

Abstract

Sorghum yield in semi-arid regions is constrained by soil fertility and moisture stress which are worsened by climate variability. Water and nitrogen present a strong interplay in sorghum growth and yield in dry lands. In view of these constraints, selection of genotypes that concurrently maximize the use of these two resources is important. A study was carried out in short rains 2018 and 2020 at Katumani, Machakos to evaluate effect of nitrogen fertilizer on water use efficiency and determine water efficient sorghum genotypes. The experimental design was a randomized complete block design with split-plot arrangement. Sorghum genotypes plus a check were planted in the main plot and nitrogen fertilizer at three levels (0, 6.5, 32.5 kg ha⁻¹) with 10 kg P ha⁻¹ as basal fertilizer was applied in the split plots. Potential evapotranspiration (ET_o) was used to determine water use efficiency. The experiment was replicated three times. The results showed that, use of nitrogen fertilizer at (6.5 kg N) ha⁻¹ and (32.5 kg N) ha⁻¹ significantly increased sorghum water use efficiency (WUE) from 9.68 to 16.69 (72%) and 9.68 to 25.8 (170%) biomass kg ha⁻¹ mm⁻¹ and 3.14 to 5.55 (77%) and 3.14 to 9.28 (196%) grain kg ha⁻¹ mm⁻¹, respectively, in SR 2018 and from 29.35 to 32.8 (12%) and 29.35 to 36.61 (25%) biomass kg ha⁻¹ mm⁻¹ and from 11.46 to 13.39 (17%) and 11.46 to 15.45 (35%) grain kg ha⁻¹ mm⁻¹, respectively, in SR 2020. The sorghum mean total dry matter and grain yields were significantly correlated ($R^2 = 0.8-0.9$) to mean WUE. Five genotypes had significantly large WUE. It was concluded that nitrogen fertilizer significantly increased WUE of sorghum genotypes in semi-arid Machakos and there are five genotypes with significantly higher WUE than Gadam and are recommended to farmers and incorporation in breeding programmes for drought tolerant sorghum.