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Yield Stability of Selected Potato Cultivars under Mulch and Fungicide Application for Different Environments

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INTRODUCTION & AIM

Smallholder farmers often struggle to achieve good yields due to a lack of access to improved high-yielding potato cultivars suited to their local conditions (Muthoni and Shimelis, 2023). Many rely on locally available tuber seeds with unknown origins, which are often vulnerable to pests and diseases and perform poorly (Van der Waals and Kruger, 2020). Limited access to quality planting materials and inadequate agronomic practices further worsen the problem (Mijena et al., 2022). Evaluating potato cultivars in specific areas enables the identification of the best-performing cultivars, enabling better recommendations, which also improve productivity and livelihoods for smallholder farmers. The objective of the study was to assess cultivar x environment x management on potato yield stability

METHOD

Field experiments were carried out within two agroecological zones: Swayimane (Gobizembe, Mbhava, and Stezi) and Appelsbosch (Hlathikhulu and Mbalenhle) during the main cropping seasons of 2022/23 and 2023/24 (August to January) under rainfed conditions. A randomized complete block design with four potato cultivars (Electra, Sababa, Panamera, and Mondial), two dry hay mulching levels (mulched and non-mulched), and fungicide (sprayed and unsprayed) across five environments (Gobizembe, Stezi, Mbhava, Hlathikhulu, and Mbalenhle). Each plot had a size of 18 m² (5 m x 3.6 m) and consisted of four rows with a seed spacing of 30 cm and a row spacing of 90 cm. Fungicides were applied weekly after the first appearance of fungal disease symptoms using a knapsack sprayer, with rotation among the three fungicides (Chlorothalonil (1L/ha), mefenoxam (2.5 L/ha), and mancozeb (3 kg/ha)). To minimize spray drift, sprayed and unsprayed plots were separated by 5 m. Mulch was applied uniformly during the crop establishment stage. Analysis was conducted using Genotype and Genotype by Environment (GGE) biplot and Additive Main effects and Multiplicative Interaction (AMMI) models.

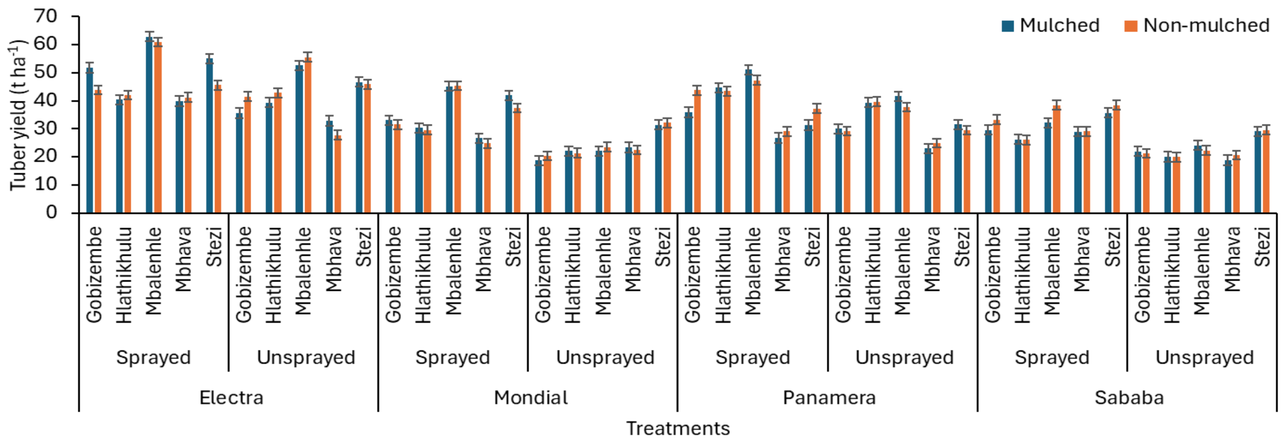

Figure 1: The average tuber yield (2022/23 and 2023/24) for different cultivars under different management practices for different environments.

Figure 2: AMMI biplot shows the main and interaction influence of potato cultivars' yield grown at five different environments under different management practices.

RESULTS & DISCUSSION

- Potato tuber yields (Figure 1) were notably influenced by cultivar x environment interaction across management practices. Hence, yield is influenced not only by genetic characteristics but also by the growing environment. This highlights the need to understand how different cultivars interact with their surroundings to make better management decisions and achieve higher yields
- A GGE and AMMI biplot (Figures 2 and 3) graphically showed the inter-relationship between the tested environment and cultivars under different management practices. Mondial was more stable across management practices, except under mulched and unsprayed conditions, although a low yield was observed compared to Electra and Panamera. Electra was found to be stable and exhibited high yield stability across all management practices and environments, except Hlathikhulu, due to its high tolerance against dry spells and foliar diseases, such as late blight. At Hlathikhulu, Panamera was found to have a stable yield across different management practices.

