Research uncovers new strategy for salt-resistant poplar

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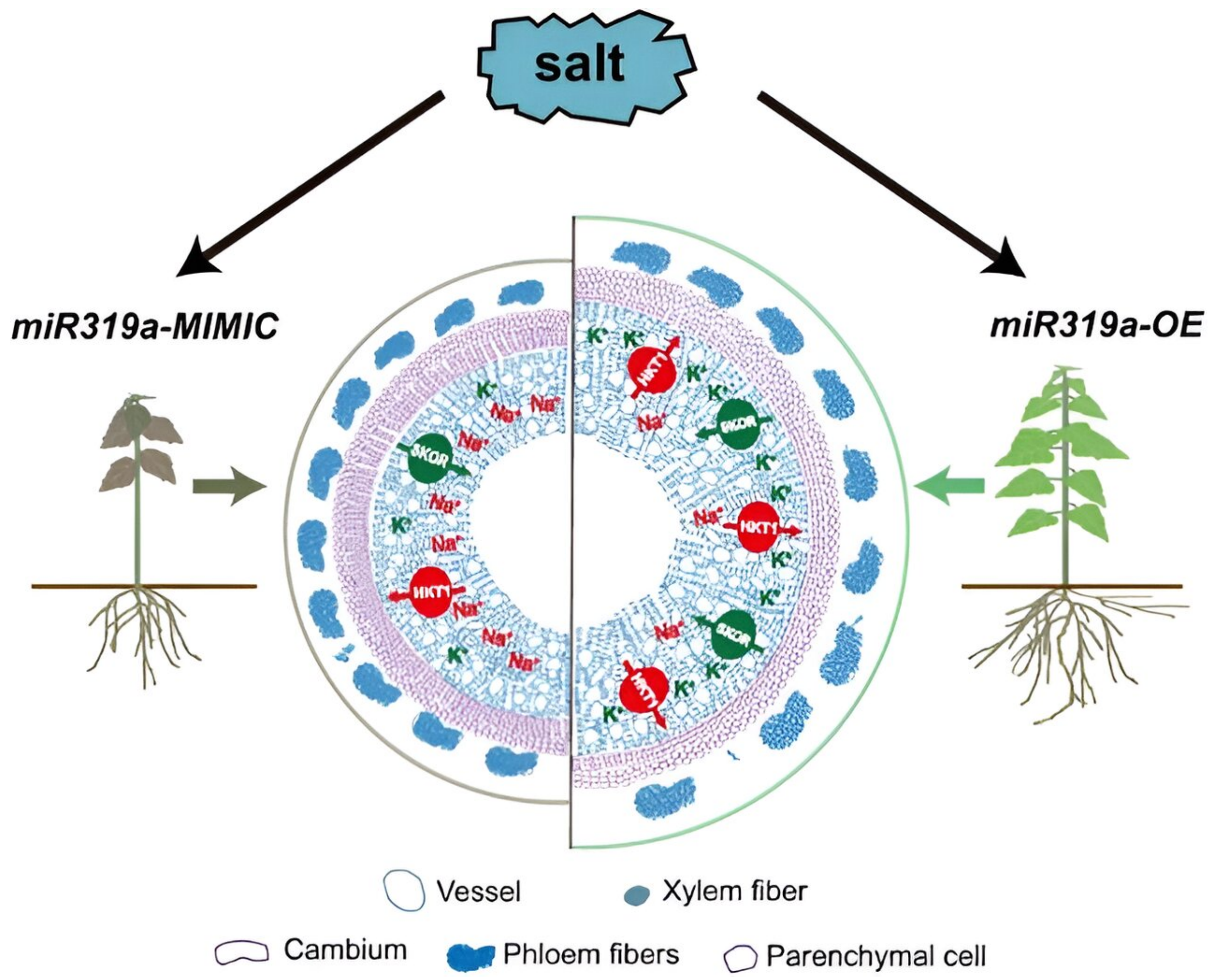

A proposed model of the miR319a-mediated enhancement salt tolerance in poplar. Credit: *Horticulture Research* (2024). DOI: 10.1093/hr/uhae157

Salt stress disrupts plant growth by impairing ion balance and reducing water uptake, posing a significant challenge to agriculture and forestry. Maintaining sodium (Na^+) and potassium (K^+) balance is particularly vital in woody plants like poplar, which exhibit unique secondary growth. However, the pathways enabling salt tolerance in trees are not well understood, especially compared to herbaceous plants.

Due to these challenges, deeper exploration of the regulatory mechanisms and structural adaptations in trees is essential for enhancing their resilience to salinity.

A team from the Chinese Academy of Forestry and Qingdao Agricultural University has revealed a novel function of miR319a in boosting salt tolerance in poplar. Published in *Horticulture Research* on June 7, 2024, the study shows that overexpressing miR319a induces key structural changes in xylem vessels, enhancing ion transport and stress resilience.

These findings highlight miR319a's role in coordinating xylem development and ion homeostasis, presenting new avenues for improving salt tolerance in woody plants—a critical trait for sustainable forestry and agriculture.

The research by Cheng and colleagues uncovers miR319a's dual function in regulating salt stress response and secondary xylem development in poplar. miR319a overexpression leads to thicker xylem layers, increased vessel number and size, and thinner cell walls, which improve the plant's ability to transport Na^+ and K^+ ions.

This structural adaptation is linked to the upregulation of key ion transporters, PagHKT1;2 and PagSKOR1-b, vital for Na^+ efflux and K^+ influx. In contrast, miR319a-MIMIC plants, which suppress miR319a, show narrower xylem, reduced vessel numbers, and thicker walls, resulting in compromised ion transport and increased salt sensitivity.

These insights position miR319a as a promising target for enhancing salt resilience in trees.

"Deciphering how miR319a influences xylem development and ion transport under salt stress marks a significant advancement in plant stress biology," said Dr. Quanzi Li, a senior researcher on the study.

"Our research not only unveils the intricate connection between xylem structure and ion regulation but also suggests new genetic strategies to boost salt tolerance in trees. This work lays the groundwork for developing salt-resistant tree varieties, which are crucial as we face rising soil salinity and climate challenges."

The study's findings hold significant promise for forestry and agriculture, particularly in salt-affected regions. By leveraging miR319a, it may become feasible to engineer poplar varieties with enhanced salt tolerance, improving biomass production and ecological resilience.

Moreover, the regulatory pathways identified could extend to other woody species, providing a strategic approach to developing stress-resistant trees that can thrive in harsh environments, supporting sustainable forestry and biodiversity conservation.

More information: Yanxia Cheng et al, MiR319a-mediated salt stress response in poplar, *Horticulture Research* (2024). DOI: 10.1093/hr/uhae157

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