

Tillage and mulching effects on crop productivity and moisture dynamics in fodder sorghum based cropping systems under rainfed condition

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Introduction

Indian farmers generally take more than one crop in a year to maximize their total production and profits. In this process fodder sorghum followed by crops like chickpea, wheat, oat, barley and mustard are common in Bundelkhand region of central India. The soils of Bundelkhand region of India are medium to low in fertility with low organic matter content and poor water holding capacity that limits the fodder and food productivity. Therefore, adoption of resource conserving technologies in fodder sorghum based cropping systems under rainfed conditions is one of the potential areas, where increase in green fodder and food production with enhanced resource use efficiency can be achieved (Dixit *et al.*, 2014). Adoption of resource conserving technologies includes minimal soil disturbance, maintaining soil cover and crop diversification through conservation of moisture for which the role of green manure mulches has been well recognised. Under rainfed situation, moisture stress has been identified as one of most important factor limiting yield of post rainy season crop. Introducing conservation tillage (zero tillage/reduced tillage) along with foliage mulching may improve soil moisture conservation, weed control, soil physico-chemical and biological properties, system productivity and may also reduce fuel, animal or human energy required for land preparation

Materials and Methods

A fixed plot field experiment was started from 2013 at the research farm of the IGFRI, Jhansi and the experimental design was split plot. Cropping systems: Fodder sorghum – Chickpea+ *Sesbania* hedge rows, Fodder sorghum – Barley+ *Sesbania* hedge rows, Fodder sorghum – Mustard+ *Sesbania* hedge rows; Tillage: Conventional Tillage (CT)-Conventional Tillage (CT), Minimum tillage (MT)-Zero tillage (ZT), Conventional Tillage (CT)-Zero tillage (ZT); Moisture conservation: Control (*Sesbania* as fodder), *Sesbania* as mulch System productivity was worked out by adding wheat grain equivalent yield of kharif season crops to wheat grain yield. All the package of practices are followed according to treatments. Soil moisture content was recorded with gravimetric method.

Results and Discussion

In fodder sorghum based cropping systems comparatively highest sorghum green fodder yield was recorded in conventional tillage (CT)- conventional tillage (CT)+ *Sesbania* as mulch (18.03 t/ha) but comparable yield also recorded with Minimum tillage (MT)-Conventional tillage (CT)+*Sesbania* as mulch (14.8) and Conventional tillage (CT)- Zero tillage (ZT)+ *Sesbania* as mulch (16.5 t/ha) (Fig. 1). Soil moisture content slightly higher CT-CT + *Sesbania* as mulch and MT-ZT+ *Sesbania* as mulch (11.01 %and 10.08% respectively) compared to without mulch (9.32% and 6.20%) during January (Fig. 2). Besides this soil moisture gradually declined up to end of season and recorded slightly higher moisture in zero tilled plots 6.76 -7.08% compared to conventionally tilled plots (5.36%).Conventional tillage- conventional tillage comparatively found better in respect to yield of rabi crops during this year of study with more moisture during initial months but at harvest time zero-tilled plots recorded more moisture (Fig. 1&2). Zero tillage along with foliage mulch to rabi season crop is one of the the options to conserve soil moisture, reduced production cost and improved soil properties (Shivadhar *et al.*, 2008)

