Geophysical Research Abstracts
Vol. 17, EGU2015-2864, 2015
EGU General Assembly 2015

The role of ectomycorrhizae of Arolla pine in mediating soil priming

Oleg Menyailo (1), Anastasia Matvienko (1), and Chih-Hsin Cheng (2)

(1) Institute of Forest SB RAS, Krasnoyarsk 660036, Russian Federation (menyailo@hotmail.com), (2) School of Forestry and Resources Conservation, National Taiwan University, Taipei, 106 Taiwan (chengch@ntu.edu.tw)

Ectomycorhizae is playing a vital role in soil C cycle. However, the role is controversial. Mycorrhizae could be a major source of soil C promoting C sequestration. On the other hand, mycorrhizal fungi could compete with soil free-living microorganisms for resources, accelerating their decomposition of soil organic matter, therefore leading to soil C losses.

We studied the contribution of ectomycorrhizae of Arolla pine, a popular tree species in Siberia, in soil priming, a short term changes in decomposition of soil organic matter after addition of glucose. We used in-growth mesh collars where mycorrhizal hyphae could or could not grow in. We applied 13C labeled glucose and measured evolution of CO_2 thereafter, and determined 13C-CO_2 using Picarro 2131 iCO_2 analyzer.

The CO_2 produced from soil was enriched 13C only during the first 48 hours, thereafter the enrichment declined to the natural abundance level. The maximum δ13C-CO_2 was observed during the first 20 min after glucose amendment. It is surprising that not more than 3% of applied C-glucose was recovered as C-CO_2 suggesting extremely high C use efficiency (97%). The glucose addition caused CO_2 flux to increase by 25-30% during the first two days, the amount of primed C-CO_2 was 7 times higher than emitted from applied C. The presence of mycorrhizae shifted both CUE and the priming. Mycorrhizae apparently competed with heterotrophs reducing their CUE by factor of 2, and increasing the priming by factor of 1.5.

Overall, mycorrhizae could amplify the priming effect increasing C losses. However, the most part of applied C was incorporated into microbial biomass, resulting at least at the short time scale in net C sequestration. Future studies should be directed to understanding of the long-term fate of C incorporated into microbial biomass.