

Spatial and temporal variability of soil compaction on different conservation tillage treatments

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Summary

Measuring of penetration resistance is known as one of the best, and also one of the fastest visible indicator of soil compaction. The experiment with the measurement of soil penetration resistance on different conservation tillage treatments was carried out during three experimental years. The experiment was set up in 2021 on two different soil types, Gleysol (Križevci site) and Stagnosol (Čačinci site). Tillage treatments were: ST (plowing), CTD (conservation deep, loosening up to 30 cm with a minimum of 30% of crop residues on the surface), and CTS (conservation shallow, tillage up to 10 cm with a minimum 50% of crop residues on the surface). Grown crops (same on both sites) were as follows: maize (2021), soybean (2022), winter wheat (2022/2023), and soybean as a second crop after winter wheat (2023). To determine soil compaction, each year penetration resistance was performed three times per vegetation year (beginning, middle, and end of vegetation). The penetration resistance was measured according to geolocated square grid design. The values of penetration resistance found in the soil roughly ranged from 1.0 up to 10.0 MPa. These high variations depend on a few factors, but primarily on tillage treatments and soil status (basically soil moisture). The main conclusion can be stated as: penetration resistance increased with the depth, penetration resistance is inversely proportional to conservation level (as crop residues on soil surface increase, penetration resistance decreases).

Keywords: conservation soil tillage, soil compaction, crop rotation, penetration resistance, crop residues

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