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Towards a simplified model of rhizodeposition on hydroponically-grown maize



A.L. Marchand, C. Robin, C. Nguyen

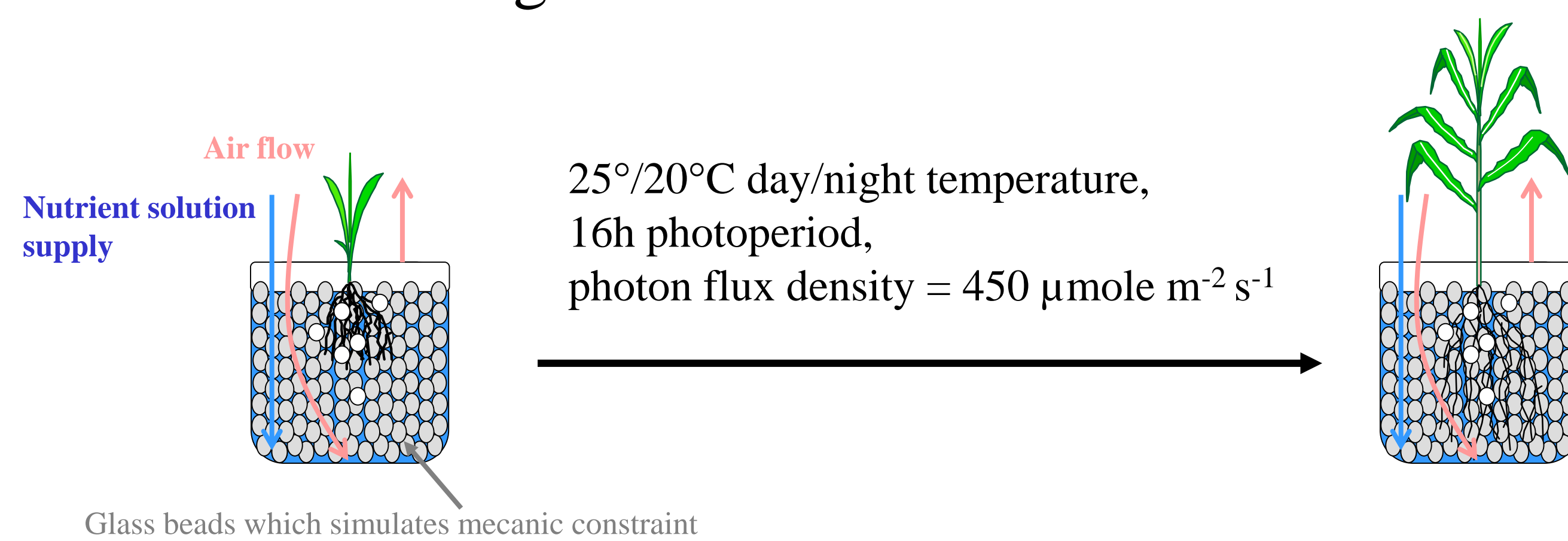
U.M.R. INRA-INPL(ENSAIA) Agronomie et Environnement Nancy-Colmar, BP 172, 54505 Vandoeuvre lès Nancy cedex, France, e-mail: marchand@ensaia.inpl-nancy.fr

