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## **Spatio-temporal dynamics of soil penetration resistance depending on different conservation tillage systems**

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### **Abstract**

Penetration resistance is one of the most valuable and applicable indicators for determination of soil tillage compaction. Experimentation with penetration resistance on two different soil types (Gleysol and Stagnosol), with different crops (maize, soybean, winter wheat), and on three tillage treatments, start in 2021 in Croatia. Treatments were as follows: ST (plowing), CTD (conservation tillage deep, up to 30 cm with a minimum of 30% of crop residues on the surface), and CTS (conservation tillage shallow, up to 10 cm with a minimum 50% of crop residues on the surface). Crops were grown in same sequence on both sites as follows: maize (2021), soybean (2022), winter wheat (2022/2023), and soybean as a second crop after winter wheat (2023). Before the start of the experiment, there was a permanent pasture on Gleysol, and on Stagnosol was carried out for several years very intensive conventional tillage. The goal was to determine the intensity and time required for soil compaction changes depending on the "starting position" on both soil types. Penetration resistance was measured three times per vegetation year/crop (beginning, middle, end of vegetation). The penetration resistance was measured according to geolocated square grid design.

High variation of penetration resistance values was found between soil types, vegetation seasons of measuring, crops and also between tillage treatments. These variations were very high, especially in the first year of the experiment (in range from 1.0 up to 10.0 MPa) but also in the third year (ranging from 3.5 up to 8.5 MPa). As general conclusions can be stated: spatio-temporal dynamics of soil penetration resistance depends on different "start position" (different previous cropping technique on sites), penetration resistance increased with the tillage depth and penetration resistance is inversely proportional to conservation level.

**Keywords:** conservation soil tillage, soil compaction, soil penetration resistance

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