



# Variation of $^{13}\text{C}$ and $^{15}\text{N}$ enrichments in different plant components of labeled winter wheat (*Triticum aestivum* L.)

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## ABSTRACT

Information on the homogeneity and distribution of  $^{13}\text{C}$  carbon ( $^{13}\text{C}$ ) and nitrogen ( $^{15}\text{N}$ ) labeling in winter wheat (*Triticum aestivum* L.) is limited. We conducted a dual labeling experiment to evaluate the variability of  $^{13}\text{C}$  and  $^{15}\text{N}$  enrichment in aboveground parts of labeled winter wheat plants. Labeling with  $^{13}\text{C}$  and  $^{15}\text{N}$  was performed on non-nitrogen fertilized ( $-N$ ) and nitrogen fertilized ( $+N$ , 250 kg N ha<sup>-1</sup>) plants at the elongation and grain filling stages. Aboveground parts of wheat were destructively sampled at 28 days after labeling. As winter wheat growth progressed,  $\delta^{13}\text{C}$  values of wheat ears increased significantly, whereas those of leaves and stems decreased significantly. At the elongation stage, N addition tended to reduce the aboveground  $\delta^{13}\text{C}$  values through dilution of C uptake. At the two stages, upper (newly developed) leaves were more highly enriched with  $^{13}\text{C}$  compared with that of lower (aged) leaves. Variability between individual wheat plants and among pots at the grain filling stage was smaller than that at the elongation stage, especially for the  $-N$  treatment. Compared with those of  $^{13}\text{C}$  labeling, differences in  $^{15}\text{N}$  excess between aboveground components (leaves and stems) under  $^{15}\text{N}$  labeling conditions were much smaller. We conclude that non-N fertilization and labeling at the grain filling stage may produce more uniformly  $^{13}\text{C}$ -labeled wheat materials, whereas the materials were more highly  $^{13}\text{C}$ -enriched at the elongation stage, although the  $\delta^{13}\text{C}$  values were more variable. The  $^{15}\text{N}$ -enriched straw tissues via urea fertilization were more uniformly labeled at the grain filling stage compared with that at the elongation stage.

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