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Title: Low-temperature tolerance in land plants: Are transcript and membrane responses conserved?

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## **Review: Low-temperature tolerance in land plants: Are transcript and membrane responses conserved?**

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### **Highlights**

- Shared transcriptional responses to low temperature occur across multiple species.
- Membrane changes in response to low temperature differ within reports from the same species.
- Severity, day-length, timing, and light intensity vary across low-temperature stress treatment protocols.
- Clear plant phenotype reporting clarifies plant stress severity between studies.

### **Abstract**

Plants' tolerance of low temperatures is an economically and ecologically important limitation on geographic distributions and growing seasons. Tolerance for low temperatures varies significantly across different plant species, and different mechanisms likely act in different species. In order to survive low-temperature stress, plant membranes must maintain their fluidity in increasingly cold and oxidative cellular environments. The responses of different species to low-temperature stress include changes to the types and desaturation levels of membrane lipids, though the precise lipids affected tend to vary by species. Regulation of membrane dynamics and other low-temperature tolerance factors are controlled by both transcriptional and post-transcriptional mechanisms. Here, we review low-temperature induced

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