Regulatory effects of jasmonate on root growth inhibition and root hair elongation

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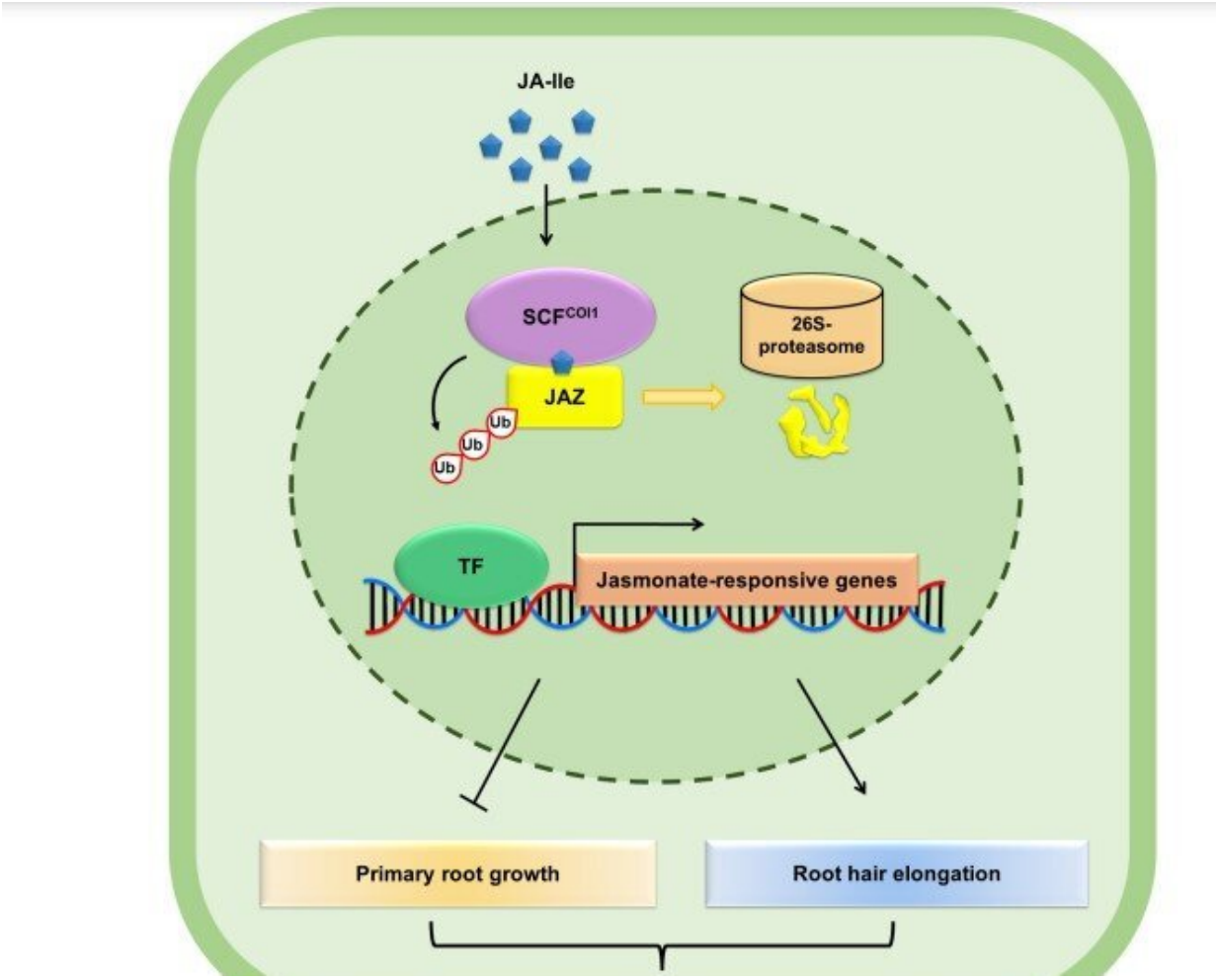

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Jasmonate is a critical phytohormone that regulates plant development and adaptation to external conditions. In response to an exposure biotic or abiotic stress, jasmonate accumulates in plants, leading to root growth inhibition and/or root hair elongation. Therefore, jasmonate-regulated root growth and root hair development is vital for plant development and adaptations to environmental conditions. However, the molecular basis of jasmonate-mediated root growth and root hair development is relatively uncharacterized.

In a study published in the *Journal of Experimental Botany*, researchers from the Xishuangbanna Tropical Botanical Garden (XTBG) of the Chinese Academy of Sciences summarized the current knowledge concerning the regulatory effects of jasmonate on root growth inhibition and root hair elongation. They found that jasmonate proteins interact with other transcription factors to regulate jasmonate-induced root growth inhibition and/or root hair elongation.

According to the researchers, perception of environmental stresses promotes the accumulation of jasmonate which is sensed by the CORONATINE INSENSITIVE1 (COI1)-JASMONATE ZIM-DOMAIN (JAZ) co-receptor, triggering the degradation of JAZ repressors and induction of transcriptional reprogramming. The basic helix-loop-helix (bHLH) subgroup IIIe transcription factors MYC2, MYC3, and MYC4 are the most extensively characterized JAZ-binding factors and together stimulate jasmonate-signaled primary root growth inhibition.

Conversely, the bHLH subgroup IIId transcription factors (i.e., bHLH3 and bHLH17) physically associate with JAZ proteins and suppress jasmonate-induced root growth inhibition.

For root hair development, JAZ proteins interact with and inhibit ROOT HAIR DEFECTIVE 6 (RHD6) and RHD6 LIKE1 (RSL1) transcription

factors to modulate jasmonate-enhanced root hair elongation.

Moreover, jasmonate also interacts with other signaling pathways (such as ethylene and auxin) to regulate primary root growth and/or root hair elongation.

"Future studies are expected to characterize molecular mechanisms underlying how jasmonate enhances the environmental adaptability of plants in extreme environments (e.g., nutrient deficiency, alkaline stress, high temperature stress, and heavy metal toxicity)," said Hu Yanru of XTBG.

More information: Xiao Han et al, Jasmonate-regulated Root Growth Inhibition and Root Hair Elongation, *Journal of Experimental Botany* (2022). DOI: 10.1093/jxb/erac441

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