

^{13}C partitioning in rhizosphere and plant organs in the experiments with ^{13}C pulse labeling

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The fate of ^{13}C assimilated and translocated below ground after pulse labeling in the $^{13}\text{CO}_2$ enriched atmosphere was studied in greenhouse experiments with oat (*Avena sativa* L.) and maize (*Zea mays* L.). ^{13}C in carbon pools (roots, soil, microbial biomass, DOC, and $^{13}\text{CO}_2$ respired from soil) and individual compounds (non-structural carbohydrates, i.e. water soluble sugars and starch) was determined periodically during the first 165 h after the labeling. Rhizosphere was isolated from root-free soil with nylon bags made of nylon monofilament screen tissue (16 micrometer mesh). In both greenhouse experiments ^{13}C values in the rhizosphere carbon pools oscillated periodically depending on day/night changes, with the dynamics of ^{13}C in rhizosphere microbial C and DOC opposite to that for $\text{CO}_2 - ^{13}\text{C}$ fluxes immediately after the pulse-labeling: minima in microbial C and DOC coincided with the maxima in CO_2 emissions, and vice versa. The microbial biomass C accounted up to one third of ^{13}C translocated below ground in rhizosphere. Similar diurnal changes were found for dynamics of photo-assimilated ^{13}C in plant organs. Total ^{13}C in ears, roots and stems oscillated following day/night changes while total ^{13}C in leaves sharply decreased in first day after pulse labeling, with further slow dilution during days 2 – 3. ^{13}C percentage in pool of water-soluble photo-assimilates decreased gradually after pulse labeling with weak or even no diurnal fluctuations. In contrast to labeled water-soluble photosynthates, ^{13}C percentage in starch pool demonstrated day/night oscillations and tended to increase during the first 3 days after labeling. Thus, close inter-relations between the dynamics of ^{13}C in CO_2 efflux, microbial biomass, DOC and plant starch pool were revealed in diurnal scale both for oats and maize plants.

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