Unlocking basal and acquired thermotolerance potential in tropical sorghum

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Abstract

Basal and acquired thermotolerance of 50 elite tropical sorghum genotypes was assessed in seedlings. Two sets of each assay were conducted following a split plot in a Completely Randomised Design replicated three times in two heat stress treatments in separate incubators. Coleoptile length was measured before and after heat treatments, and the differences were subjected to analysis of variance for heat treatments, genotypes and their interactions. Highly significant differences ($p < 0.001$) were observed between heat treatments, genotypes, and their interactions for both basal and acquired thermotolerance assays, signifying adverse effects of heat stress and the existence of genetic diversity in the thermotolerance of the assessed genotypes. Popular varieties 'Macia' and 'SV4' did not feature among the top performers for both forms of tolerance, indicating the risk subsistence farmers relying on them are to heat stress. Two genotypes were consistently amongst the top ten performers in terms of basal thermotolerance in the two sets, these are genotypes NPGRC1704, and IS24426. Genotypes NPGRC3093, and IS24272 consistently demonstrated superiority in acquired thermotolerance. Genotypes NPGRC1704, IS9567, NPGRC1197, NPGRC1868, and NPGRC1782 exhibited potential in both basal and acquired thermotolerance. The identified genotypes may be used as potential donors in crop improvement programs that seek to improve thermotolerance in sorghum.

Keywords: Acclimatization, Drought, Coleoptile, Heat shock proteins, Sorghum bicolor