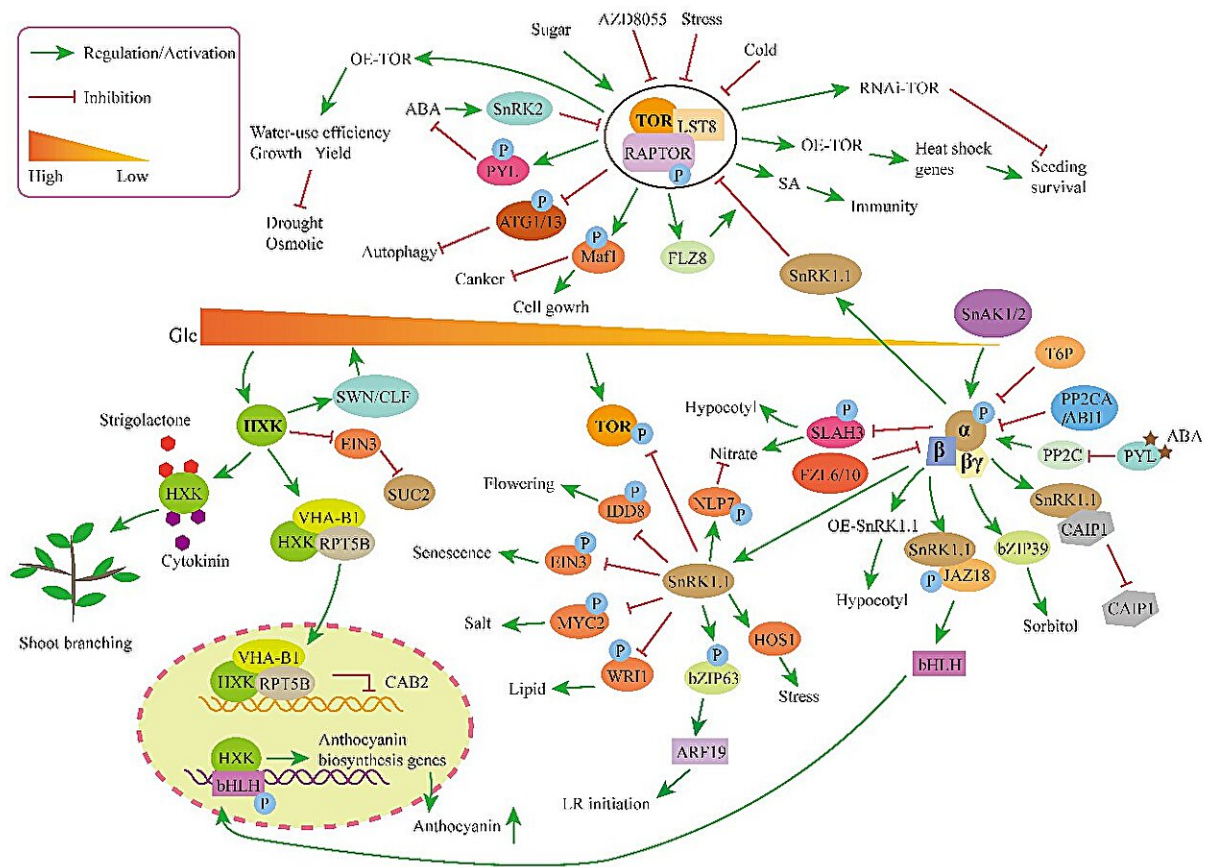


A systematic review of three key sugar metabolism proteins: HXK, SnRK1 and TOR

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HXK, SnRK1 and TOR signaling networks in plant growth and development.
Credit: The authors

Sugar signaling is one of the most important regulatory signals for plant growth and development, and its metabolic network contains many regulatory factors. Sugar signaling molecules regulate cellular activities and organismal development by interacting with other intrinsic regulators and environmental cues. HXK, SnRK1 and TOR are three proteins that play key roles in the plant sugar metabolism network.

HXK is the first glucose sensor identified in plants and also plays an important role in phytohormone signaling and abiotic stress. SnRK1 is a conserved key regulator of plant growth that regulates plant growth and maintains energy homeostasis under energy stress. TOR is an atypical serine/threonine [protein](#) kinase that is highly conserved in living organisms. TOR serves as a key signaling integrator that controls diverse cellular processes such as organ growth, cellular metabolism and transcriptional reprogramming in response to nutrient and hormonal cues and stress conditions.

These three proteins not only regulate sugar signaling, but also show some signaling crosstalk in the regulation of plant growth and development and [abiotic stress](#).

In April 2024, *Horticulture Research* published a review titled "[The critical roles of three sugar-related proteins \(HXK, SnRK1, TOR\) in regulating plant growth and stress responses](#)", which was co-authored by Ying Zhao, Associate Professor of Ningxia University, and Guangshuo Li, Ph.D. of the University of Copenhagen, Denmark.

The review first systematically discussed the basic functions of the three proteins, HXK, SnRK1 and TOR, summarized how the three proteins regulate plant sugar metabolism and response to stress, and finally further explored the regulatory networks of the three proteins and the signaling crosstalk among them.

This paper aims to provide some clues for further investigation of the signaling crosstalk between the three proteins, HXK, SnRK1 and TOR, and the regulatory networks in which they are involved.

The three proteins, HXK, SnRK1 and TOR, play important roles in [plant growth](#), metabolic regulation and environmental stress response.

Therefore, the regulation of these three proteins in horticultural plants is expected to improve [crop quality](#), increase yield and enhance plant resistance to various stresses, providing an important theoretical and practical basis for horticultural plant improvement and breeding.

In particular, exploring the balanced coordination network between TOR and SnRK1 will help to regulate the size and quality of horticultural fruits at the [molecular level](#) in the future, and improve the quality characteristics of horticultural fruits, such as texture, color and flavor, and promote the development of plant science.

More information: Guangshuo Li et al, The critical roles of three sugar-related proteins (HXK, SnRK1, TOR) in regulating plant growth and stress responses, *Horticulture Research* (2024). [DOI: 10.1093/hr/uhae099](#)

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