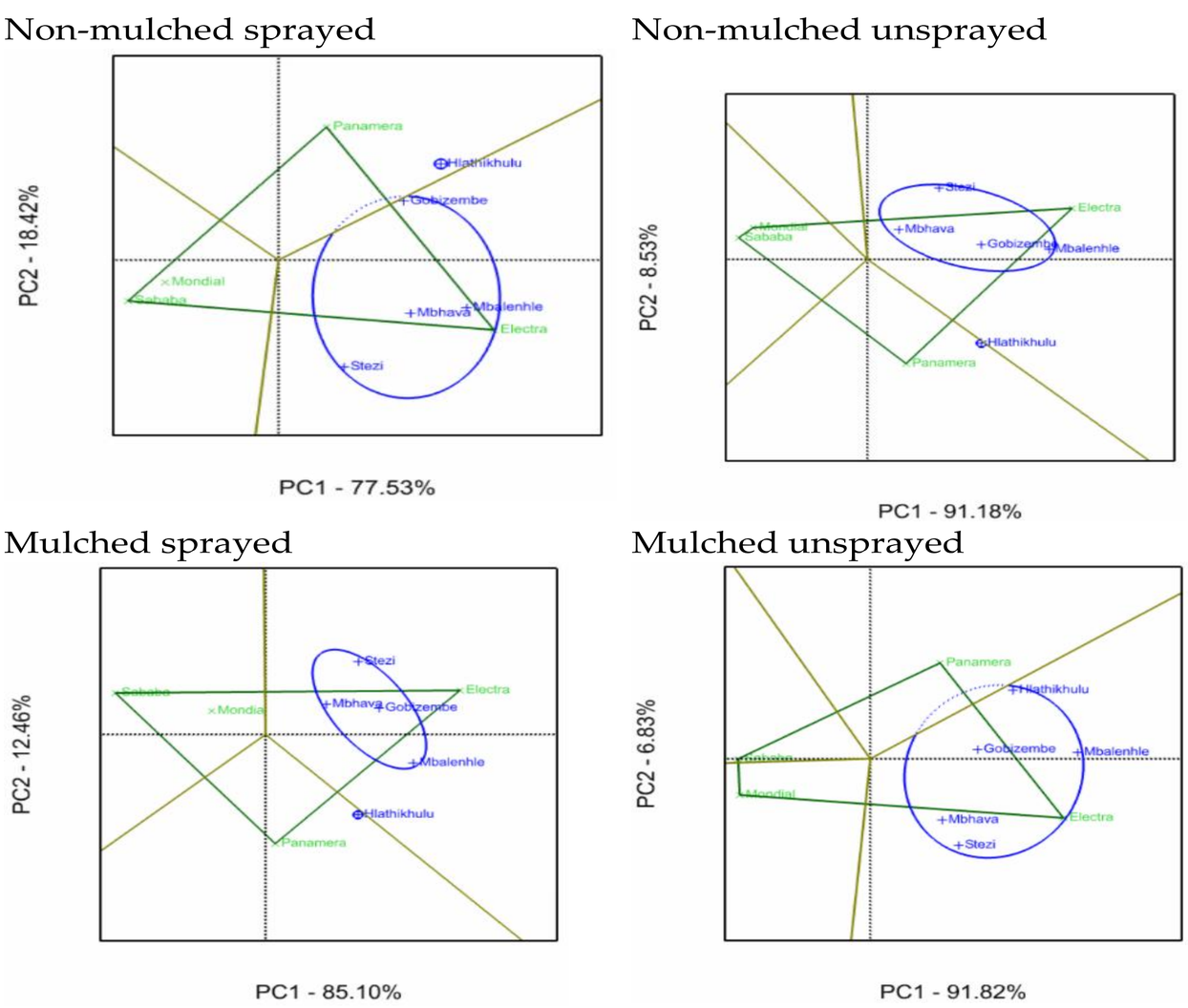

Figure 3: GGE biplot shows the main and interaction influence of potato cultivars' yield grown at five different environments under different management practices.

CONCLUSION

Smallholder farmers from Stezi, Mbalenhle, Mbhava, and Gobizembe can select Electra and apply fungicide spraying; in contrast, those from Hlathikhulu can use Panamera and fungicide spraying to achieve a potato yield with fewer fluctuations.

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