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Assessment of Soil Electrical Conductivity and Yield Responses of Maize Hybrids under different plant densities

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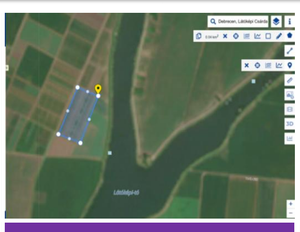
INTRODUCTION & AIM

Maize hybrids differ widely in their nutrient uptake efficiency, influencing growth and yield outcomes under diverse field conditions. Plant density plays a critical role in determining nutrient availability per plant, thereby affecting key developmental stages such as germination, tasselling, and kernel filling. Soil Electrical Conductivity (EC) has emerged as a useful indicator of soil chemical and physical properties linked to nutrient dynamics, yet its relationship with maize performance under varying densities remains insufficiently explored.

This study aimed to evaluate how soil EC interacts with hybrid characteristics and plant density to influence yield, and to identify optimal hybrid-density combinations for enhanced productivity and resource-use efficiency.

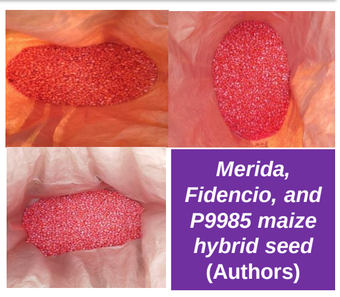
METHODS

Base map of field layout (Authors)



Experimental area aerial Image (Authors)

Strip tilled non-irrigated chernozem soil (Authors)



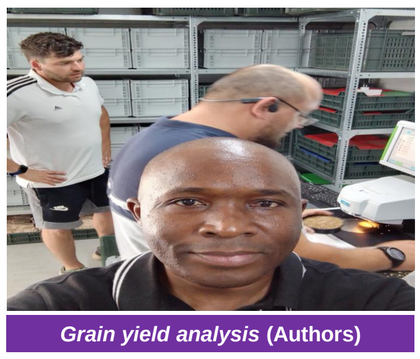
Merida, Fidencio, and P9985 maize hybrid seed (Authors)

Location and field set-up of the experiment, conducted under strip tillage on non-irrigated chernozem soil, featuring three maize hybrids

Plants at 60,000 & 80,000 per ha (Authors)

N, P, and K fertiliser samples (Authors)

Portable soil sensor (Authors)



Grain yield analysis (Authors)

Field management and measurement workflow of two plant densities, fertiliser application rate of N + PK, monthly soil EC measurements, and grain yield assessment.

Statistical analysis using *SPSS Software* (IBM v20), with significance evaluation at $p \leq 0.05$.

RESULTS & DISCUSSION

	Irrigation	Tillage	Plant density	Hybrid	Fertiliser	EC	Yield (t/ha)
2	Non-irrigated	Strip tillage	60k	1	80 kg N/ha +PK	14133,167	11,09382
3	Non-irrigated	Strip tillage	60k	2	80 kg N/ha +PK	10360,833	11,634741
4	Non-irrigated	Strip tillage	60k	3	80 kg N/ha +PK	2783,6667	10,616894
5	Non-irrigated	Strip tillage	80k	3	80 kg N/ha +PK	2781,5	11,217856
6	Non-irrigated	Strip tillage	80k	1	80 kg N/ha +PK	2779,5	9,6951981
7	Non-irrigated	Strip tillage	80k	2	80 kg N/ha +PK	2777	12,225979
8	Non-irrigated	Strip tillage	60k	1	80 kg N/ha +PK	13023,833	11,462082
9	Non-irrigated	Strip tillage	60k	2	80 kg N/ha +PK	13709,667	11,116665
10	Non-irrigated	Strip tillage	60k	3	80 kg N/ha +PK	13708	10,082197
11	Non-irrigated	Strip tillage	80k	2	80 kg N/ha +PK	13874,667	12,582689

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Yield (t/ha)	2,109[a]	1	2,109	1,971	,174
	EC	21192929,120[b]	1	21192929,120	1,345	,259
Plantdensity	Yield (t/ha)	2,109	1	2,109	1,971	,174
	EC	21192929,120	1	21192929,120	1,345	,259

a. R Squared = ,082 (Adjusted R Squared = ,040)

b. R Squared = ,058 (Adjusted R Squared = ,015)

Source	F	Sig.	R^2 (Adj)	Interpretation
Plant Density	1.971	0.174	0.082 (0.040)	F = 1.971, p = 0.174 > 0.05 → Not statistically significant. Plant density explains ~8.2% of yield variation (adjusted: 4%).
Source	**F**	**Sig.**	**R^2 (Adj)**	**Interpretation**
Plant Density	1.345	0.259	0.058 (0.015)	F = 1.345, p = 0.259 > 0.05 → Not statistically significant. Plant density explains ~5.8% of EC variation (adjusted: 1.5%).

- No significant correlations among hybrid, EC, plant density, and yield.
- Neither EC nor plant density served as reliable predictors of yield under the conditions of this study.
- The absence of clear relationships implies that additional environmental (such as soil moisture availability and temporal rainfall distribution) or management factors may have exerted stronger influence on crop performance.

CONCLUSION

Soil EC and plant density does not predict maize yield, indicating stronger effects from moisture and soil fertility.

FUTURE WORK / REFERENCES

- Examine interactions between EC and other factors affecting maize productivity.

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