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COMPARATIVE ASSESSMENT OF MAIZE HYBRID PERFORMANCE UNDER SUPPLEMENTARY IRRIGATION IN DROUGHT-PRONE CONDITIONS OF SOUTHEASTERN ROMANIA

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Abstract: *This study evaluated the agronomic performance of seven maize hybrids cultivated under conventional tillage and supplementary irrigation (1,600 m^3 ha^{-1}) in Cogealac (Constanța County, Romania) during the 2024–2025 growing season. Climatic conditions were characterized by low rainfall and thermal stress, which affected crop development despite irrigation.Plant density remained stable at harvest (5.87 plants m^{-2}), while thousand kernel weight showed low variability (300.1 g; CV = 2.72%), indicating relatively stable grain filling. Grain yield averaged 6,106 kg ha^{-1}, with a 19.5% difference between hybrids.The highest performance was recorded for P88812, P9415 and Maxxatac II, which exceeded the mean yield by 5–11%. The results highlight that irrigation alone does not ensure maximum productivity, while hybrid genetic background plays a decisive role in yield stability under drought-prone conditions.*

• Introduction

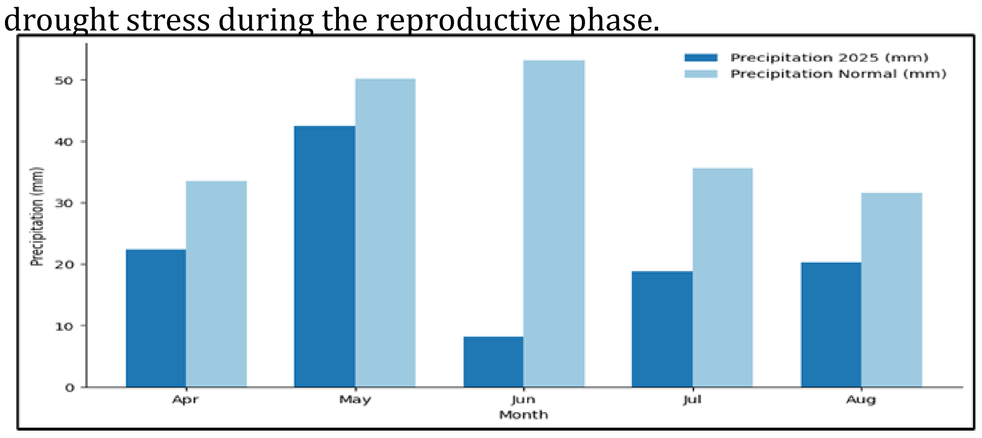
Maize (*Zea mays* L.) is a major crop for food, feed and industry, with high economic importance in Romania. However, climate change has increased yield variability in south-eastern regions due to frequent drought and heat stress. Water deficit during flowering and grain filling is a key limitation for maize productivity, while high temperatures reduce pollination efficiency and kernel formation. In drought-prone areas such as Dobrogea, irrigation is essential for stabilizing yield, but its effectiveness depends on hybrid adaptability and physiological response.

• Material and method

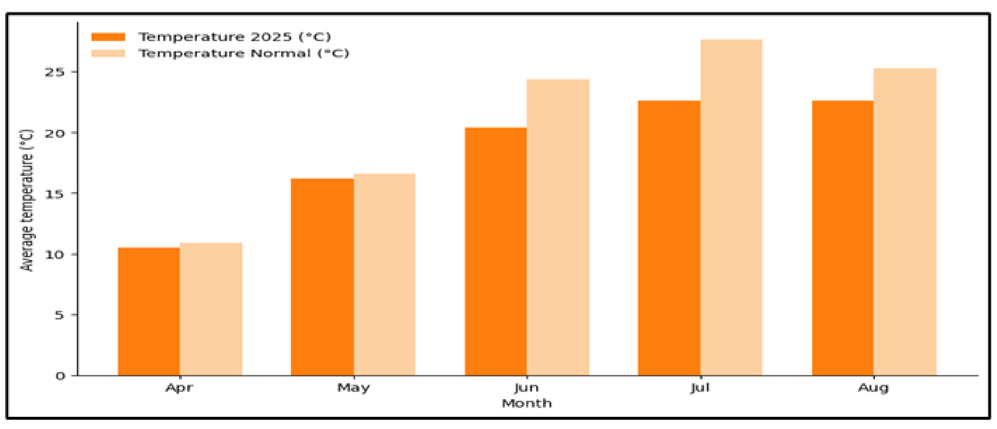
The study was conducted in 2025 in Cogealac (Constanța County, Romania) under drought-prone conditions, on a cambic chernozem soil. Seven maize (*Zea mays* L.) hybrids were evaluated in 1 ha plots under identical conditions. The crop was established at 70,000 plants ha^{-1} (70 cm spacing) using conventional tillage, balanced fertilization and supplementary irrigation (1,600 m^3 ha^{-1}).Climatic conditions included low rainfall and heat stress, with delayed sowing (19 April) due to late frost. Plant density, growth parameters and grain yield were recorded and comparatively analyzed to assess hybrid performance.

