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Biotische und abiotische Steuerung von Bodengasflüssen

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Titel
Interactive effects of low molecular weight carbon compounds on N_2O emissions

Abstract
Low molecular weight carbon (C) compounds in hotspots such as the rhizosphere can greatly affect nitrate reduction processes. Towards a better prediction of N_2O emission from denitrification, we are still lacking understanding of responses to the supply of complex C compound mixtures such as rhizodeposits versus the often examined response to individually amended C compounds. In a laboratory study, we applied three C compounds, glucose, citric acid and glutamic acid, individually or as a three-compound mixture to $^{14}NH_4$ $^{15}NO_3$amended soil at 80% water-filled pore space. For the individual C compound treatments, the substrateswere enriched in ^{13}C-C. The mixture was enriched in ^{13}C-C either in all constituent compounds or in one of the compounds only, resulting in four different treatments. This set-up enabled quantification of the utilization of each compound for heterotrophic respiration when applied individually and in combination, and for this to be related to the dynamics of ^{15}N-NO_3^- reduction to ^{15}N-N_2O. The total ^{15}N-N_2O emission from the compound mixture over 10 days was similar to the total emission predicted from the average of the individual compound treatments This could suggest potential predictability of denitrification responses to complex mixtures of C based on knowledge of its constituents. However, immediate and simultaneous peaks of ^{15}N-N_2O and ^{13}C-CO_2fluxes from the compound mixture contrasted with observed delays in ^{15}N-N_2O and ^{13}C-CO_2 fluxes when the compounds had been applied individually. Moreover, relative contributions of the C compounds to ^{13}C-CO_2respiration from the compound mixture were different from the predicted contributions based on their individual application. While contributions of glutamic acid-C and citric acid-C to respiration in mixture during peak ^{15}N-N_2