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DROUGHT STRESS

Effect of Drought and Nitrogen Availability on Osmotic Adjustment of Five Pearl Millet Cultivars in the Vegetative Growth Stage

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Abstract

Growth of pearl millet (*Pennisetum glaucum* (L.) R. Br.) is affected in areas with limited and erratic rainfall, often combined with nitrogen deficiency. Therefore, effects of severe drought and nitrogen availability on mechanisms of dehydration avoidance were investigated. Five pearl millet genotypes were cultivated in soil differing in nitrogen availability, low (N1), medium (N2) or high (N3) in a climate chamber. Thirty-five days after sowing, the plants were exposed to drought for 12 days. Drought decreased leaf area and stomatal conductance strongly and caused leaf rolling. In the youngest fully expanded leaves, drought led to an osmotic adjustment from around −0.5 to −0.9 MPa, in N1 and N2 substantially achieved by potassium accumulation. Nitrate contributed to the osmotic adjustment in N2 and N3, proline only slightly, increasingly from N1 to N2, whereas the sum of glucose, fructose and sucrose did not play a role. The dehydration independent osmotic force for water uptake (osmotic potential at full turgor) was under drought strongest at N2 and in the landrace Dembi Yellow stronger than in the cultivars Ashana and Ugandi. This contributed to the higher relative water content (RWC) of 'Dembi Yellow', whereas due to other factors nitrogen had no effect on the RWC.