SureVeg - Belowground Biodiversity in strip cropping systems – Practice Abstract

CORE organic

SureVeg

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Problem

The EU demand for organic vegetables is rapidly rising. Optimized agricultural practices aim not only to increase crop yield, but also to preserve diversity of the belowground organism groups. This is important for soil fertility.

Solution

Instead of monocropping (one crop in a field), strip-cropping and intercropping are agricultural systems where two crops are simultaneously grown in the field, thus promoting the agrobiodiversity

Impact

If compared to monocropping (MC), strip cropping (SC) modified the soil microbial C/N/P ratios, favoured fungi-dominated communities and promoted plant mycorrhizal symbiosis, guaranteeing a higher or comparable crop yield.

Practical recommendation

- **In soil, fungal communities promote root symbiosis and increase the N and P microbial immobilization more than bacteria.**
- **SureVeg field experiments, carried out in different EU countries (Picture 1) showed that strip cropping addresses soil microbial groups dynamics towards fungal or bacterial community predominance, playing the selected crops a key role (Picture 2).**
- **In faba bean-tomato strip-cropping system (CREA, Italy) the soil microbial C/N was lower under the legume crop, showing the predominance of fast-growing bacteria communities while, under tomato, the fungal species dominate (Fig. 1-A), being also increased the root mycorrhization (Fig.1-B). This is also confirmed in beetroot-cabbage system (AU-Food, DK) where, under strip cropping, the root mycorrhizal colonization increases even in cabbage, commonly recognized as a non-mycorrhizal species (Fig.1-B). In celeriac-leek system (ILVO-Inagro, Belgium), the strip cropping promotes the fungal predominance under celeriac and the bacteria under leek (Fig.1-C). The reduced ability of monocropping system to conserve the soil organic matter compared to the strip-cropped one is confirmed in the faba bean-cabbage trial (LatHort, Latvia), where the soil microbial respiration under mono-cropped cabbage is the highest (Fig.1-D).**
- **Strip cropping can be introduced in organic vegetable systems to modulate the diversity of the soil microbiota in favour of belowground organism groups able of reducing the loss of organic matter and retaining N and P nutrients. Genetic characterization of rhizosphere microbiota also showed a decrease in the relative abundance of some pathogenic bacteria and fungi.**

Applicability box

Theme

Increasing belowground biodiversity in EU organic vegetable systems by strip-cropping

Keywords

Organic vegetables, strip cropping, soil microbiota diversity, genetic characterization, mycorrhization.

Geographical coverage

EU countries (BE, DK, FI, IT, LV, NL, ES)

Application time

Strip-cropping is implemented at sowing and planting (2018-2019)

Required effort

Management of strip-crops

Period of impact

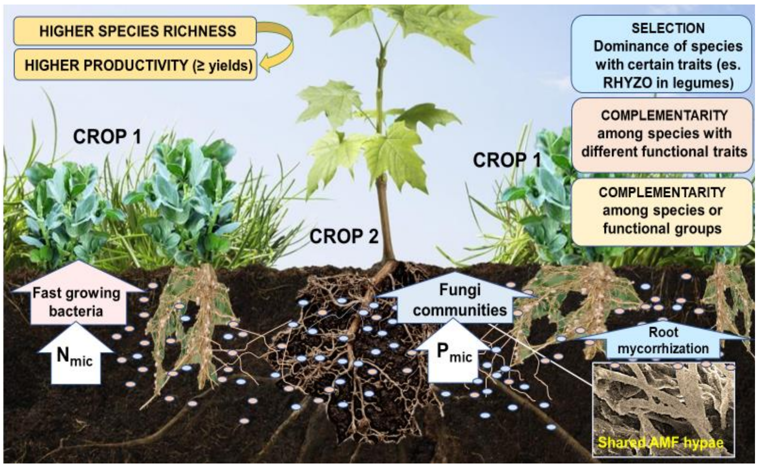
≥ 2 years

Equipment for documentation

Field experiments across EU, ICP-OES Next-Generation Sequencing, optical microscope, Scanning Electron Microscopy.

Picture 1: SureVeg field experiments (CREA, IT; ILVO-Inagro, BE; AuFood, DK; LatHort, LV; LUKE, FI; WUR, NL).

