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Contributions of root and shoot derived-C to soil organic matter throughout an agricultural soil profile assessed by compound-specific ^{13}C analysis

Mercedes Mendez-Millan (1), Marie-France Dignac (1), Cornelia Rumpel (1), Daniel P Rasse (2), and Sylvie Derenne (3)

(1) Laboratoire de Biogéochimie et Ecologie des Milieux continentaux, UMR CNRS Université Paris 6, Bldg Eger, F-78850 Thiverval-Grignon, France, (2) Bioforsk, Norwegian Institute for Agricultural and Environmental Research, 1432 Ås, Norway, (3) UMR Bioemco, CNRS, UPMC, INRA, 4 place Jussieu, F-75005 Paris, France

The turnover of soil organic matter (SOM) is generally studied in the topsoil horizons, where the highest concentrations of organic carbon (OC) are found. Subsoils, although containing lower amounts of organic carbon compared to topsoils, greatly contribute to the total carbon stocks within a soil profile. An increase in SOM aliphaticity was observed during SOM degradation, and also down the soil profile, suggesting that the stable pool of SOM is enriched in aliphatic structures. These alkyl-C structures might mainly derive from cutins and suberins, two biomacromolecules, which contain biomarkers specific for shoot and root plant biomass. The aim of this study was to use cutin and suberin structural units to follow the incorporation of plant biomass originating from roots and shoots throughout an agricultural soil profile. We measured the ^{13}C natural abundance of root and shoot biomarkers in samples taken from 15 to 105 cm depth in a C_3/C_4 chronosequence. After 9 years of maize (C_4) cropping, the distribution of root biomarkers (diacids) significantly changed and their concentration increased compared to the wheat (CC_3) soil. The largest increase was observed at 60-75 cm where diacids reached up to 134 μg/gOC compared to 23 μg/gOC in the wheat soil. Higher inputs from maize root biomass are also suggested by an average ^{13}C enrichment of the root markers in the maize compared to the wheat soil.