrogen levels. Crop Science. 39 (4): 1035–1040. SUA.

BOCIANOWSKI, J., NOWOSAD, K., REJEK, D., 2024 – Genotype-environment interaction for grain yield in maize (Zea mays L.) using the additive main effects and multiplicative interaction (AMMI) model. Journal of Applied Genetics. 65 (4): 653–664. Germania.

CAIRNS, J.E., CROSSA, J., ZAIDI, P.H., GRUDLOYMA, P., SANCHEZ, C., ARAUS, J.L., THAITAD, S., MAKUMBI, D., MAGOROKOSHO, C., BĂNZIGER, M., MENKIR, A., HEARNE, S., ATLIN, G.N., 2013 – Identification of drought, heat, and combined drought and heat tolerant donors in maize. Crop Science. 53 (4): 1335–1346. SUA.

DJUROVIĆ, D.S., MADIĆ, M.R., BOKAN, N.R., STEVOVIĆ, V., TOMIĆ, D.D., TANASKOVIĆ, S.T., 2014 – Stability parameters for grain yield and its component traits in maize hybrids of different FAO maturity groups. Journal of Central European Agriculture. 15 (4): 199–212. Croația.

DUVICK, D.N., 2005 – The contribution of breeding to yield advances in maize (Zea mays L.). Advances in Agronomy. 86: 83–145. SUA.

LOBELL, D.B., BĂNZIGER, M., MAGOROKOSHO, C., VIVEK, B., 2011 – Nonlinear heat effects on African maize as evidenced by historical yield trials. Nature Climate Change. 1: 42–45. Regatul Unit.

MUNTEAN, L. S., CERNEA, S., MORAR, G., DUDA, M., VÂRBAN, D., MUNTEAN, S., & MOLDOVAN, C., 2014 - Fitotehnie. Ed. Risoprint, Cluj-Napoca.

POPA, C., CĂLUGĂR, R.E., VARGA, A., VANA, C., CECLAN, L.A., MUNTEAN, L., 2026 – The agronomic performance of some Romanian maize hybrids under unfavourable climatic conditions. Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Agriculture. 83 (1): 52–58. România.

RANUM, P., PEÑA-ROSAS, J.P., GARCIA-CASAL, M.N., 2014 – Global maize production, utilization, and consumption. Annals of the New York Academy of Sciences. 1312 (1): 105–112. SUA.

SCHLENKER, W., ROBERTS, M.J., 2009 – Nonlinear temperature effects indicate severe damages to U.S. crop yields under climate change. Proceedings of the National Academy of Sciences. 106 (37): 15594–15598. SUA.

SHIFERAW, B., PRASANNA, B.M., HELLIN, J., BÄNZIGER, M., 2011 – Crops that feed the world 6. Past successes and future challenges to the role played by maize in global food security. Food Security. 3: 307–327. Țările de Jos.

SHOJAEI, S.H., MOSTAFAVI, K., OMRANI, A., OMRANI, S., MOUSAVI, S.M.N., ILLÉS, Á., BOJTOR, C., NAGY, J., 2021 – Yield stability analysis of maize (Zea mays L.) hybrids using parametric and AMMI methods. Scientifica. 2021: articolul 5576691.

TOKATLIDIS, I.S., KOUTROUBAS, S.D., 2004 – A review of maize hybrids' dependence on high plant populations and its implications for crop yield stability. Field Crops Research. 88 (2–3): 103–114. Țările de Jos.

TOLLENAAR, M., LEE, E.A., 2002 – Yield potential, yield stability and stress tolerance in maize. Field Crops Research. 75 (2–3): 161–169. Țările de Jos.

TOLLENAAR, M., WU, J., 1999 – Yield improvement in temperate maize is attributable to greater stress tolerance. Crop Science. 39 (6): 1597–1604. SUA.

*** www.google.com/maps