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Dynamics of shoot vs. root C assessed by natural ^{13}C abundance of their biomarkers

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Cutins and suberins are biopolyesters that have been suggested to significantly contribute to the stable pool of soil organic matter (SOM). They might be used as tracers for the above- or belowground origin of plant material. The aim of this study was to evaluate the dynamics of shoot and root-derived biomarkers in soils using a wheat/maize (C_3/C_4) chronosequence. Our results suggest that α,ω-alkanedioic acids can be considered as root specific markers and mid-chain hydroxy acids as shoot specific markers of wheat and maize in this agricultural soil. The changes of the ^{13}C isotopic signatures of these markers with years of maize cropping after wheat evidenced their contrasted behaviour in soil. After 12 years of maize cropping, shoot markers present in soils probably originated from old C_3 vegetation suggesting that new maize cutin added to soils was mostly degraded within a year. The reasons for long-term stabilisation of shoot biomarkers remain unclear. By contrast, maize root markers were highly incorporated into SOM during the first six years of maize crop, which suggested a selective preservation of root biomass when compared to shoots, possibly due to physical protection. The contrasting distribution of the plant-specific monomers in plants and soils might be explained by different chemical mechanisms leading to selective degradation or stabilization of some biomarkers.