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Soil Properties Influenced By Tillage and Crop Residue Management Practices In Groundnut-Based Cropping Systems in Vertisols of Saurashtra Region of Gujarat

Ram A Jat, Sacheen Raval* and Kiran K Reddy
ICAR-Directorate of Groundnut Research, Junagadh 362 001 Gujarat, India
***Corresponding author: sachinraval547@yahoo.com**

Introduction

From agricultural point of view depth of soil is an important issue in Saurashtra as majority of the soils are shallow to medium in depth (Meena et al., 2017 and Gandhi and Savalia, 2016). Further, farmers resort to intensive tillage practices and burning of crop residues exposing soils to various kinds of degradation processes. Therefore, there is need to develop technologies encompassing minimum tillage, retention of residues, and crop rotations for not only to conserve the soils but also to minimize environmental pollution and reduce cost of cultivation. Keeping in view above facts a field experiment was initiated during kharif 2015 to study the impact of tillage and residue management practices on productivity of groundnut+pigeonpea and groundnut+cotton cropping systems and soil properties.

Methodology

A field experiment was conducted during kharif 2015 and 2016 at Research Farm of ICAR-Directorate of Groundnut Research, Junagadh, India to study the effects of tillage and residue management practices in groundnut+pigeonpea and groundnut+cotton cropping systems. The treatments consisted of four levels of tillage practices in main plots viz. conventional tillage, minimum tillage, zero tillage, and rota-tillage; two levels of residue management practices in sub-plots viz. no residue application and residue application; and two cropping systems in sub-sub-plots viz. groundnut+pigeon pea intercropping system and groundnut+cotton intercropping system. The experiment was laid out in split-split plot design with three replications. Sowing of groundnut 'TG 37A' and intercrops of pigeonpea 'BDN 2' and Bt cotton- bollgaurd 2 was done following recommended package of practices. Soil samples were collected 30 days after crop sowing during kharif 2016 to measure enzymatic activities and soil microbial biomass –carbon (SMBC) while samples were collected for estimating soil physical and chemical properties after completion of two crop seasons.

Results and Discussion

Total aggregate stability and porosity was improved after two years of plasticizing minimum and zero tillage over conventional tillage and retention of crop residues but differences were not significant. Total nitrogen in 0-15 cm depth was found significantly higher under zero tillage as compared to rota-tillage while available nitrogen and potash was significantly higher under minimum tillage over conventional tillage. Available nitrogen and potash was significantly higher with residue retention. Among the enzymatic activities, β-glucosidase activity was found significantly higher with minimum tillage over other tillage practices. Retention of crop residues enhanced enzymatic activities but differences were significant only for dehydrogenase. Among the cropping systems, groundnut+ pigeonpea system had significantly higher activities of dehydrogenase over that under groundnut+ cotton intercropping system. SMBC was found significantly higher with minimum tillage and residue retention.

Conclusion

Overall, minimum tillage and residue retention was found to improve soil physical, chemical and biological properties of the soil in short-term.