Interactive effect of vegetation and climate warming on total microbial and fungal biomass in soil

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Introduction

Soil microbiota ensuring sustainable functioning of terrestrial ecosystems is strongly dependent on climatic conditions and vegetation type. Even within the same climatic zone, active land-use alters the size, structure and functioning of the microbial community. We hypothesized that land use effect on soil microbial biomass will be more pronounced under impact of global warming. We also tested whether the biomass of specific microbial group (e.g., fungi) is more sensitive to environmental changes than total microbial biomass.

Research area

Experiments based on Global Change Experimental Facility platform, located at the field research station of the Helmholtz-Centre for Environmental Research in Bad Lauchstädt near Halle, Saxon-Anhalt, Germany.

https://de.wikipedia.org/wiki/Bad_Lauchstädt

Global Change Experimental Facility platform

Experimental setup included 50 plots, located in 10 blocks (5 plots per block). Five blocks are under ambient climate and the rest 5 blocks are subjected to a realistic climate change treatment (under conditions predicted by several models of climate change in Central Germany for 2050–2080 period).

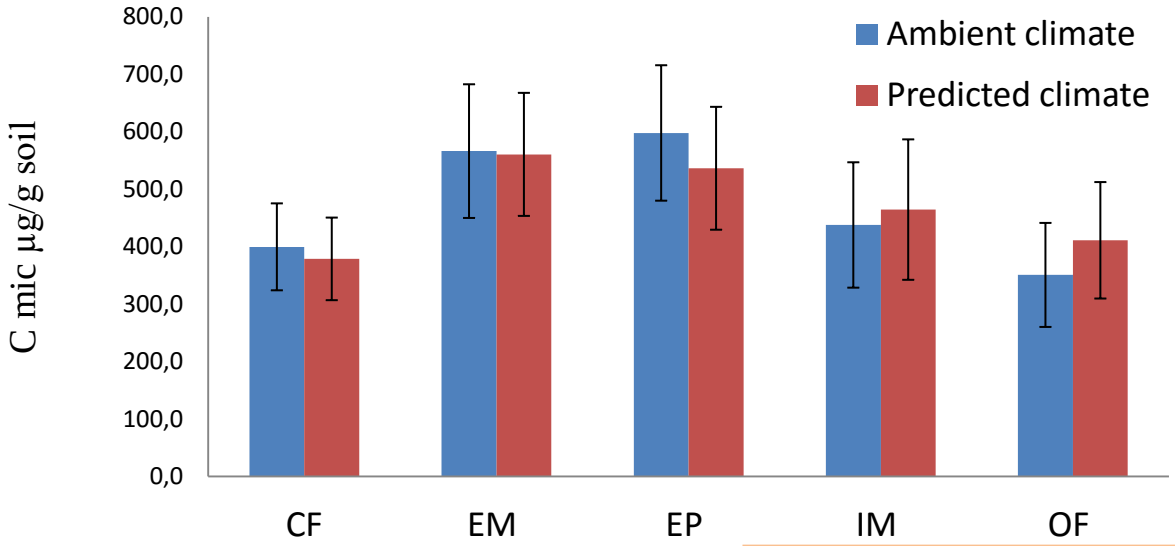
Five land use types were established in every block: conventional farming (CF); organic farming (OF); intensively used meadow (IM), extensively used meadow (EM) and extensively used pasture (EP).

