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

Maria Udovenko^{1,2}, Vusal Guliyev¹, and Evgenia Blagodatskaya¹

¹Department of Soil Ecology, Helmholtz Centre for Environmental Research – UFZ, Halle, Germany

(maria.udovenko@ufz.de)

²Faculty of Soil Science, Lomonosov Moscow State University, Russian Federation

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.

We proved these hypotheses in the 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. 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; organic farming; intensively used meadow, extensively used meadow and extensively used pasture. We determined soil microbial biomass and its fungal component by chloroform fumigation-extraction method and by ergosterol content, respectively. We found that fungal biomass was more sensitive to intensive land use for crop production than to climate change. The possible mechanisms of such a sensitivity will be discussed.