• Results and discussions

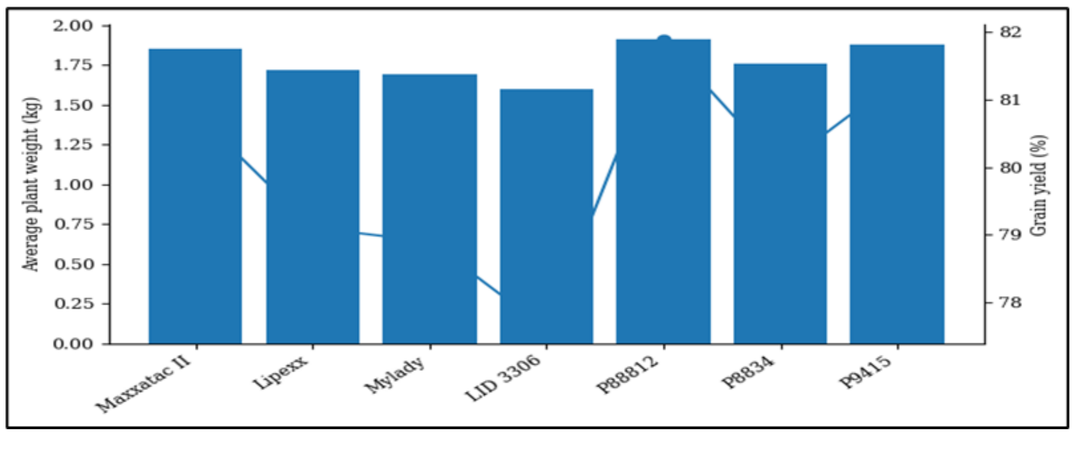
Rainfall during April–August 2025 was significantly below the multiannual average (Figure 1), totaling 112.1 mm compared to 204.1 mm (–45.1%). The most severe deficit occurred in June (–84.6%), indicating strong water limitation during critical growth stages.These conditions, combined with delayed sowing, exposed the crop to heat and drought stress during the reproductive phase.



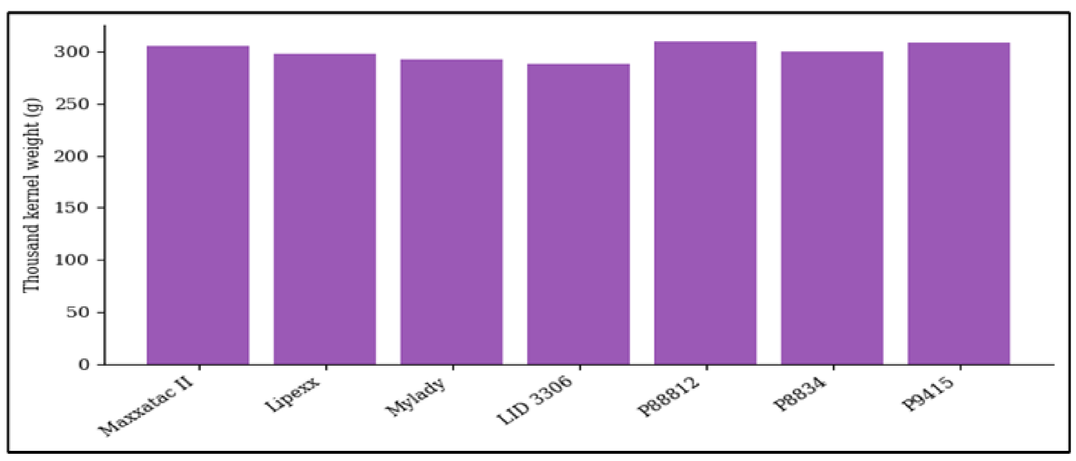
Average monthly temperatures increased from April to July–August but remained below multiannual averages (Figure 2), with the largest deviations in June (–4.0°C) and July (–5.1°C). Despite lower mean values, extreme heat events occurred during the reproductive stage, with a maximum of 40.1°C in July. These conditions may have negatively affected pollen viability and fertilization



