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Short-term response of methane oxidation to biofertilizer treatments in sandy and clay soil.

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Introduction

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Biofertilizers are desribed as the fertilizer that contains living soil microorganisms to increase the availability and uptake of mineral nutrients for plants (Vessey, 2003).

The use of biofertilizers

is promising method of improving the quality of degraded and cultivated soils

contrary to conventional chemical fertilisers they are ecofriendly and create lower costs

Biofertilizers application **can improve soil health and increase crop growth** through different mechanisms connected with microorganisms activity which determines types of biofertilizers, i.e. biological N fixation, phosphorous solubilizing, phosphate mobilizing (Ellafi et al., 2011; Meenakshi 2016).

Tha aim of the study was laboratory test on methane (CH_4) uptake in sandy and clayey soil as affected by the use fertilizers with microorganisms.

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EXPERIMENT DESCRIPTION - Soil samples were collected two months after fertilization, and incubated in laboratory with methane (1% vol.) for 21 days. Changes in CH_4 concentration were observed by gas chromatography method.

Nine soil treatments were included:

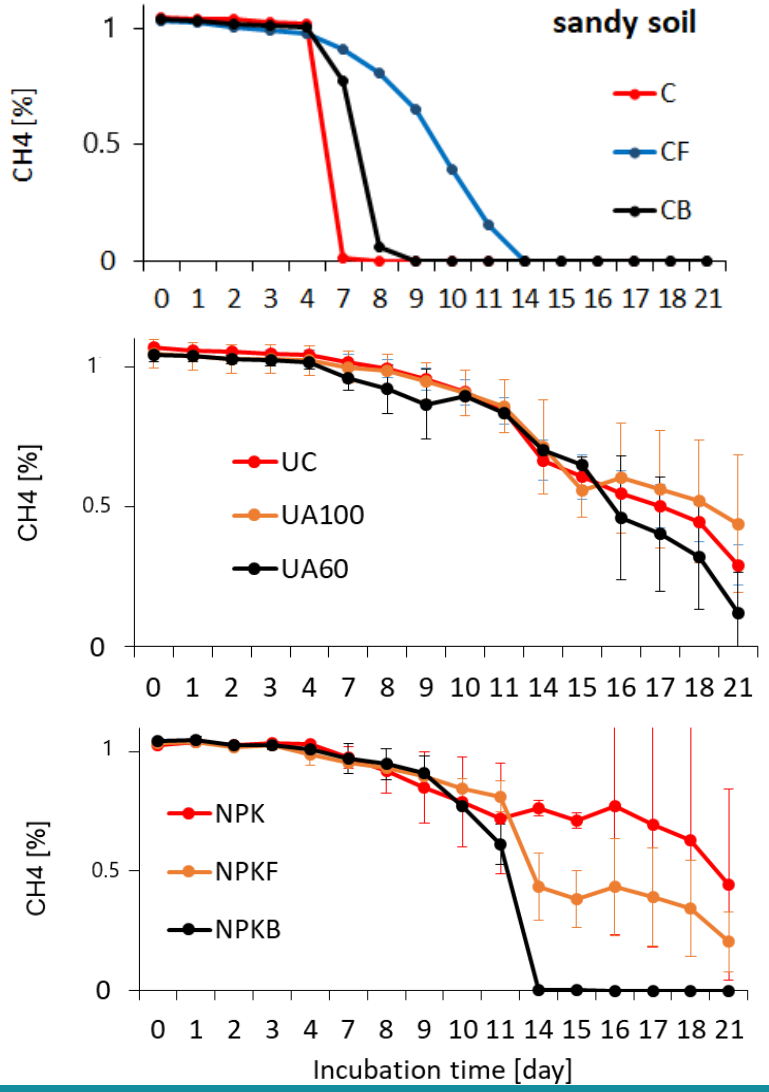
(C) - Control zero without fertilization
(CF) - Control zero + fungal strains
(CB) - Control zero + bacterial strains

(UC) - Urea without microbiological enrichment
(UA100) - Urea in optimal dose (100%) + bacterial strains
(UA60) - Urea (in reduced dose 60%) + bacterial strains