Methods

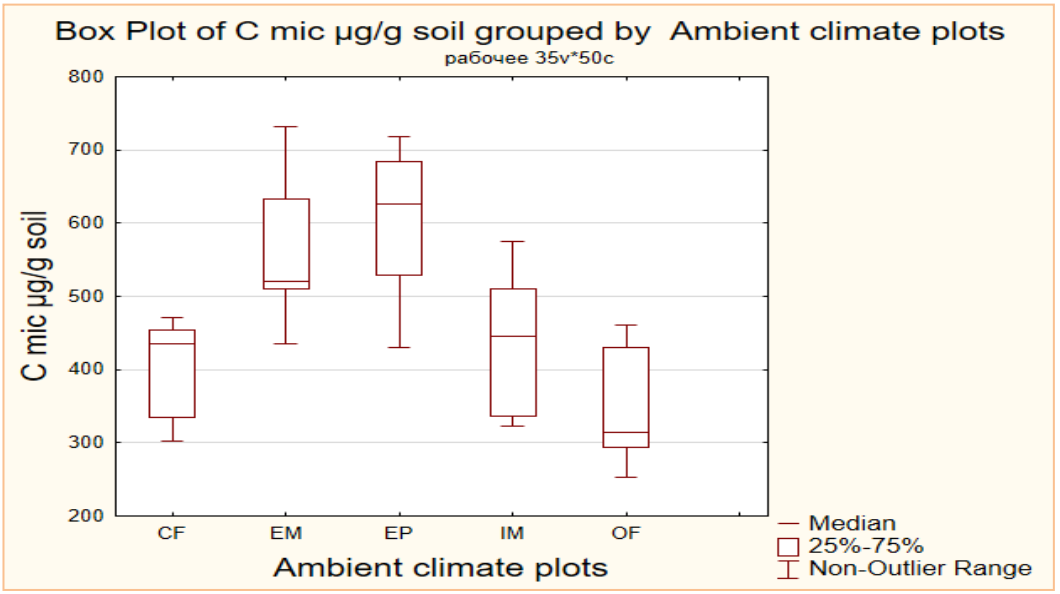
1. Chloroform fumigation - extraction method;
2. Ergosterol content;

Statistical analyses were performed with the STATISTICA program.

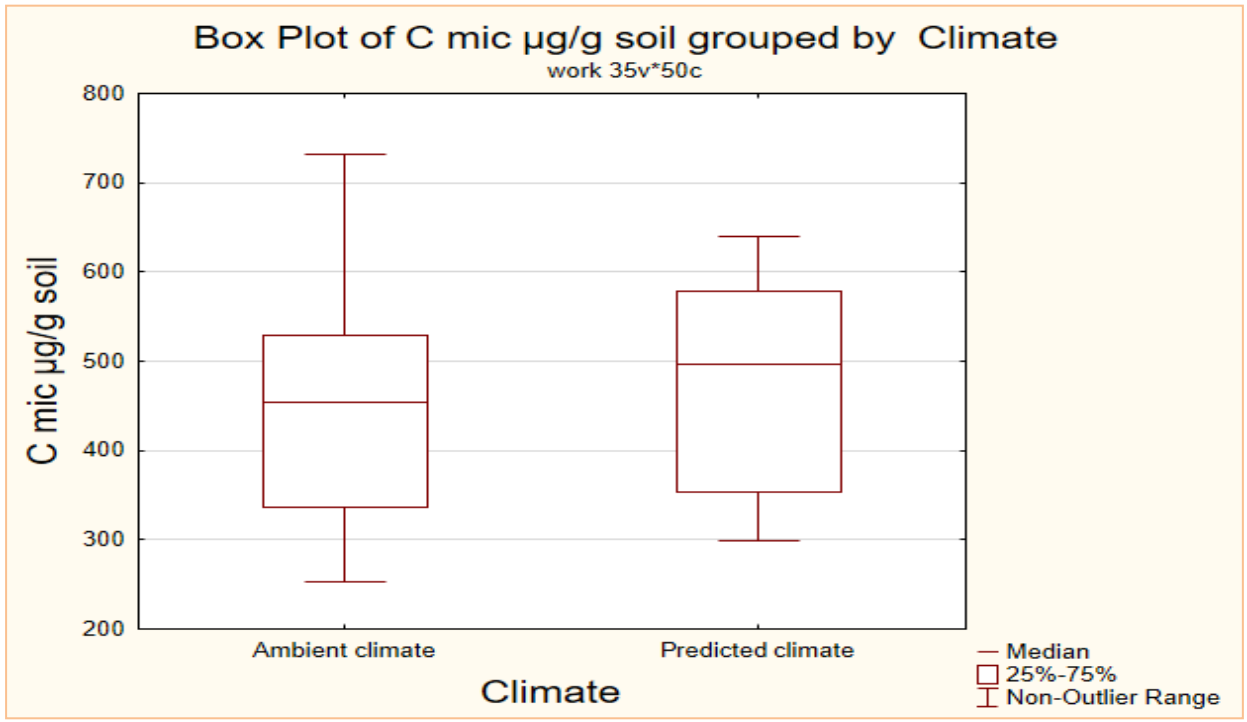
Influence of vegetation on microbial biomass

