RESEARCH ARTICLE

ENHANCING CROP PRODUCTIVITY THROUGH AMELIORATION OF SUBSURFACE SOIL COMPACTION

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Abstract: Tillage bring change in the soil physical environment with the change of soil mechanical and water transmission characteristics of surface and sub surface soils depending on the type of implement used which ultimately effect crop productivity. But these changes persist for some time even after discontinuing the practice. To test this hypothesis a field study was thus conducted at the Research Farm, Department of Soil Science, Punjab Agricultural University, Ludhiana to evaluate the residual impact of different tillage practices on maize (*Zea mays* L) productivity in a sandy loam soil. The study comprised of three tillage practices i.e. CT (conventional tillage), NT (no tillage with residue) and DT (deep tillage), three N levels (N1=90 kg N ha^{-1}, N2= 120 kg N ha^{-1}, N3=150 kg N ha^{-1}) and two irrigation regimes i.e. IW/PAN-E = 0.6 (I1) and 0.9 (I2). The design of the experiment was split-split plot with 3 replications. Maximum thousand grain weight (TGW, g) of maize was recorded in DT (289.5) followed by NT (277.6) and least in CT (272.1). Significant increase in TGW (g) was observed in N2 treatment (285.2) than N1 (272.1). However, the impact of irrigation on TGW was not significant. Maize biomass (t ha^{-1}) was significantly higher under N2 (14.1) followed by N3 (13.5) and minimum in N1 (11.6). Maximum maize biomass (t ha^{-1}) was recorded in DT (14.9) and least under CT (10.9). Among different irrigation regimes, I2 (13.4) recorded non- significantly higher biomass than I1 (12.7). Maize grain yield (t ha^{-1}) was significantly higher under N2 (6.0) than N1 (5.1). Grain yield (t ha^{-1}) of maize was found to be significantly higher under DT (6.4) than NT (5.4) and CT (5.1). Among irrigation regimes, significantly higher maize grain yield was recorded at I2 (5.8 t ha^{-1}) level than I1 (5.4 t ha^{-1}). Irrigation water productivity (IWP, kg ha^{-1} mm^{-1}) of maize was significantly influenced by N levels, maximum IWP was recorded at N2 (35.3) followed by N3 (34.8) and lowest under N1 (29.8). Maize IWP (kg ha^{-1} mm^{-1}) was also significantly highest under DT (37.7) as compared to CT (30.2). Among irrigation regimes, IWP was observed to be significantly higher at I1 (38.7 kg ha^{-1} mm^{-1}) than I2 (27.8 kg ha^{-1} mm^{-1}). The tillage practices also left significant effect on soil penetration resistance at 20-30 cm soil depth with highest values under CT (2.9 M Pa) and lowest under DT (1.7 M Pa). Similarly, water transmission i.e. infiltration rate (IR) of soil were also found to be effected by tillage practices, where maximum IR was recorded under DT (2.6 cm hr^{-1}) followed by NT (2.2 cm hr^{-1}) and least in CT (1.4 cm hr^{-1}). Above findings indicates that deep tillage has significant residual effect on maize productivity and soil penetration resistance.

Keywords: Deep tillage, Maize, Residual effect, Penetration resistance, Water productivity

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