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Book of abstracts

GT 03 - 704 - P

EVALUATING THE IMPACT OF COVER CROP AND NITROGEN APPLICATION RATE ON SOIL N_2O SMISSIONS, COMBINING AN AUTOMATIC CHAMBER SYSTEM AND THE DAYCENT MODEL.

GT 03. SOIL BIOGEOCHEMISTRY & GLOBAL CHANGE / GT 07. SOIL AMENDMENTS & FERTILIZERS

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Agricultural soils are the main source of nitrous oxide (N_2O) emissions due to various farming practices. Management practices such as adjusting nitrogen fertilizer rates or introducing cover crops, particularly legume-based mixtures during fallow periods, can improve agricultural system efficiency by reducing nitrogen losses in the form of N_2O. The objective of this study was to evaluate the impact of two agricultural practices on soil N_2O emissions: the use of cover crops and the adjustment of nitrogen fertilization rates.

An experimental trial was conducted at the Aula Dei Experimental Station (EEAD-CSIC, Zaragoza), comparing a tilled fallow (F) with a cover crop (CC) consisting of an oat-vetch mixture, and three nitrogen fertilization rates: a control (C) with 0 kg N ha^{-1}, a medium rate (M) of 150 and 200 kg N ha^{-1} for CC and F, respectively, and a high rate (H) of 350 and 400 kg N ha^{-1} for CC and F, respectively, during the maize growing season. Soil N_2O emissions were continuously monitored using an automatic chamber system. Additionally, the data collected were used to parameterize the DayCent model.

Cumulative soil N_2O emissions and yield-scaled N_2O emissions showed significant differences depending on the nitrogen fertilizer rates. In contrast, the implementation of cover crops did not have a significant impact. Similarly, neither grain yield nor the nitrogen emission factor (EF) showed significant differences between treatments. Nevertheless, it is worth noting that the EF values obtained did not exceed 0.25%, which is lower than the 1% threshold established by the IPCC. The DayCent model showed satisfactory performance in simulating soil N_2O emissions.

This study highlighted that the introduction of cover crops, combined with optimized nitrogen fertilization, are effective strategies for reducing external nitrogen inputs and N_2O emissions without compromising the viability of agricultural systems.

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GT 03 - 705 - P

MULTIPLE GLOBAL CHANGE PRESSURES: CASCADING CONSEQUENCES FOR SOIL BIOLOGY AND MULTIFUNCTIONALITY IN THREE MEDITERRANEAN ECOSYSTEMS

GT 03. SOIL BIOGEOCHEMISTRY & GLOBAL CHANGE / GT 08. SOIL-PLANT-WATER INTERACTIONS

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Recent scientific evidence highlighting the diminishing capacity of ecosystems to provide vital services, on which human survival depends, has spotlighted the urgent need to deepen research into global change impacts. Global change drivers do not act in isolation; rather, they interact, generating unpredictable effects compared to their independent impacts. This recognition has driven a paradigm shift in global change and ecosystem services research, moving from investigating single causes (e.g., drought, pollution) to emphasizing the need to understand how various abiotic and biotic factors jointly determine ecosystem futures. This need for studying complex environmental responses is particularly acute in traditionally understudied Mediterranean Basin ecosystems. These areas not only provide crucial provisioning and regulating services for local and regional socioeconomic development but also warrant focused study due to their significant biodiversity and spatial-temporal heterogeneity. The objective of this study is to advance scientific knowledge regarding ecosystem multifunctionality limitation and the factors modulating its response to multiple global change drivers. Our hypothesis posits that the service-generating capacity of these Mediterranean ecosystems will be more limited with an increased number of co-occurring global change drivers. Specifically, we anticipate that impacts from increased aridity and enhanced nitrogen deposition will be modulated by plant biodiversity, which will, in turn, determine the response of soil biological communities, leading to cascading effects on soil multifunctionality. This hypothesis has been tested along three natural gradients on different Mediterranean ecosystems: shrublands, dehesas and mixed forests. Each of these gradients encompass five plots which combine different levels of aridity, nitrogen deposition and vegetal biodiversity, leading to plots subjected to 0, 1, 2 and 3 drivers of global change. In this study we will present the preliminary results of soil analyses performed on this experimental setup. This study will contribute to elucidating the underlying mechanisms of simultaneous environmental perturbations in Mediterranean ecosystems. Furthermore, these results will fill a knowledge gap in the study of more than two global change drivers, a pressing yet often overlooked topic in terrestrial ecology, particularly in Mediterranean ecosystems.

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