(NPK) - NPK without microbiological enrichment
(NPKF) - NPK + fungal strains
(NPKB) - NPK + bacterial strains

RESULTS

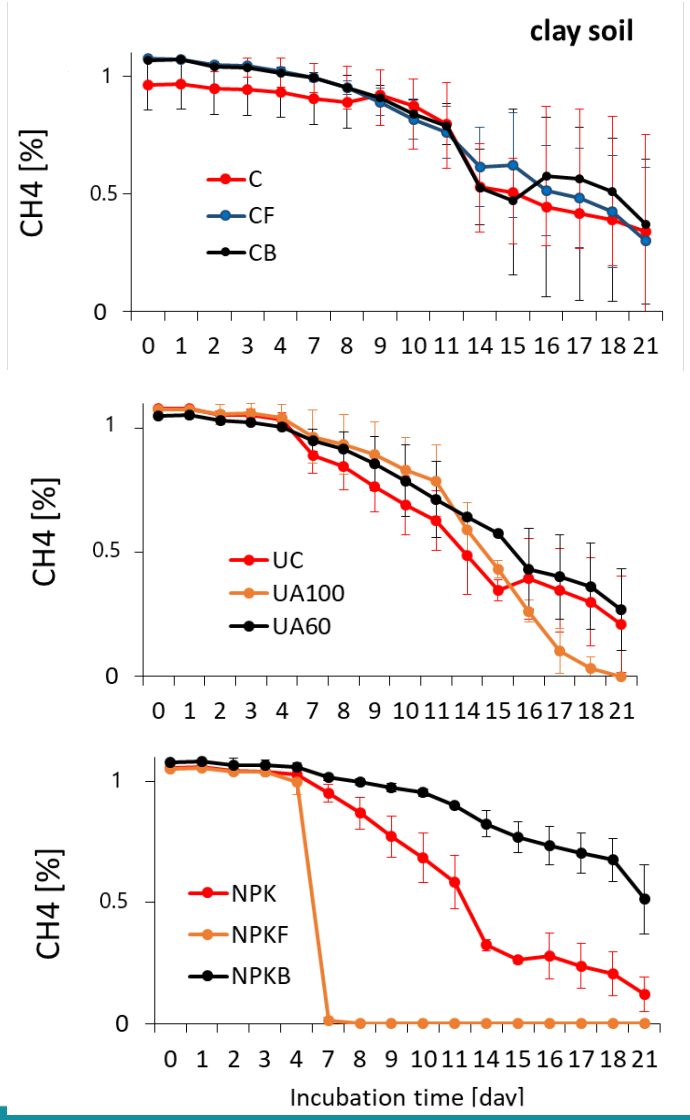
Fig.1. Changes in CH_4 (1% v/v) concentration during incubation of **sandy soil**



- ✓ the enrichment of the soil with bacteria and especially fungi has resulted in the slowing down of CH_4 uptake
- ✓ urea apparently inhibited methanotrophy in sandy soil without as well as with microbial enrichment
- ✓ the use of NPK fertilizer without microbes inhibited CH_4 consumption compared to Control (C) in sandy soil
- ✓ fungal (NPKF) and bacterial (NPKB) enrichments resulted in acceleration of the CH_4 uptake

RESULTS

Fig.2. Changes in CH_4 (1% v/v) concentration during incubation of **clay soil**



- ✓ fungal and bacterial strains (CF and CB) not affected the process in clay soil

- ✓ urea had no effect on methanotrophy
- ✓ faster consumption of added CH_4 occurred in the variant with optimal dose (100%) enriched with bacteria

- ✓ fungal enrichments (NPKF) accelerated CH_4 oxidation while bacterial amendments (NPKB) gave the opposite effect

Summary

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- sandy soil showed higher methanotrophic activity than clayey soil.
- fungal and bacterial strains (CF and CB) delayed CH_4 uptake in sandy soil, while not affected the process in the clay soil.
- the bio-ferilizers can affect the exchange of GHGs differently depending on the soil texture and fertilizer type
- microbiological tests will help to explain the mechanisms of observed changes in CH_4 absorption.

Implementing various solutions in agriculture it is important to determine their influence on GHGs emission and absorption.

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