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Compost and mulching modulates morphological, physiological responses and water use efficiency in sorghum (bicolor L. Moench) under low moisture regime

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Abstract

Supplying organic compost and mulching could be a practical solution to alleviate the negative effects of water stress on sorghum (bicolor L. Moench) in newly reclaimed soils. For this purpose, two field experiments were conducted during 2016 and 2017 seasons. This investigation was conducted as split-split experiments based on randomized complete blocks design with organic compost (OC) as a soil amendment at three levels (0, 15 and 30 t ha^{-1}), rice straw as a soil mulching (M) at two levels (0, and 10 t ha^{-1}) and soil moisture at three levels (100, 85 and 70% of ETc) using three replications. Sorghum yields (forage and seed), and forage and seed water use efficiencies (F-WUE and S-WUE) were significantly ($P < 0.05$) affected by irrigation quantity and by both compost and mulching application. Plant growth (e.i. plant height, shoot dry, and leaf area), leaf photosynthetic pigments, plant water status (canopy temperature, relative water content (RWC %), and harvest index (HI) were also significantly ($P < 0.05$) affected in two seasons. The highest yields (41.41 and 7.8 t ha^{-1} for forage and seed yields) as the average for both seasons were recorded under full irrigation, 10 t ha^{-1} of M and 30 10 t ha^{-1} of OC. It can be concluded that organic compost and soil mulching improved significantly seed and forage yield production under deficit irrigation conditions. The results indicate that under scarcity water, application of (I_{85} ×OC_{30}×M_{10}) treatment was found to be favorable to save 15% of the applied irrigation water, to produce not only the same yields, approximately, but also to save more of water as compared to $I_{100\%}$