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Beyond osmotic stress: salinity and drought shape early seedling performance of sweet corn cultivar 'Bonanza' across germination, growth, and physiological responses

By

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Abstract

Salinity and drought impair maize seedling growth through osmotic and physiological stress. This study evaluated the effects of NaCl and PEG 6000 on early growth of sweet corn (*Zea mays* L.) cv. 'Bonanza'. Two independent completely randomized experiments were conducted using NaCl (0-150 mM) and PEG (0-15%) treatments with five replications. Increasing stress intensity significantly reduced seedling performance. Germination decreased by 44% under salinity and 36% under drought. Plant height declined by up to 30% and 25%, respectively, while chlorophyll content and relative water content also decreased. Root growth traits were reduced by 20-30% under severe stress. However, DPPH scavenging activity increased by 142% under salinity and 121% under drought. Proline accumulation increased by 37.63% and 35.92%, catalase activity by 25.24% and 19.64%, while malondialdehyde increased by 54.67% and 71.05% under salinity and drought stress, respectively. Multivariate analysis showed coordinated reductions in growth and biomass traits alongside enhanced antioxidant responses, suggesting a trade-off between growth maintenance and stress defense. These findings provide physiological insights for early stress screening and support the development of climate-resilient maize management strategies (SDG 2 and 13). Further studies using biostimulants or plant growth regulators are needed to clarify tolerance mechanisms under salinity and drought stress.

Keywords

Author Keywords: [Abiotic stress](#); [drought stress](#); [salt stress](#); [antioxidant activities](#); [lipid peroxidation](#); [stress tolerance](#); [Agriculture & Environmental Sciences](#); [Soil Sciences](#); [Plant & Animal Ecology](#)

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