Context

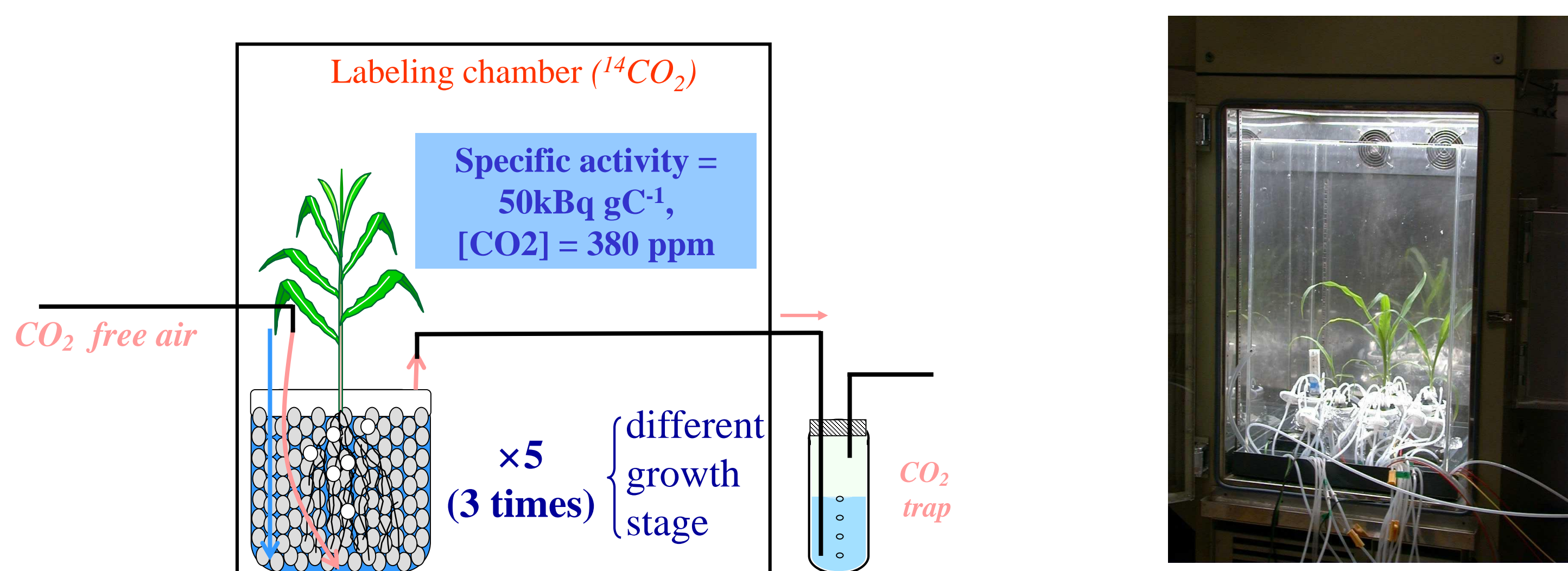
The knowledge of rhizodeposition process is essential to understand the functioning of soils. As it is yet not clearly understood, the aim of our study was to investigate the the different mechanisms by which C is lost by roots. In a prior study on a sandy-loamy soil, we shown a correlation between ^{14}C