



Sustainable Maize Crop Management: A Multifactorial Long-Term Field Experiment in Hungary

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INTRODUCTION & AIM

Maize (*Zea mays* L.), a staple cereal crop domesticated in southern Mexico around 9,000 years ago from teosinte grass, ranks as the world's leading grain by production volume. Corn is one of the major crops of Hungary, cultivated on approximately 25% of arable land in Hungary and is considered one of the most important agricultural export products in Hungary (Mizik and Rádai, 2021). Corn has high productivity, but it is very sensitive to the agroecological and agrotechnical conditions. When these conditions are optimal, the amount of yield is determined by the differences between the hybrids; but in the case of unfavourable weather conditions or shortcomings in the agrotechnique, the most important factor is the adaptability of the hybrids (Gardner et al., 1990; Marton et al., 2005). The effects of the agrotechnical factors on the yield stability of maize are especially important and exert their effect via interactions, rather than in isolation (Pepó, 2007). This study presents a multifactorial long-term field experiment designed to evaluate the combined effects of fertilisers, hybrid varieties, planting density, tillage practices, and crop rotation on sustainable crop management. The experiment was established to address the need for integrated agricultural practices that optimise crop yield. The aim is to identify the most effective interactions within intricate systems to promote practices that successfully balance productivity with sustainability.

MATERIALS AND METHODS

Study location

- Latókép Experimental Station University of Debrecen

Experimental design

- Split-split plot design
- Long-term experiment
- Season 2024

Treatments

- Hybrid: (Merida, Fidencio, P9985)
- Fertilizers Doses
- Tillage Types
- Irrigation
- Crop Rotation
- Plant density



Research area

Maize Seeds



NPK Fertilisers



Sowing date: Season 2024

Research- Institute of Land Use, Engineering and Precision Farming Technology

The long-term experiments, spanning multiple decades and unique in Europe, ensure research continuity while enabling the development of crop production technologies tailored to ecological conditions and their practical application.

Research area

Evaluation of tillage, irrigation, fertilisation, crop density and weather factors in crop production



Scan for more information

RESULTS & DISCUSSION

- ✓ The application of N80+PK or N160+PK fertilizers increased yield significantly ($p < 0.05$)

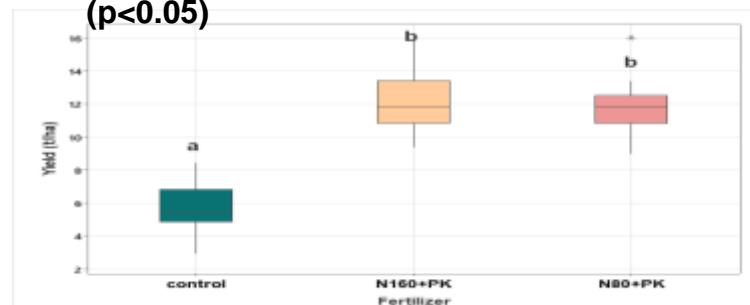


Fig.1: Effects of fertiliser doses on grain yield(Látókép, Debrecen 2024)

- ✓ The hybrid Merida had the highest yield (11.02), which was significantly higher than Fidencio (10.67) and P9985 (11.02)

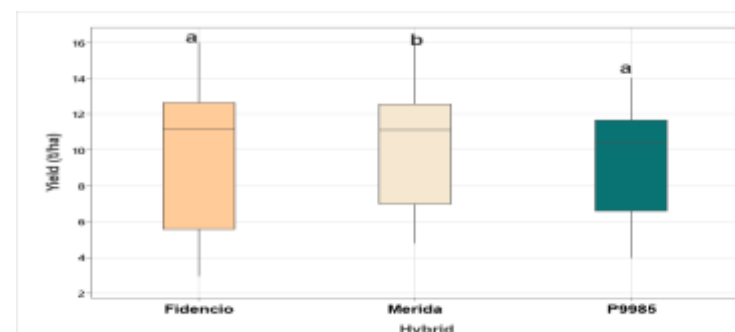
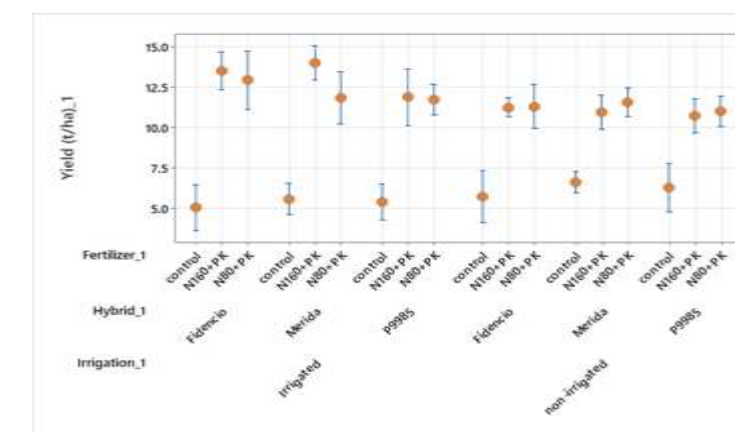


Fig.2: Effects of hybrids on grain yield(Látókép, Debrecen 2024)

- ✓ Fidencio and Merida tended to give slightly higher yields than P9985 under irrigation, particularly when N80P+K was applied



Effects of the interaction between the hybrid*Fertilisers*Irrigation on grain yield(Látókép, Debrecen 2024)

CONCLUSION

Overall, maize grain yield responded positively to both fertiliser application and hybrid choice, with the highest yields obtained under N80P+K and N160+PK fertilisation compared with the unfertilized control. Merida generally produced the greatest yields, and together with Fidencio out-yielded P9985, especially under irrigated conditions and when N80P+K was applied. These findings indicate that combining improved hybrids with balanced NPK fertilisation, particularly under irrigation, is an effective strategy to maximise maize grain yield in the studied environment.

Acknowledgement

I sincerely thank Dr. Tamas Ratonyi for his guidance and, also, Dr. Andras Tamas and Dr. Péter Ragan for their invaluable assistance in the fieldwork.