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Advancing soil knowledge for a sustainable future

Book of abstracts

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GT 09 - 687 - P

IMPACT OF CEREAL/LEGUME INTERCROPPING SYSTEM ON MYCORRHIZAL ABUNDANCE AND ITS INTERACTION WITH C SEQUESTRATION IN THE ORGANICALLY MANAGED CROPPING SYSTEM

GT 09. SOIL HEALTH / GT 10. SOIL CARBON DYNAMICS AND STABILIZATION

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Arbuscular mycorrhizal (AM) fungi form mutualistic relationships with the majority of land plants and are an important part of the soil microbial community in natural and agricultural ecosystems. These fungi promote water and nutrient acquisition by their host plant and regulate the allocation of photosynthetic carbon to soil. Both crop variety and environment affect naturally occurring mycorrhizal abundance in roots, but the relative importance of those factors for mycorrhization is largely unknown. Therefore, this study aims to investigate the impact of cereal/legume intercropping systems on mycorrhizal abundance and C sequestration in the organically managed cropping system.

The field study experiment was conducted in the Lithuanian Research Centre for Agriculture and Forestry, Akademija, Kedainiai district (55°23′50″N, 23°51′40″E) in the organically managed cropping system in 6 treatments: two monocultures (spring barley and oat) and two compositions with legume intercropping (field pea and red clover). Mycorrhizal colonisation intensity (M%) of the root sample segments was determined by light microscopy (Trinchera et al., 2019) in the LAMMC Microbiology Laboratory. The potential of the C sequestration in the system was estimated by incubating the intercropping systems using the 13C-CO2 pulse labelling method (De Neergaard and Gorissen, 2004). The content of carbon isotope in plant roots and soil was assessed using a Thermo Flash EA 1112 elemental analyser interfaced to a Thermo Scientific Delta V Advantage isotope ratio mass spectrometer (IRMS) in the Isotopic Research Laboratory at the Centre for Physical Sciences and Technology.

Spring barley and oats M% ranged from 29 to 44% and 44 to 63%, respectively, across all samples. Averaged across all samples, the M% of oat was significantly higher than spring barley. The establishment of field pea intercrop has resulted in a significantly higher M% on spring barley and tended to decrease on oat. The red clover intercrop showed a positive effect on increasing M% on oat. The M% of spring barley and oat positively correlated with yield and showed significant differences in root biomass and C content in the soil.

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GT 09 - 696 - P

TRACE ELEMENTS IN THE SOIL-PLANT SYSTEM: ALFALFA AND NICKEL CASE STUDY

GT 09. SOIL HEALTH / GT 07. SOIL AMENDMENTS & FERTILIZERS

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In Serbian soils, nickel (Ni) and chromium (Cr) are found in elevated concentrations over significant areas, often these elements origin is geochemical (from basic and ultrabasic rocks which account for about 4% of territory), but it can also be the result of anthropogenic pollution. Elevated Ni and Cr concentrations often occur in soils, which are generally suitable for agricultural production, including alfalfa cultivation. With the aim to select the nickel contaminated soil, agricultural soils from 15 locations in the central part of the country were examined for basic soil properties, and content and solubility of heavy metals. The soils with contrasting Ni concentrations (with slightly elevated and remediation Ni concentrations) were selected for further monitoring of alfalfa-soil interactions and elements translocation. The both soils were slightly acidic, moderately supplied with humus, nitrogen and available potassium, with clay mechanical composition. In addition, the inoculation with effective nitrogen-fixing bacteria rhizobia was performed at the beginning of trial, to ensure stable yields, and to examine the effect of strains on the accumulation of trace metals in the above-ground part of plants.

Lower solubility of metals in weakly acidic soil and adsorption on clay minerals possibly affected the lower mobility and accessibility of elements in the soil.

There is a pronounced accumulation of elements in the roots of the plant, which is confirmed by the translocation factor, which is generally less than 1. The Ni concentrations in alfalfa shoots varied depending on the strain, soil Ni and growing conditions, where inoculation with some strains reduced the Ni concentration compared to uninoculated plants. Concentrations of all tested elements were mostly in the range of common values for plants. In the soil with a higher content of Ni and Cr, significantly higher concentrations of these elements were found in all treatments, but a greater mass of alfalfa was also measured. The results indicate that inoculation of alfalfa with effective rhizobial strains showed potential for improvement of plants growth and phytostabilisation of trace elements in the soils. Further research is necessary to enable a better explanation of the relationships in the soil-plant-microorganisms system.

KEYWORDS

Soil, rhizobia, trace elements, alfalfa, soil quality.

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