

Amino acids in motion: role of the UmamiT family in the transport of nitrogen in maritime pine.

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Abstract

Nitrogen (N) is a limiting and fundamental element for the development and growth of plants, due to its presence in essential components such as nitrogenous bases, nucleic acids and amino acids (Yao *et al.* 2020). The coniferous species maritime pine (*Pinus pinaster* Ait.) has been used as a model for the study of nitrogen metabolism, accumulating numerous genomic and transcriptomic studies that have shed light on the understanding of nitrogen management in forest trees (Cañas *et al.* 2017, Ávila *et al.* 2022).

Therefore, it is crucial to understand how organic nitrogen is mobilised between different compartments for its assimilation. The recently identified UmamiTs (Usually Multiple Acids Move In and out Transporter) (Zhao *et al.* 2021, Cao *et al.* 2025) play a key role in this process, along with other amino acid transporters including AA permeases (AAPs) and cationic transporters (CATs).

In this study we focused on the role of the UmamiT family members in maritime pine, we conducted phylogenetic and expression analyses, which revealed different subcellular locations. These findings suggest that UmamiT transporters may facilitate N movement between cellular compartments, ensuring its mobilization and storage. This function appears to be critical in key physiological processes, including phloem and xylem loading and unloading, embryogenesis and N remobilisation.

To further explore these roles, we have performed functional studies on selected candidate transporters, deciphering their specific contributions to amino acid exchange across compartments. Our results provide valuable insights into nitrogen assimilation in pine and offer promising implications for enhancing plant growth and forestry practices aimed at sustainable ecosystems development.

Keywords: *transport, amino acids, Pinus pinaster.*

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