Picture 2: Effect of strip cropping on belowground biodiversity observed in SureVeg organic vegetable systems (AMF: arbuscular mycorrhizal fungi; N_{mic}: microbial N content; P_{mic}: P microbial content).



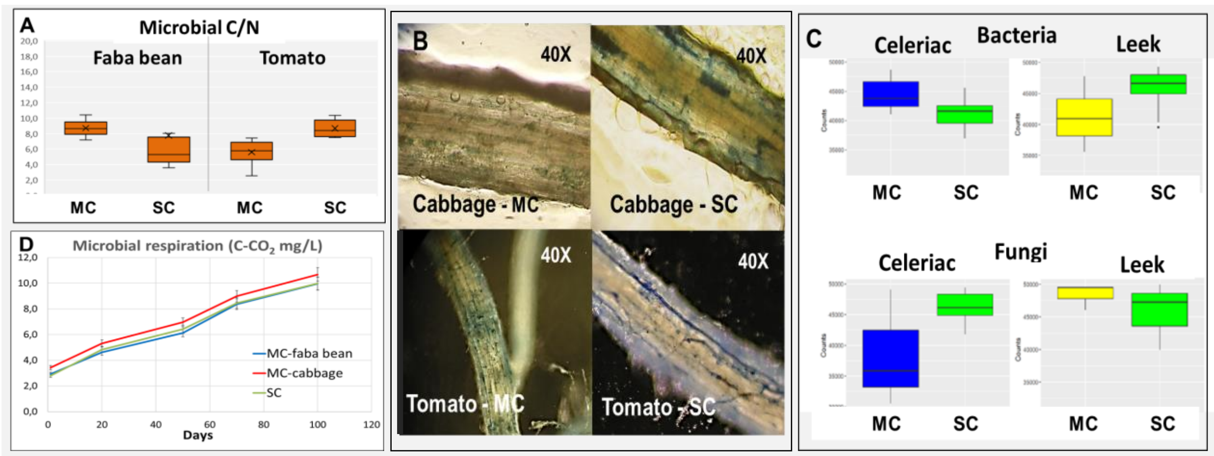


Figure 1: Overview of belowground biodiversity as affected by strip cropping in different SureVeg field trials. A: soil microbial C/N ratio in faba bean-tomato system (CREA-OF, Italy). B: Slightly-mycorrhized root of cabbage (Aarhus Univ., Denmark, 2019) and mycorrhized root of tomato (CREA, Italy) under strip cropping. C: Total counts of bacteria and fungi in celeriac-leek system by Next Generation Sequencing (ILVO-Inagro, Belgium). D: cumulative soil microbial respiration in faba bean-cabbage system (LatHort, Latvia).

The project receives funding from the European Union's Horizon2020 Research & Innovation Programme under grant agreement no 727495, CORE Organic Cofund

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Further information

Further readings

https://projects.au.dk/fileadmin/projects/coreorganiccofund/Report_on_farmers_expected_benefits_of_diversification.pdf

Weblinks

- Increasing the functional biodiversity of belowground organisms: https://projects.au.dk/coreorganiccofund/core-organic-cofund-projects/sureveg/

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Publisher: CREA – Council for Agricultural Research and Economics

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Permalink:

NAME OF YOUR PROJECT: This practice abstract was elaborated in the SureVeg project. The project is running from March 2015 to September 2021, as part of the CORE Organic Cofund.

Project website: https://projects.au.dk/coreorganiccofund/core-organic-cofund-projects/sureveg/

Project partners: Coordinator: Aarhus University Department of Food Science, AU-FOOD (DK). Partners: Institute for Agricultural and Fisheries Research, ILVO (BE); Inagro (BE); Council for Agricultural Research and Economics, CREA (IT); Institute of Horticulture Graudu iela, LatHort (LV); Louis Bolk Institute, LBI (NL); Wageningen University, WUR (NL); Natural Resources Institute Finland, Luke (FL); University of Eastern Finland, UEF (FL); Universidad Politécnica Madrid, School of Agricultural Engineering, UPM (ES); Agencia Estatal Consejo Superior de Investigaciones Cientificas, M.P., Centre for Automation and Robotics, CSIC-CA (ES); University, Department of Bioscience, AU-BIOS (DK).

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