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Proyecto: Local auxin biosynthesis regulates plant architecture in response to environmental cues.

Plants exhibit a remarkable capacity to integrate external environmental cues with their own internal developmental programs to always adapt their growth and development to dynamic conditions. This adaptive ability has been shaped over millions of years of evolution and increasingly underscores the key role plant hormones play in the information integration process.

Auxin is a fundamental plant hormone accountable for many aspects of plant development and its regulation in response to environmental variations. In other words, auxin modulates the adaptability of plants to different environments or conditions. Auxin morphogenic gradients govern stem cell niches and cellular differentiation, determining cell fate. The polar transport of auxin is essential for creating and maintaining the auxin gradients. However, recent discoveries highlighting the refined spatiotemporal expression patterns of auxin biosynthesis genes, such as the TAA1/TAR and YUC families, suggest that local auxin biosynthesis also has a major contribution to the formation of the auxin gradients.

Our previous studies demonstrated the cooperative role of local auxin biosynthesis and transport being individually dispensable for establishing and maintaining root meristems. Conversely, processes like flower fertility and specific root responses to environmental signals require local auxin production, as transport alone fails to entirely compensate for generating auxin gradients. The current TFM focuses on investigating the impact of local auxin biosynthesis on the plant architecture in response to environmental cues. Specifically, we explore how diverse environmental factors —such as temperature and light quality— affect a plant's capacity to develop vascular tissue, elongate its hypocotyl and grow new leaves in response to these external stimuli. This research holds crucial significance in the context of climate change and sustainable agricultural practices.

Our objective is to pinpoint key genes and their precise spatiotemporal expression patterns that drive local auxin biosynthesis responsible for vasculature development, contribute to the stem elongation, and affect plant growth in response to temperature and light. This knowledge, in the future, can be used to develop biotechnological tools with the potential to enhance agricultural systems.

Keywords: plant development; local auxin biosynthesis; polar auxin transport; auxin maxima; morphogenic gradient; plant architecture; environmental cues; climate change.

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