EGU21-10461
https://doi.org/10.5194/egusphere-egu21-10461
EGU General Assembly 2021

Root exudates compounds and microbial community composition regulates CH4 dynamics in fire degraded tropical peatland

Massimo Lupascu[1,2], **Hasan Akhtar**[1,3,4], Aditya Bandla[4], Rahayu S Sukri[5], and Sanjay Swarup[3,4,6]
[1]National University of Singapore, Geography, Singapore, Singapore
[2]NUS Environmental Research Institute, Singapore
[3]NUS Life Sciences Institute, Singapore
[4]Singapore Centre for Environmental Life Sciences Engineering, Singapore
[5]Institute for Biodiversity and Environmental Research, Universiti Brunei Darussalam, Brunei Darussalam
[6]Department of Biological Sciences, National University of Singapore, Singapore

Fires and drainage are common disturbance factors in tropical peatlands (TP) in Southeast Asia. These disturbances alter the hydrology, vegetation composition, and peat biogeochemistry; thereby affecting the microbiome where microbial communities reside**.** Studies from northern peatlands have well established the role of vegetation composition in regulating the labile C, in the form of plant root exudates, and microbial community composition affecting the peat decomposition; however, for tropics, it remains unexplored. Recent studies have also established how these fire-degraded TP areas become a hot spot of sedge-mediated CH_4 emission. To further our understanding of control mechanisms regulating CH_4 dynamics, we investigated the composition of plant root exudates (n=3 per plant species) from sedges (Scleria sumatrensis) and ferns (Blechnum indicum, Nephrolepis hirsutula), the most commonly occurring plant species at our fire-degraded tropical peatland site in Brunei, Northwest Borneo, as well as microbial community composition in plant (n=9 for S. sumatrensis, and B. indicum, and n=5 for N. hirsutula) rhizo-compartments (rhizosphere, rhizoplane, endosphere).

Using a targeted analysis, we found that the root exudates compounds secreted from sedge (Scleria sumatrensis) and one species of fern (Blechnum indicum) were significantly different ($p<0.05$) and showed a similar ratio of 2:1 for sugars (glucose, fructose) and organic acids (acetate, formate, lactate, malate, oxalate, succinate, tartrate), which is in contrast to that secreted from trees in intact tropical peatlands (1:2). Further, using 16S rRNA gene amplicon sequencing, we found that the microbial community composition in rhizo-compartments of plant species showed significant differences ($p<0.001$). Interestingly, the sedge species harboured a relatively higher abundance of methanogens (Thermoplasmata) and lesser methanotrophs (Alphaproteobacteria, Gammaproteobacteria) across all three compartments compared to fern species, which further supports the higher sedge-mediated CH_4 emissions from fire-degraded TP.

Our results provide fresh insights into the effects of post-fire vegetation composition in regulating the labile C and microbial community composition, and hence affecting CH_4 emissions

from fire-degraded TP. Further, our results can form an important basis for future CH_4 dynamics studies as the emissions might increase with the expansion of degraded TPs as a consequence of frequent fire episodes and flooding