Serbian Society of Soil Science

University of Belgrade, Faculty of Agriculture

BOOK OF ABSTRACTS

3rd International and 15th National Congress

SOILS FOR FUTURE UNDER GLOBAL CHALLENGES

21–24 September 2021

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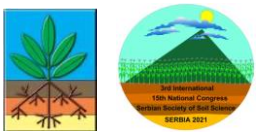

ADAPTATION OF THE FARMING SYSTEM WITH COVER CROPS GROWING FOR INCREASING SOIL CARBON SEQUESTRATION

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Abstract

The aim of this research was to introduce a cover crop technology, by sowing white mustard (*Sinapis alba* L.) in organic field production. The research was conducted on the certified organic experimental plots at the Tamiš Institute (2.5 ha size), on Chernozem soil type from 2016 to 2020. During the study, oat was harvested (*Avena sativa* L.) and the soil was tilled with chisel plow (Mulch tillage) to allow for self-growth of oats sprouting. Direct sowing (No till) of white mustard was performed in such conditions. At the beginning of August, mustard seeds germinated thus establishing intercropped cover crop of oats and white mustard.

Accelerated growth of white mustard plants and established oat biomass in the mixed crop system contributed to the development of land cover. It was 80% in the end of August for all years of the research, and 100% in the phase of elongation of white mustard stem (BBCH 34). The green biomass of the cover crop was terminating by a roller crimper when 30% of white mustards were in bloom (BBCH 63) and the soil was tilled with chisel plow. The average total biomass was 9.8 t ha^{-1} in the combined cover crop at the time of its destruction, oat biomass 1.5 ha^{-1}, and white mustard 8.3 ha^{-1}. The average C/N ratio of the white mustard biomass was 8.68:1, oats 13.78:1, and total biomass 9.48:1. The narrower C/N ratio of the total biomass obtained by this combination was favorable, because the nitrogen mineralized faster and became more available to the next crop. Average N content in biomass was 4.02%.

Soil respiration intensity was statistically significantly higher after the cover crop of white mustard and oats (1090.84 µg/g CO2-C/week) compared to the control soil (447.53 (µg/g CO2-C/week). Carbon content of microbial biomass (MBC) was also statistically significantly higher (235.91/96.78 µg/g). There were no significant differences in microbial biomass (MBN) and nitrogen content. The obtained results indicate that the application of cover crops with white mustard and oats provides: 1. a continuous supply of organic matter in the form of green biomass, which is returned to the soil, 2. numerous and active microorganisms, due to replenishment of nutrients with fresh biomass and 3. The analysis of total microflora, ammonifiers, actinomycetes, *Azotobacter* sp. indicates a positive effect of white mustard as a cover crop on the number and diversity of microorganisms in the soil.

Introduction of a cover crop with white mustard in the crop sequence resulted that the crop rotation expanded and agrobiodiversity increased over time. The results indicate that proposed cropping technology contributes to the carbon sequestration and thus to the mitigation of consequences of climate change.

Keywords**:** Cover Crops, Intercropping, Soil Carbon Sequestration, White Mustard