incorporated in the root compartment and ^{14}C residues into the soil. In order to shake off microflora respiration, this relation was investigated with hydroponic culture systems in sterile conditions.

Methodology

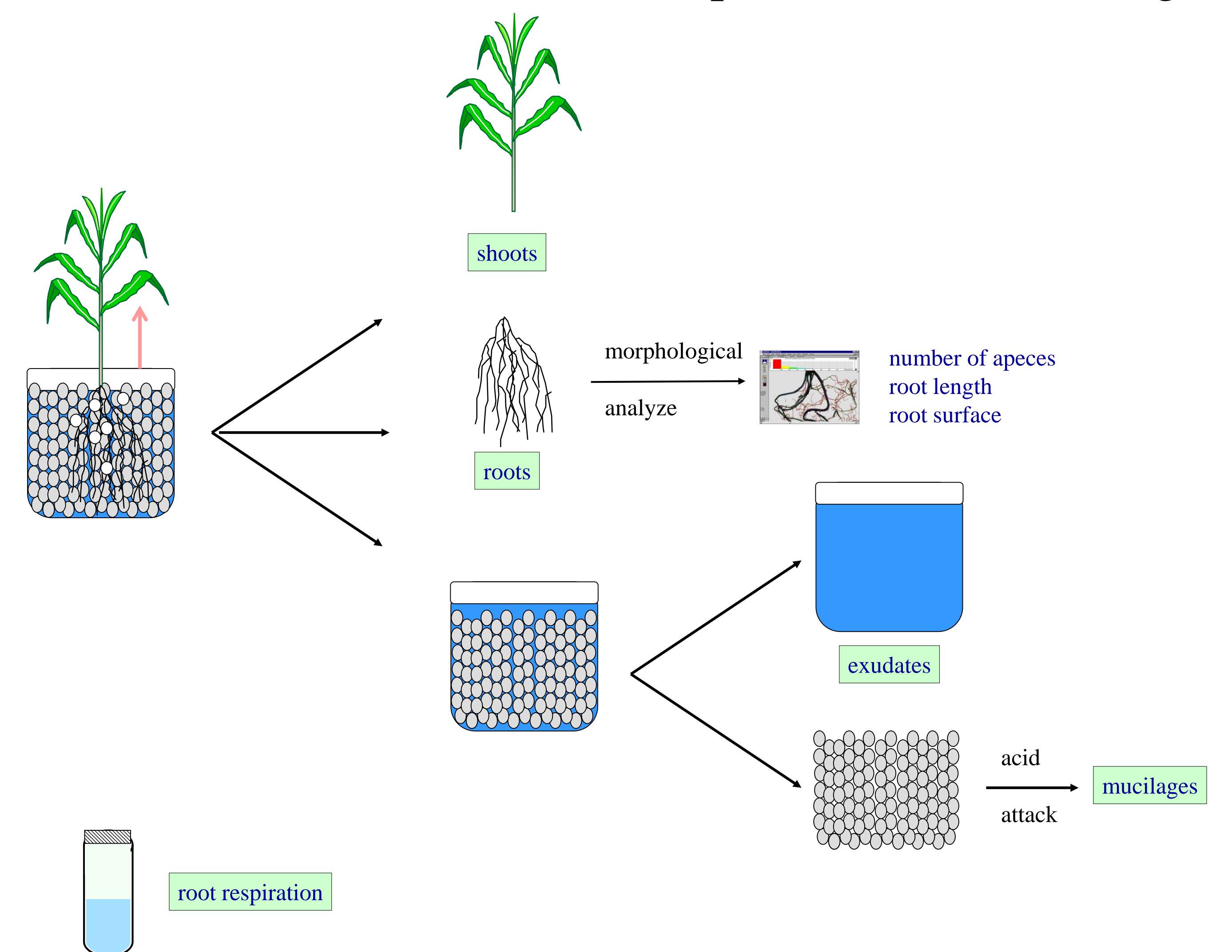
1) Maize plants (*Zea mays* L. cv. DEA) were surface sterilized and grown in sterile nutrient solution.



