Carbon dioxide emissions from the soil in winter wheat (*Triticum aestivum* L.): effects of soil management

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Summary

Sustainable agricultural practices that aim to maximize carbon sequestration and reduce greenhouse gases releases are essential for mitigating the agricultural impact on climate change. The aim of this work was to determine the influence of different soil management practices on C-CO_2 flux in winter wheat field during one vegetation season (2023). The research was conducted in Križevci (Croatia) on Gleysol. The experimental field consists of three factors: i) tillage (CT-conventional tillage; CTD-conservation system deep; CTS-conservation system shallow); ii) liming (CN-without liming; CY-with liming); and iii) fertilization (FR-according to recommendation [with basic macronutrients NPK]; GFR-according to recommendation + biophysiological soil activator [GeO2]), 12 treatments in total. The average annual C-CO_2 flux ranged from 16.5 kg ha^{-1} day^{-1} at CTS-GFR-CN to 23.0 kg ha^{-1} day^{-1} at CT-FR-CN. Depending on the effect of fertilization in different tillage treatments, the study showed that the addition of FR had a greater effect on the annual C-CO_2 flux than the addition of GFR at all studied tillage treatments. Treatments with CTS tillage also showed lower flux values than the treatment with GFR addition. Comparing the different tillage treatments with the same liming and fertilization (FR-CN), the results showed that the lowest average annual C-CO_2 flux was recorded for the tillage treatment CTS with 18.8 kg ha^{-1} day^{-1}, while the highest average annual C-CO_2 flux was recorded for CT with 23.0 kg ha^{-1} day^{-1}. Comparing treatments with different liming but the same fertilization and tillage, certain changes occurred. Higher average annual C-CO_2 values were found in the treatment without liming and in the treatment with CT and CTD tillage. Higher average annual C-CO_2 values were found in the treatment with CTS tillage than in the treatment with liming.

Keywords: C-CO_2 flux, conservation tillage, fertilization, liming, agroecosystem

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