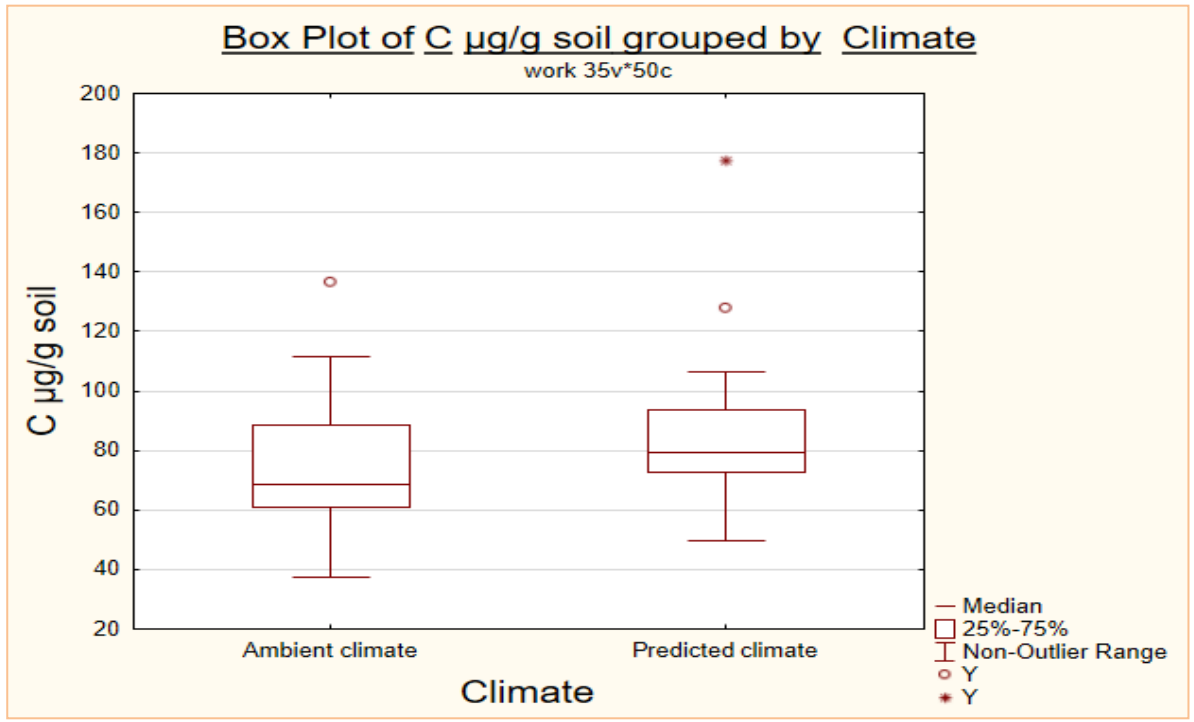


The highest Cmic content was in the soils with constant supply of nutrients - extensively used pasture (EP) and extensively used meadow (EM) . The lowest Cmic content was in conventional farming block soil (CF) and organic farming block soil(OF).



