Effect of irrigation management on soil properties, growth and yield of sugarcane (Saccharum officinarum) in waterlogged saline Vertisols under Tungabhadra Project Command area

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INTRODUCTION

In the Tungabhadra project command (TBP) area, subsurface drainage systems are being installed to reclaim waterlogged and salinity area, but due to higher investment cost for individuals per unit area (Fig.1) and very poor technical knowledge on installation, adoption of this technology taking a back seat. Some individual farmers do not have the required elevation difference with natural drainage (Fig.2). All the waterlogged and salinity areas of the TBP command cannot be brought under the subsurface drainage system. Instead, soft options like surface or subsurface drip irrigation technology under the waterlogged and salinity area could be a better option. However, surface drip irrigation under saline soils is less effective as the water applied may not effectively leach down salts. To overcome these problems, subsurface drip irrigation (SSDI) is tested in saline soils.

METHODOLOGY

A field experiment was conducted at Agricultural Research Station, Gangavathi, Karnataka, India, to know the effect of different irrigation techniques and irrigation levels on soil properties, growth and yield of salt-tolerant sugarcane in saline Vertisols of TBP command. The experiment was laid out in saline soils (4-6 dS m⁻¹) with irrigation methods viz., surface drip (SDI), subsurface drip, and furrow irrigation as main treatments and with irrigation levels viz., 0.8, 1.0, and 1.2 evapotranspiration (ET) as sub treatments (Fig.3).

RESULTS

Higher moisture was retained (Fig.4) and more salt leached out from the root zone in (Fig.5 and 6) subsurface-drip-irrigated with 1.2 ET level treatments and water table was deeper (Fig.7) under this treatment. Among different irrigation techniques, higher cane yield (131.0 t ha⁻¹) was recorded in SSDI (Fig.8) and among different irrigation levels, the higher yield was recorded in 1.2 ET level (124.7 t ha⁻¹). Similarly, higher water use efficiency (WUE) and sugar water use efficiency of 83.0 kg ha⁻¹ mm⁻¹ and 1.72 kg m⁻³ were recorded in SSDI (Fig.8) respectively and more salt leached out at sugarcane roots in SSDI.

DISCUSSION

Subsurface drip irrigation with 1.2 ET level treatments in saline recorded higher cane yield due higher salt leaching and lowering of water table (Wang et al., 2011) and higher moisture was retained in at deeper depths (Santos et al., 2016) with higher BC ratio (Fig.9).

CONCLUSIONS

Improved subsurface drip irrigation technique with 1.2 ET regimes had contributed to better performance of the crop under saline soils. Hence, this practice can be considered as a viable option to improve the crop productivity of sugarcane in the TBP command and could be an option for replacing drainage system.

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