



Effect of mountain climatic elevation gradient and litter origin on decomposition processes: long-term experiment with litter-bags

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Temperature is one of the most important factors affecting soil organic matter decomposition. Mountain areas with vertical gradients of temperature and precipitation provide an opportunity to observe climate changes similar to those observed at various latitudes and may serve as an approximation for climatic changes. The aim of the study was to compare the effects of climatic conditions and initial properties of litter on decomposition processes and thermal sensitivity of forest litter. The litter was collected at three altitudes (600, 900, 1200 m a.s.l.) in the Beskidy Mts (southern Poland), put into litter-bags and exposed in the field since autumn 2011. The litter collected at single altitude was exposed at the altitude it was taken and also at the two other altitudes. The litter-bags were laid out on five mountains, treated as replicates. Starting on April 2012, single sets of litter-bags were collected every five weeks. The laboratory measurements included determination of dry mass loss and chemical composition (Corg, Nt, St, Mg, Ca, Na, K, Cu, Zn) of the litter. In the additional litter-bag sets, taken in spring and autumn 2012, microbial properties were measured. To determine the effect of litter properties and climatic conditions of elevation sites on decomposing litter thermal sensitivity the respiration rate of litter was measured at 5°C, 15°C and 25°C and calculated as Q10 L and Q10 H (ratios of respiration rate between 5° and 15°C and between 15°C and 25°C, respectively). The functional diversity of soil microbes was measured with Biolog[®] ECO plates, structural diversity with phospholipid fatty acids (PLFA). Litter mass lost during first year of incubation was characterized by high variability and mean mass lost ranged up to a 30% of initial mass. After autumn sampling we showed, that mean respiration rate of litter (dry mass) from the 600m a.s.l site exposed on 600m a.s.l. was the highest at each tested temperature. In turn, the lowest mean respiration rate was showed for litter from the 1200m a.s.l. exposed on 1200m a.s.l. sites. The higher elevation of liter exposition, the lower respiration rate was measured, however some interactions between litter origin and exposure elevation were detected. The opposite effects were found for Q10 ratios, that increase in the higher elevation of litter origin and the elevation of exposition. The higher Q10 values were obtained, both in lower and higher temperature range. These results are in contrast with our previous research on soil, as we did not find any dependences between elevation and Q10. However, decomposing litter may respond stronger on environmental conditions than soil. Litter-bags field exposition will be running up to autumn 2014y. The study is founding by the Polish State Committee for Scientific Research (Grant 0594/B/P01/2011/40).