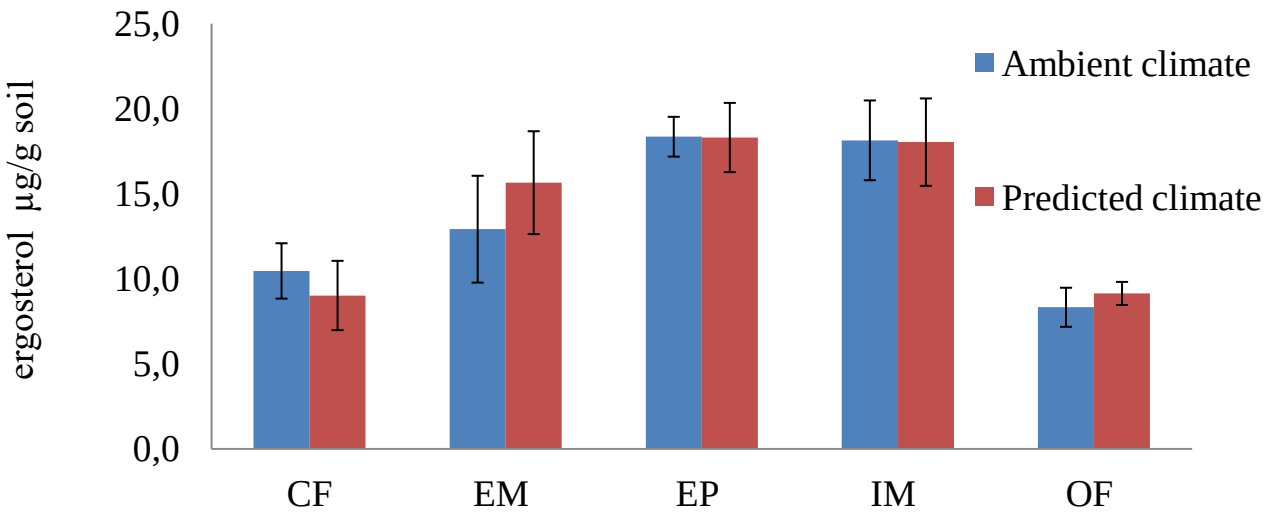
Climate change and microbial biomass



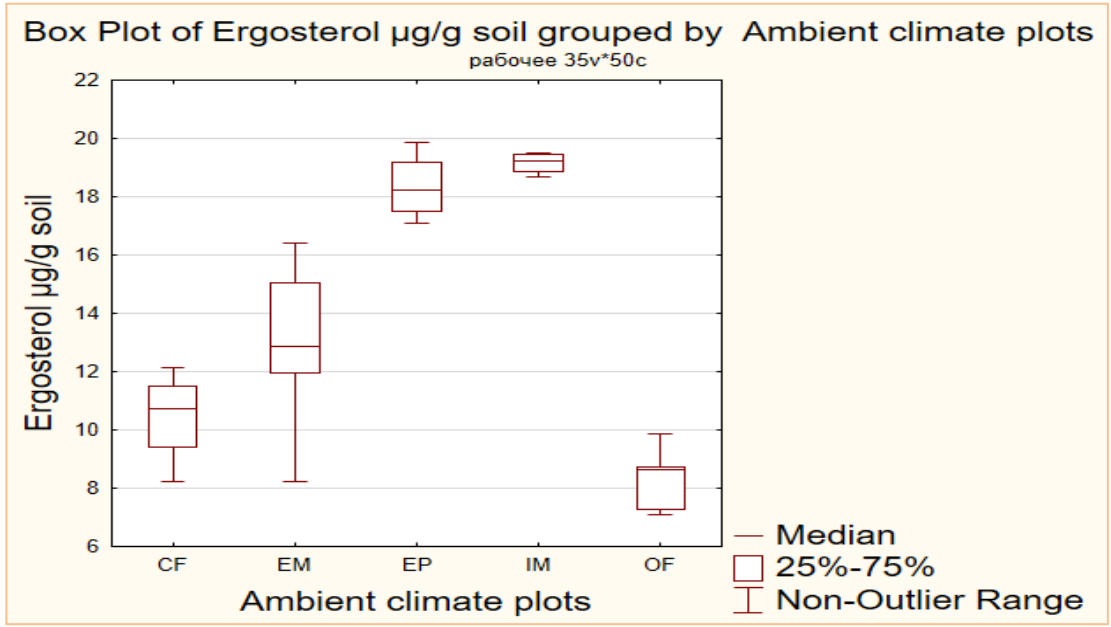


There are not significantly influence