2) At different growth stages (2 to 7 leaves), shoots were pulse-labeled with $^{14}\text{CO}_2$ for 1.5 hour



3) Plants and device culture were sampled 48h after labeling

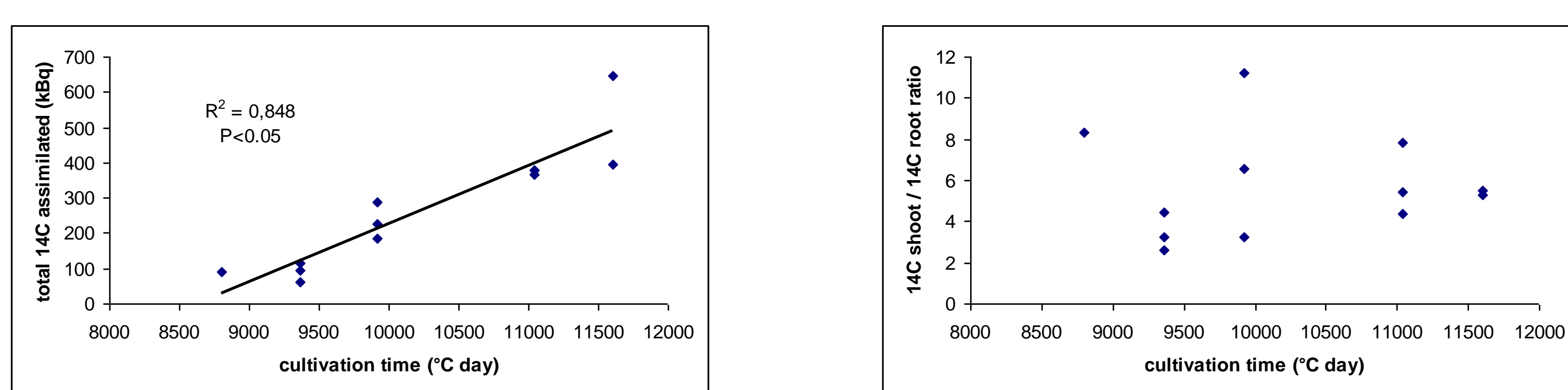


4) ^{14}C (kBq) of of each compartment was measured

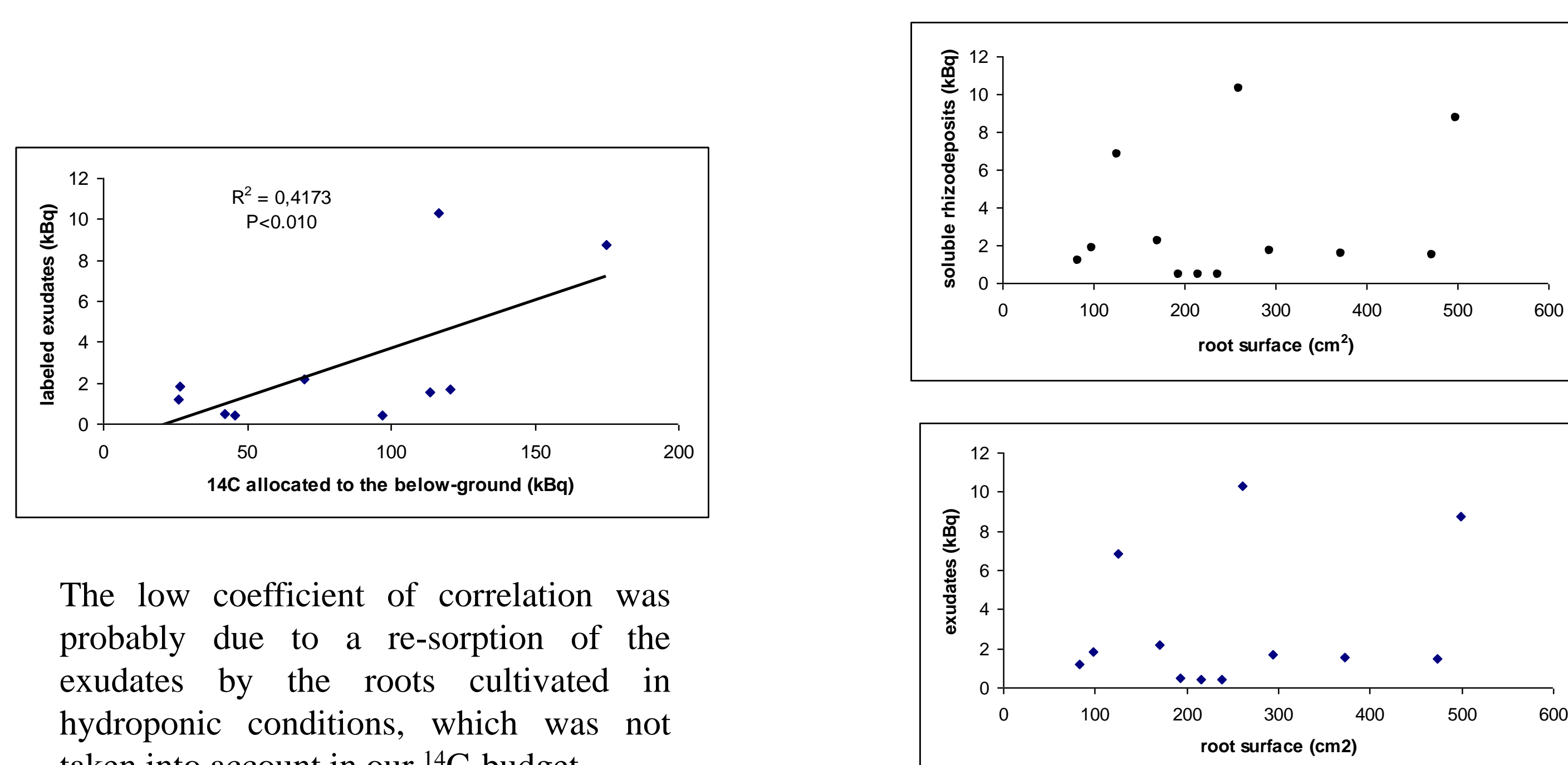
Results

The rhizodeposits were mainly composed by exudates (90.8%)

