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Honeydew Application to the organic Layer and the mineral Soil of a Rendzina - Aspects of C and N priming Effects and δ^{13}C Signatures in a Microcosm Approach

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In this meso-cosm experiment, the effects of low amounts of honeydew (obtained from *Phyllaphis fagi*) applied to the organic layer and the mineral soil of a Rendzina soil type were studied over three months with regard to potential C and N priming effects. The present work deals with the likely ecological implications of herbivory insect outbreaks on C and N cycling and the linkage of above and below ground processes in forest ecosystems.

The study was carried out in microcosms (18 cm in diameter) encompassing three different homogenized air dried soil materials 1. organic layer, 2. calcareous Ah horizon and 3. organic layer plus Ah horizon and two different treatments (irrigation with 25 mg honeydew TOC per week and a control treatment). Emissions of CO_2 over the incubation period were quantified by soda-lime traps. In soil solution DOC, DIC, totalN, NO_3-N and "rest"-N (totalN - NO_3-N) and pH were measured. In the soil and organic layer material the δ^{13}C signiture was detected before and after the experiment.

Preliminarily results supply evidence for a different response to low inputs of honeydew TOC depending on the soil material and the C and N fraction studied. Within the organic layer the input/output budgets showed that the low input of readily avail-

able organic C caused a positive C and N priming effect enhancing CO_2 production as well as DOC, DIC (dissolved organic and inorganic C) and total N and NO_3-N output fluxes with leachate compared to the control. However, in the Ah horizon set-ups, the honeydew input caused increased C output fluxes as DIC (plus 33%) and DOC (plus 13%) but decreased CO_2 fluxes (minus 11%) compared to the control, resulting in a net negative C priming effect. A negative priming effect was also observed for N, where the honeydew input led to significantly lower NO_3-N fluxes (- 43%), pointing to a microbial N immobilisation. In the combined set-ups (organic layer plus Ah horizon) the honeydew application induced a negative C priming effect and a nearly balanced N budget.

δ^{13}C measurements of the soil material before and after the incubation revealed an isotopic shift towards more “heavier” (enriched in ^{13}C) C in the organic material and towards “lighter” C in the mineral soil material.

In terms of soil solution composition, honeydew input changes flux proportions of C and N species especially in the Ah material. Furthermore, C is diverted from the CO_2 pathway to the DIC export by solution and the selective N-immobilisation increased the ratio of total N to NO_3-N in solution thus changing the quality of N in solution.