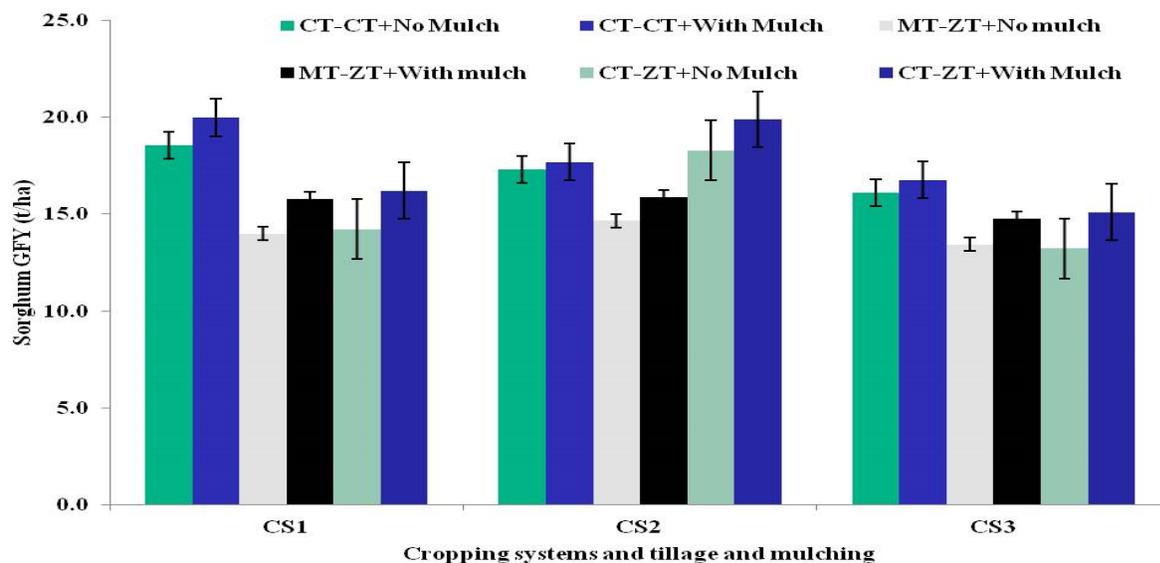


Fig. 1 Green fodder yield of kharif sorghum as influenced by tillage and mulching

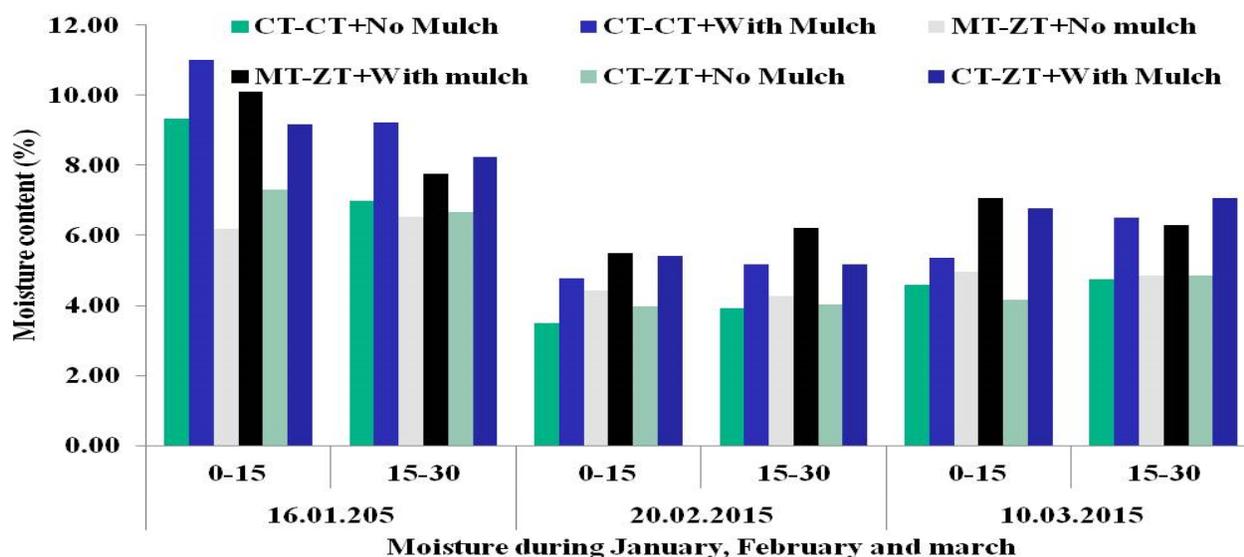


Fig. 2 Soil moisture content during rabi season

Conclusion

Conventional tillage (CT)- conventional tillage (CT) with sesbania mulch produced higher Green fodder yield of sorghum but comparable with Minimum tillage (MT)-Conventional tillage (CT) and Conventional tillage (CT)- Zero tillage (ZT) with sesbania as mulch. Soil moisture is more in CT-CT + sesbania mulching during initial months of sowing but at harvest time Zero-tilled plots recorded slightly higher soil moisture.

References

- Shivadhar, S. K. Das, Sunil Kumar and J. B. Singh. 2008. Effect of tillage and soil moisture conservation practices on crop yields of chickpea (*Cicer arietinum*) and soil properties under rainfed conditions. *Indian Journal of Agricultural Sciences* 78: 1042-1053.
- Dixit, A. K., A. K. Rai and T. Kiran Kumar 2014. Effect of resource conserving technologies on productivity and profitability of rainfed food-fodder cropping system under semi arid climate of India. *Annals of Agricultural Research New Series* 35(3): 259-266.