

## Abstract

Sorghum production in semi-arid lands is constrained by inadequate soil moisture and low nitrogen. Research was carried out between 2018-2020 to determine the effect of nitrogen fertilizer on nitrogen use efficiency, yield on selected sorghum genotypes and genotypes suitable for low soil fertility in semi-arid lands. The experiment was a randomized complete block design in a split-plot arrangement with 11 sorghum genotypes in the main plot and nitrogen (0, 6.5 and 32.5 kg ha<sup>-1</sup>) as the sub-plots in three replicates. Nitrogen use efficiency (NUE) and its indices agronomic efficiency (AE), nitrogen internal utilization (IE), physiological efficiency (PE), nitrogen recovery efficiency, nitrogen harvest index (NHI) and partial factor productivity (PFP) were obtained from sorghum yield data and nitrogen uptake. The results showed that nitrogen application at 6.5 kg ha<sup>-1</sup> and 32.5 kg ha<sup>-1</sup> significantly increased grain yield, stover weight and total dry matter (TDM) by 43% and 116%, 39% and 85% and 42% and 57% respectively. Sorghum genotypes TTKKIAMA6, KTIRASTAMMA4, SNYAKTOSA5, and MKNKKIRWMA2 had significantly higher grain yield and low N uptake implying they are N-efficient. NUE of sorghum decreased with increasing N application. Nitrogen internal utilization efficiency (IE) was significantly higher at zero N application rate implying better N assimilation by sorghum genotypes at low N. AE, PE, RE and PFP were all significantly higher at 6.5 kg N ha<sup>-1</sup>. All tested genotypes had significantly high NUE (90 to 1148 kg kg<sup>-1</sup>, RE (27 to 94 kg kg<sup>-1</sup>), AE (41 to 139 kg kg<sup>-1</sup>), PE (27 to 84 kg kg<sup>-1</sup>) and IE (41 to 139 kg kg<sup>-1</sup>) than the check (Gadam). It was concluded that sorghum genotypes yield parameters were increased by nitrogen application, NUE was highest at low N levels and its indices were significantly higher at 6.5 kg N ha<sup>-1</sup>. Four genotypes were found to be highly N-efficient and are recommended for sorghum improvement.