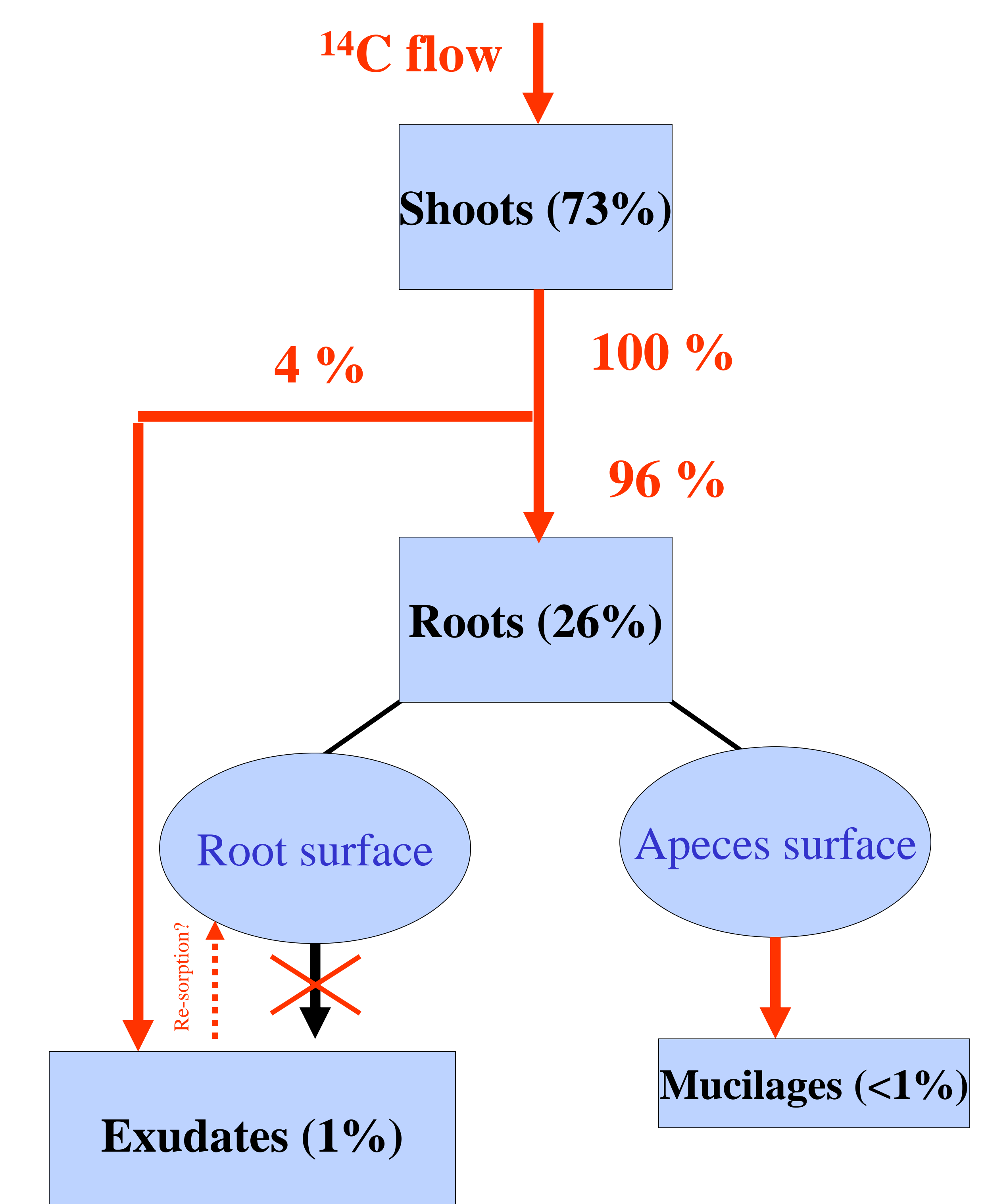
The plant growth varied, but not the percentage of ^{14}C -assimilates allocated from the shoots to the roots.



The quantity of labeled exudates was linearly correlated with the quantity of ^{14}C allocated to the below-ground, but not with the quantity of ^{14}C allocated to the roots, nor to the root surface.



The low coefficient of correlation was probably due to a re-sorption of the exudates by the roots cultivated in hydroponic conditions, which was not taken into account in our ^{14}C -budget



Percentage of assimilated ^{14}C recovered in shoots, roots (i.e. root structures and root respiration), and in the nutrient solution.

Conclusion

The rhizodeposits were mainly composed by exudates. No correlation was observed between assimilate incorporated in root structure and the exudation. However, significant relation was found between exudation and C allocated to the below-ground. These results should enable us to create a model of maize exudation starting from easily accessible variables such C recovered in shoots or cultivation time.