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Soil Quality Response to Long-Term Intensive Resources Management and Soil Texture

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Abstract : The investigations on soil conservation are one of the most important topics in modern agronomy. Soil management practices have great influence on soil physico-chemical quality and GHG emission. Research objective: To reveal the sensitivity and vitality of soils with different texture to long-term antropogenisation on Cambisol in Central Lithuania and to compare them with not antropogenised soil resources. Methods: Two long-term field experiments (loam on loam; sandy loam on loam) with different management intensity were estimated. Disturbed and undisturbed soil samples were collected from 5-10, 15-20 and 30-35 cm depths. Soil available P and K contents were determined by ammonium lactate extraction, total N by the dry combustion method, SOC content by Tyurin titrimetric (classical) method, texture by pipette method. In undisturbed core samples soil pore volume distribution, plant available water (PAW) content were determined. A closed chamber method was applied to quantify soil respiration (SR). Results: Long-term resources management changed soil quality. In soil with loam texture, within 0-10, 10-20 and 30-35 cm soil layers, significantly higher PAW, SOC and mesoporosity (MsP) were under no-tillage (NT) than under conventional tillage (CT). However, total porosity (TP) under NT was significantly higher only in 0-10 cm layer. MsP acted as dominant factor for N, P and K accumulation in adequate layers. P content in all soil layers was higher under NT than in CT. N and K contents were significantly higher than under CT only in 0-10 cm layer. In soil with sandy loam texture, significant increase in SOC, PAW, MsP, N, P and K under NT was only in 0-10 cm layer. TP under NT was significantly lower in all layers. PAW acted as strong dominant factor for N, P, K accumulation. The higher PAW the higher NPK contents were determined. NT did not secure chemical quality within deeper layers than CT. Long-term application of mineral fertilisers significantly increased SOC and soil NPK contents primarily in top-soil. Enlarged fertilization determined the significantly higher leaching of nutrients to deeper soil layers (CT) and increased hazards of top-soil pollution. Straw returning significantly increased SOC and NPK accumulation in top-soil. The SR on sandy loam was significantly higher than on loam. At dry weather conditions, on loam SR was higher in NT than in CT, on sandy loam SR was higher in CT than in NT. NPK fertilizers promoted significantly higher SR in both dry and wet year, but suppressed SR on sandy loam during usual year. Not antropogenised soil had similar SOC and NPK distribution within 0-35 cm layer and depended on genesis of soil profile horizons.

Keywords : fertilizers, long-term experiments, soil texture, soil tillage, straw
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