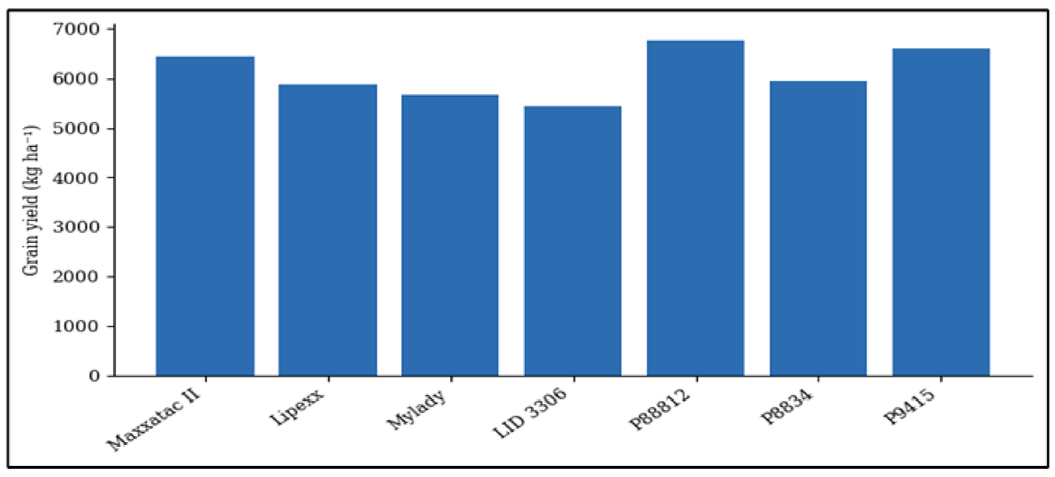
Plant height averaged 237 cm, with moderate variability among hybrids (220–260 cm). P88812 and Maxxatac II showed the highest vegetative growth, while P9415 had the lowest values. Plant biomass ranged between 1.60 and 1.91 kg $plant^{-1}$. P88812 recorded the highest biomass. Figure 3 shows that P88812 and P9415 combined high biomass with superior grain yield (~81–82%), indicating efficient conversion into grain. In contrast, LID 3306 showed lower yield efficiency.



Thousand kernel weight averaged 300 g, with low variability among hybrids (CV = 2.7%). Values ranged from 288 g (LID 3306) to 310 g (P88812).The highest values were recorded for P88812, P9415 and Maxxatac II, indicating superior grain filling capacity. In contrast, LID 3306 and Mylady showed lower performance.



Grain yield averaged 6,106 kg ha^{-1}, with moderate variability among hybrids (CV = 8.1%). Values ranged from 5,445 kg ha^{-1} (LID 3306) to 6,765 kg ha^{-1} (P88812) (Figure 5).The highest yields were recorded for P88812, P9415 and Maxxatac II, which exceeded the overall mean by 5–11%, indicating superior adaptability and efficient biomass conversion under stress conditions.In contrast, LID 3306, Mylady and Lipexx showed lower productivity, with LID 3306 recording the lowest yield. Results confirm that hybrid selection is essential, as irrigation alone does not ensure maximum productivity under drought and heat stress.



• Conclusions

Climatic conditions in 2025 (drought and heat stress) limited maize performance, even under irrigation.
Hybrids P88812, P9415 and Maxxatac II showed the best adaptability and highest yields.
Hybrid selection is essential, as irrigation alone cannot ensure yield stability under climatic stress.