



Changes in soil physical properties as affected by tillage systems and residue management practices in groundnut based cropping system

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Introduction

Soil physical properties are so dynamic that they rapidly change with climate, farm management practices like tillage, residue application and intercropping. Soil physical properties like soil moisture, soil and canopy temperature, soil compaction affect groundnut peg penetration, pod development, root growth and nutrient acquisition. So, measuring soil physical attributes gives an in-depth insight into the interplay of management practices with soil physical properties, which in turn effect crop growth

Material and methods

Observations for soil temperature were taken at two depths (7.5 cm and 15 cm) with mercury thermometers (Novanna ltd.) at 6, 12, 13 and 14 WAS (weeks after sowing), during forenoon (FN) (10:30 AM) and afternoon (AN) (12:30 PM). Infrared thermometer (Raytex[®]) was used to measure canopy temperatures at 6WAS. Cone penetrometer CP II (Rimik) was used to measure soil hardness/compaction at harvest.

Results and Discussion

Effect on soil profile temperature

Analysis of soil temperature pattern over three weeks at two depths (7.5cm and 15cm) revealed that Zero tillage has high soil temperature at 7.5 cm soil depth (32.3°C at 12 WAS,AN) compared to Minimum tillage which reported lower temperatures (29°C at 12 WAS,AN). Rota-till was found to have maximum soil temperatures at 15 cm depth compared to other tillage systems (34.6 °C at 14WAS, AN). Residue application has decreased maximum soil temperature and increased minimum soil temperatures at both the depths. This is in corroboration with Bhatnagar *et al* 1983. Intercropping with pigeon pea has maximum soil temperature compared to cotton at both the soil depths

Effect on canopy temperature

Rota till has high canopy temperature (28.7°C) compared to other tillage systems at 6 WAS (FN). Residue and intercropping systems reported least variation in canopy temperatures

Effect on soil compaction

Rota till was found to have high soil compaction (which may be responsible for high soil temperatures mentioned above), compared to other tillage systems (3240 kPa at 220 mm soil depth). Residues applied to soil reported low soil compaction compared to no-residue applied soil (2746 kPa at 240 mm). Groundnut+Cotton intercropping reported a little higher compaction (2860 kPa at 240 mm soil depth) compared to Groundnut+Pigeonpea intercropping

Conclusion

Conservation agricultural practices like minimum or zero tillage, residue application and intercropping does bring a considerable change in the soil physical properties, which in turn effects groundnut crop growth and yield