Geophysical Research Abstracts
Vol. 18, EGU2016-820-1, 2016
EGU General Assembly 2016
© Author(s) 2015. CC Attribution 3.0 License.

Succession change of microorganisms on plant waste decomposition in simulation modelling field experiment

Julia Vinogradova, Evgenia Perminova, Fluza Khabibullina, Vera Kovaleva, and Elena Lapteva

Federal State Budget Organization of Science Institute of Biology of the Komi Science Centre of the Ural Division RAS, Russian Federation (pelichova@rambler.ru)

Plant waste decomposition processes are closely associated with living activity of soil microbiota in aboveground ecosystems. Functional activity of microorganisms and soil invertebrates determines plant material transformation rate whereby changes in plant material chemical composition during destruction – succession change of soil biota. The purpose of the work was revealing the mechanism of microorganisms succession change during plant waste decomposition in middle-taiga green-moss spruce forests and coniferous-deciduous secondary stands formed after earlier cut bilberry spruce forests. The study materials were undisturbed bilberry spruce forest (Sample Plot 1 - SP1) and coniferous-deciduous secondary stands which were formed after tree cutting activities of 2001-2002 (SP2) and 1969 and 1970 (SP3). Plant material decomposition intensity was determined in microcosms isolated into kapron bags with cell size of 1 mm. At SP1 and SP2, test material was living mosses and at SP3 – fallen birch and aspen leaves. Every test material was exposed for 2 years. Destruction rate was calculated as a weight loss for a particular time period. Composition of micromycetes which participated in plant material decomposition was assessed by the method of inoculation of soil extract to Getchinson's medium and acidified Czapek's medium (=4.5). Microbe number and biomass was analyzed by the method of luminescent microscopy. Chemical analysis of plant material was done in the certified Ecoanalytical Laboratory of the Institute of Biology Komi SC UrD RAS.

Finally, plant material destruction intensity was similar for study plots and comprised 40-44 % weight loss for 2 years. The strongest differences in plant material decomposition rate between undisturbed spruce forests and secondary after-cut stands were observed at first stages of destruction process. In the first exposition year, mineralizing processes were most active in undisturbed spruce forest. Decomposition rate in cuts at that period was less by a factor of 1.7-2.3. The highest diversity of moss-decomposing micromycetes (30 species of microscopic fungi of 13 genera) was found for undisturbed spruce forest (SP1). At cuts, the figures were 17 and 23 species of micromycetes, correspondingly. Succession change in composition of micromycetes was best pronounced in undisturbed spruce forest. At cuts, there was no clear mechanism of micromycetes species diversity change during plant waste decomposition. This could serve an anthropogenic disturbance marker of taiga ecosystems. Generally, microscopic moss- and leaf-decomposing fungi at all plots were very species specific.

Total biomass of microorganisms in microcosms at cuts was less than that at undisturbed spruce forest by 1.4-1.6 time. Its structure was dominated by mycelium and fungal spores (98-99 % total biomass). On leaf waste decomposition (SP3), microbe biomass got more bacteria.

By the obtained data, undisturbed middle-taiga spruce forests have better conditions for living activity of plant waste-decomposing microscopic fungi. This is evidenced by less species diversity of microscopic fungi, shorter length and less biomass of mycelium at cuts as compared with undisturbed spruce forests.