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Refining cotton-wick method for 15N plant labelling.

Joëlle Fustec and Stéphanie Mahieu

Ecole Supérieure d'Agriculture, Lab. of Plant Ecophysiology & Agroecology, Angers, France (j.fustec@groupe-esa.com, +33241235565)

The symbiosis Fabaceae/Rhizobiaceae plays a critical role in the nitrogen cycle. It gives the plant the ability to fix high amounts of atmospheric N. A part of this N can be transferred to the soil via rhizodeposition. The contribution of Fabaceae to the soil N pool is difficult to measure, since it is necessary for assessing N benefits for other crops, for soil biological activity, and for reducing water pollution in sustainable agriculture (Fustec, 2009). The aim of this study was to test and improve the reliability of the 15N cotton-wick method for measuring the soil N derived from plant rhizodeposition (Mahieu et al., 2007). The effects of the concentration of the 15N-urea labelling solution and of the feeding frequency (continuous or pulses) on the assessment of nitrogen rhizodeposition were studied in two greenhouse experiments using the field pea (Pisum sativum L.) and the non-nodulating isoline P2. The plant parts and the soil were prepared for 15N:14N measurements for assessing N rhizodeposition (Mahieu et al., 2009). The fraction of plants' belowground nitrogen allocated to rhizodeposition in both Frisson pea and P2 was 20 to more than 50% higher when plants were labelled continuously than when they were labelled using fortnightly pulses. Our results suggested that when 15N root enrichment was high, nitrogen rhizodeposition was underestimated only for plants that were 15N-fed by fortnightly pulses, and not in plants 15N-fed continuously. This phenomenon was especially observed for plants relying on symbiotic N fixation for N acquisition; it may be linked to the concentration of the labelling solution. In conclusion, N rhizodeposition assessment was strongly influenced by the 15N-feeding frequency and the concentration of the labelling solution. The estimation of N rhizodeposition was more reliable when plants were labelled continuously with a dilute solution of 15N urea.

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