of climate change on microbial biomass and organic carbon content .

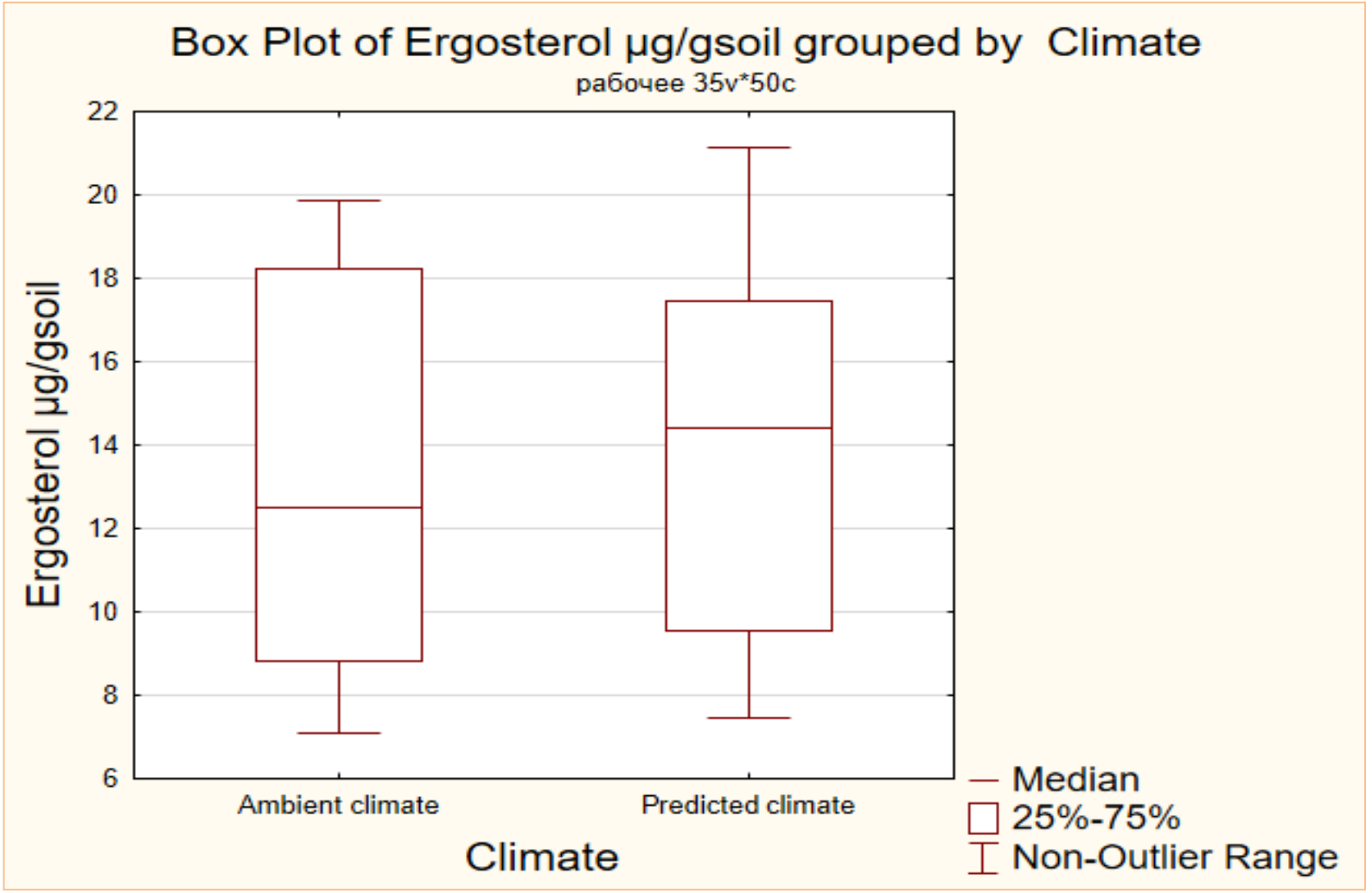
Influence of land use on ergosterol content



