

The dynamic of Planosol chemical composition and CO₂ respiration in differently tilled faba bean cultivation [†]

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Abstract: Soil tillage intensity influences the chemical proportion of soil, the distribution of nutrients, the physical and mechanical soil properties as well as the gas flows from the soil. The impact of the reduced tillage on these indices in faba bean agrocenoses is still insufficient in global scale. For this reason, investigations were carried out at the Research Station of Vytautas Magnus University, Agriculture Academy (Lithuania) in 2016–2018. Investigations were performed on the basis of long-term tillage experiment (since 1988). The aim of these investigations was to establish the influence of the tillage systems on the chemical composition, the temperature, the moisture content and the soil CO₂ respiration in faba bean crop limited by the semi-humid subarctic climate. Five tillage systems were tested: deep and shallow mouldboard ploughing, deep cultivation-chiselling, shallow cultivation-disking and no-tillage. Results showed that in conditions of ploughless tillage systems the volume of pre-crop residues on the top-soil before the spring tillage was 5 to 15 times higher than in ploughed plots. In addition, it was largely influenced by the amount of available nutrients in the soil, soil temperature and moisture content. The highest concentration of chemical elements was found in no-tilled plots. During single vegetation, the faba beans enriched soil with potassium and nitrogen. The CO₂ e-flux and the concentration above the ground in faba bean cultivation were generally not significantly affected by different tillage systems. These indicators were more dependent on the meteorological conditions, such as temperature and rainfall ($r = 0.792$ and 0.841). To summarize, long-term ploughless tillage systems and no-tillage initiated increase in the amount of available nutrients in soil. Faba bean crop largely increased proportion of potassium and total nitrogen as well as stabilized soil the CO₂ respiration during single vegetative period. Agricultural faba bean production method - interface between agriculture and the environment, integrate scientific analyses derived from different perspectives of agroecosystem sustainability, agricultural systems effect on the environment, including soil, air quality, and are put in as wide an international or comparative context as possible.

Keywords: ploughless tillage; soil chemical content; temperature; moisture; CO₂ respiration; *Vicia faba* L.