Boosting Terpene Production to Enhance Plant Drought Tolerance

Background/Objective

- This study examines how the stress-induced molecule GABA regulates terpene biosynthesis and enhances drought tolerance in *Sindora glabra*, with a particular focus on the role of the autophagy protein SgATG8a in modulating terpene production under abiotic stress.

Approach

This research employed a combination of physiological, molecular, and biochemical approaches, including:

- Assessing drought tolerance in GABA-treated *S. glabra* via chlorophyll fluorescence and leaf weight.
- Overexpressing SgATG8a in *Arabidopsis*; measuring stress response and terpene content.
- Identifying WRKY13, ERF4, and LecRK1 as SgATG8a partners via Y2H, Co-IP, and luciferase assays.

Results

- GABA treatment in *S. glabra* upregulated *SgTPS* genes, boosted terpene levels, and enhanced drought tolerance and photosynthesis.
- Overexpression of *SgATG8a* in *Arabidopsis* increased terpene production and improved drought resilience.
- Transcription factors WRKY13 and ERF4 interact with SgATG8a to activate *SgTPS3*, while LecRK1 phosphorylates them to fine-tune this regulatory complex.

Significance/Impacts

- This study uncovers a GABA–terpene signaling pathway where GABA enhances drought tolerance by activating terpene biosynthesis through the autophagy protein SgATG8a. SgATG8a forms a complex with WRKY13, ERF4, and LecRK1 to regulate terpene synthase genes like *SgTPS3*. This pathway links stress signaling to secondary metabolism and offers potential for engineering drought-resilient, terpene-rich crops.

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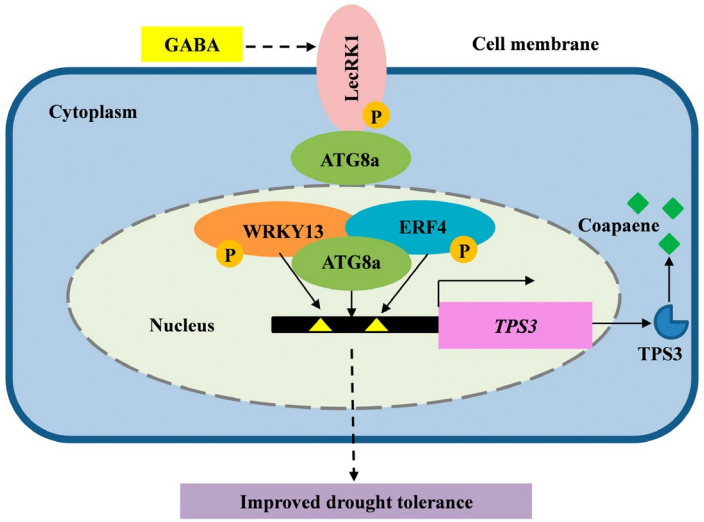
Working model of GABA-regulated terpene biosynthesis



Protein interaction among LecRK1, SgATG8a, ERF4, and WRKY13