The ergosterol content ranged from 7,08 to 21,12 µg /g soil. Fungal biomass responded to intensive land use stronger than microbiota .The highest ergosterol content was extensively used pasture (EP) and intensively used meadow (IM). The lowest ergosterol content was in organic farming block (OF).

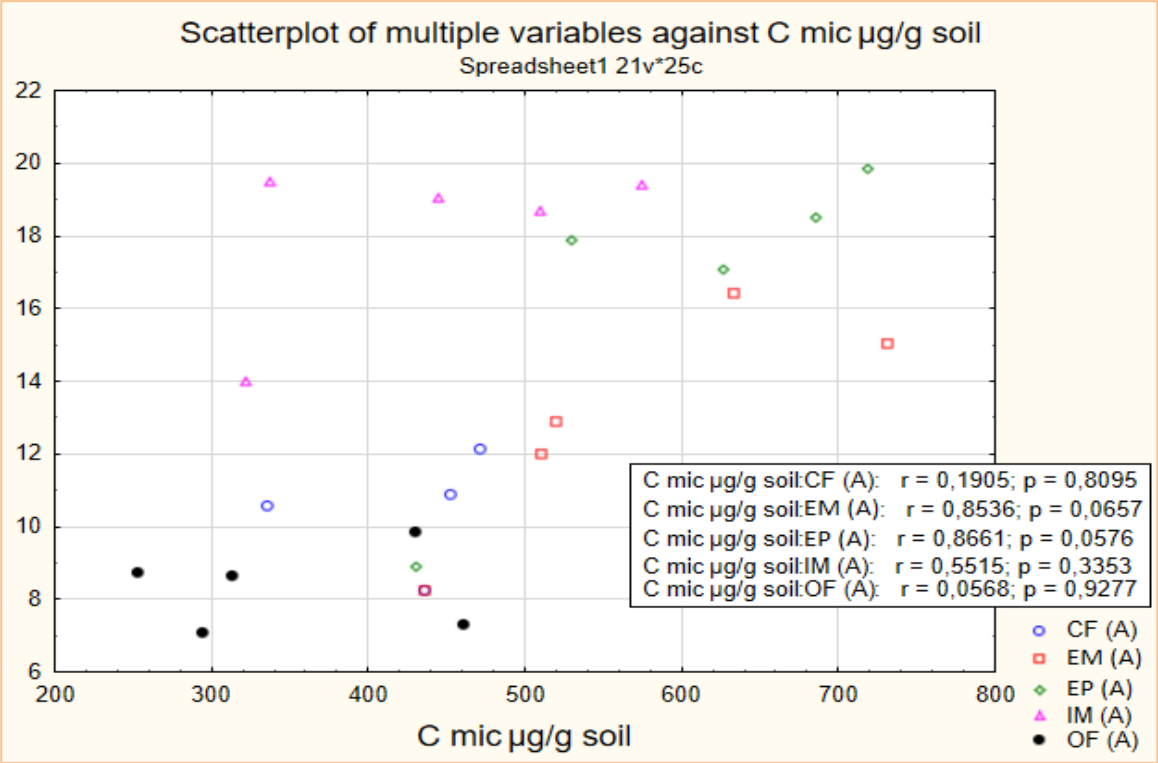


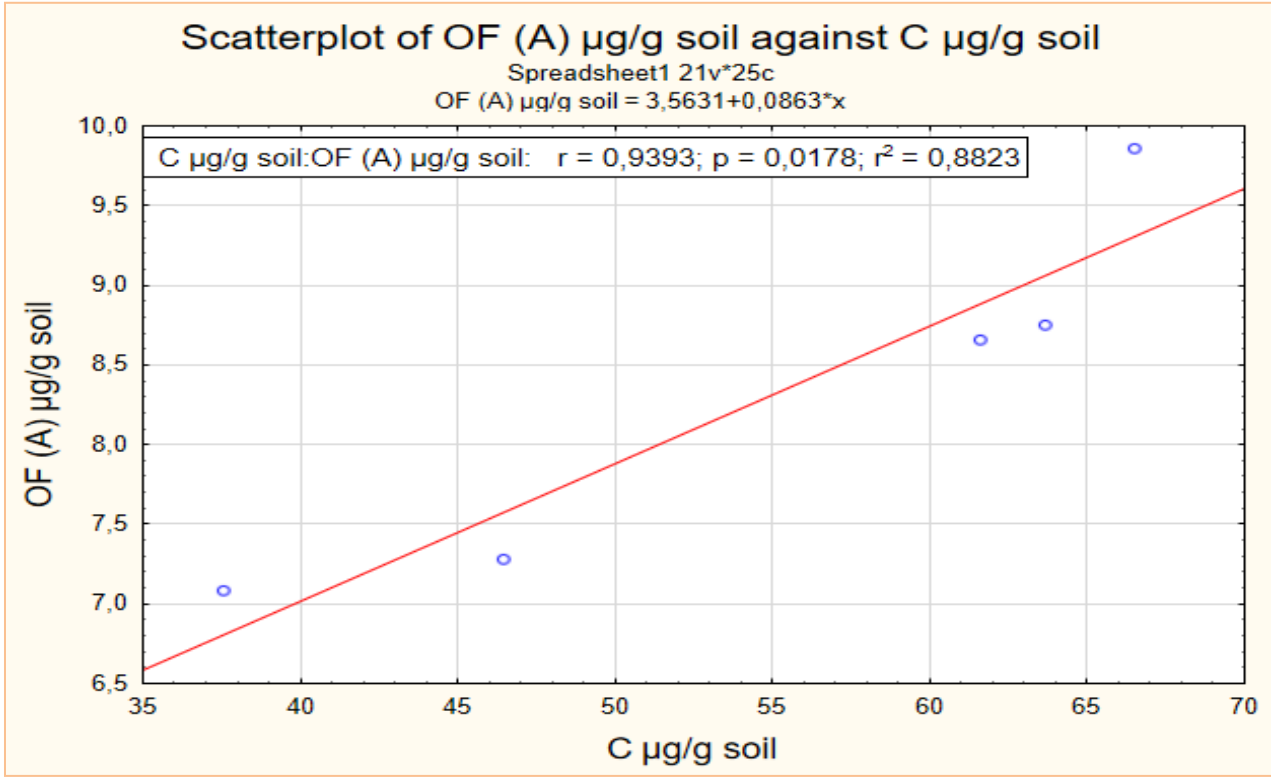
Climate change and fungal biomass



Climate change did not significantly affect the fungal biomass content

Relationship between microbial and fungal biomass





The ergosterol content didn't significant correlate with microbial C. Significant relationship between ergosterol content and soil organic matter was only found in the OF(Ambient) soils.

Conclusions

- Climate warming did not significantly affect total microbial and fungal biomass;
- Fungal biomass was more sensitive to intensive land use then microbiota;
- Soils of organic farming plots contained less microbial and fungal biomass then soil of another plots;
- Significant relationship between ergosterol and soil organic matter was found only in OF(Ambient climate) soils.

Thank you for your attention!

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