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Tillage Effects on Soil Properties & Respiration

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Soil tillage systems can be able to influence soil compaction, water dynamics, soil temperature and soil structural condition. These processes can be expressed as changes of soil microbiological activity, soil respiration and sustainability of agriculture. Objectives of this study were: 1) to assess the effects of tillage systems (Conventional System-CS, Minimum Tillage-MT, No-Tillage-NT) on soil compaction, soil temperature, soil moisture and soil respiration and 2) to establish the relationship that exists in changing soil properties. Three treatments were installed: CS-plough + disc; MT-paraplow + rotary grape; NT-direct sowing. The study was conducted on an Argic-Stagnic Faeoziom. The MT and NT applications reduce or completely eliminate the soil mobilization, due to this, soil is compacted in the first year of application. The degree of compaction is directly related to soil type and its state of degradation. The state of soil compaction diminished over time, tending toward a specific type of soil density. Soil moisture was higher in NT and MT at the time of sowing and in the early stages of vegetation and differences diminished over time. Moisture determinations showed statistically significant differences. The MT and NT applications reduced the thermal amplitude in the first 15 cm of soil depth and increased the soil temperature by 0.5-2.20C. The determinations confirm the effect of soil tillage system on soil respiration; the daily average was lower at NT (315-1914 mmoli m-2s-1) and followed by MT (318-2395 mmoli m-2s-1) and is higher in the CS (321-2480 mmol m-2s-1). Comparing with CS, all the two conservation tillage measures decreased soil respiration, with the best effects of no-tillage. An exceeding amount of CO_2 produced in the soil and released into the atmosphere, resulting from aerobic processes of mineralization of organic matter (excessive loosening) is considered to be not only a way of increasing the CO_2 in the atmosphere, but also a loss of long-term soil fertility.

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