

Soil Penetration Resistance and Water Content Spatial Distribution Following Different Tillage and Crop Rotation in a Chinese Mollisol

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Abstract : To better understand the spatial variability of soil penetration resistance (SPR) and soil water content (SWC) induced by different tillage and crop rotation in a Mollisol of Northeast China, the soil was sampled from the tillage experiment which was established in Dehui County, Jilin Province, Northeast China, in 2001. Effect of no-tillage (NT), moldboard plow (MP) and ridge tillage (RT) under corn-soybean rotation (C-S) and continuous corn (C-C) system on SPR and SWC were compared with horizontal and vertical variations. The results showed that SPR and SWC spatially varied across the ridge. SPR in the rows was higher than inter-rows, especially in topsoil (2.5-15 cm) of NT and RT plots. SPR of MP changed in the trend with the curve-shaped ridge. In contrast to MP, NT, and RT resulted in average increment of 166.3% and 152.3% at a depth of 2.5-17.5 cm in the row positions, respectively. The mean SPR in topsoil in the rows means soil compaction is not the main factor limiting plant growth and crop yield. SPR in the row of RT soil was lower than NT at a depth of 2.5-12.5 cm. The SWC in NT and RT soil was highest in the inter-rows and least in the rows or shoulders, respectively. However, the lateral variation trend of MP was opposite to NT. From the profile view of SWC, MP was greater than NT and RT in 0-20 cm of the rows. SWC in RT soil was higher than NT in the row of 0-20 cm. Crop rotation did not have a marked impact on SPR and SWC. In addition to the tillage practices, the factor which affects SPR greatly was depth but not position. These two factors have significant effects on SWC. These results indicated that the adoption of RT was a more suitable conservation tillage practices than NT in the black soil of Northeast China.

Keywords : row, soil penetration resistance, spatial variability, tillage practice

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