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Abstract

Carbon (C) and nitrogen (N) are essential elements for plant, animal and microorganism growth. The C and N metabolisms have long been known to be coupled, and this is required for adjusting nitrogen use efficiency (NUE). Currently, improving the plant NUE is an important research question in order to reduce the production costs and environmental risks linked to N leakage in the environment. However, it remains unclear how a deregulation of sugar transport impacts N allocation despite their intricate relationship. Here we investigated, in Arabidopsis, the consequences of the simultaneous disruption of the genes coding for the sugar transporters *SWEET11*, *SWEET12*, *SWEET16,* and *SWEET17* genes on various anatomical and physiological traits ranging from the stem's vascular system development, plant biomass production, seed yield, and N remobilisation and NUE. The results show that intracellular sugar exchanges mediated by SWEET16 and SWEET17 proteins specifically impact vascular development but do not play a significant role in the distribution of N in plant organs. In contrast, we showed that the double mutant *swt11swt12* is also impacted in the vascular development in stem and displayed an improved NUE and nitrogen remobilisation to seeds. Our results thus deepen the link between sugar transport, C/N allocation and vascular system development.