

# NAC-mediated membrane lipid remodeling negatively regulates fruit cold tolerance

August 10 2022

---



Credit: Pixabay/CC0 Public Domain

NAC transcription factors (TFs) are involved in regulating complex signaling networks that respond to various abiotic stresses. However, it is unknown whether NAC TFs can negatively regulate fruit cold tolerance

by regulating phospholipid degradation to produce PA. Thus, there is an urgent need to investigate the functions of cold-responsive NAC TFs in regulating phospholipid degradation to produce PA and to improve the understanding of plant responses to cold stress.

Recently, Professor Zhenfeng Yang from Zhejiang Wanli University and his collaborators published a research article in *Horticulture Research*. This article suggests a [lipid metabolism](#)-based regulatory mechanism by which NAC TFs negatively regulate cold tolerance in banana and transgenic tomato fruits.

The authors found that cold stress generates high levels of PA to induce CI in banana fruit, but ethylene inhibits the accumulation of PA, suggesting that ethylene-mediated inhibition of PA accumulation is an important mechanism for enhancing cold tolerance in banana [fruit](#). They also identified 13 genes responsible for phospholipid degradation to produce PA in bananas during cold stress.

This research revealed that two nuclear NAC TFs, MaNAC25 and MaNAC28, negatively regulate cold tolerance in banana and transgenic tomato fruits by positively modulating phospholipid degradation to produce PA and CI. Transient expression assays in tobacco leaves further verified that MaNAC25 and MaNAC28 can directly bind to the promoters of 13 phospholipid degradation genes to positively regulate their transcription. However, the authors also found that ethylene can inhibit the upregulated expression of MaNAC25, MaNAC28, and phospholipid degradation genes.

Furthermore, this research demonstrated that MaNAC25 and MaNAC28 formed a positive feedback loop to induce the transcription of phospholipid-degradation genes and PA production. However, ethylene indirectly reduces PA by inhibiting the activation of MaNAC25 and MaNAC28 via this positive feedback loop. The authors added, "To our

knowledge, this is the first study to report that NAC TFs co-regulate ethylene-mediated cold tolerance by modulating phospholipid degradation to produce PA in banana fruits."

In conclusion, the authors proposed a hypothetical working model in which MaNAC25 and MaNAC28 regulate [ethylene](#)-mediated cold tolerance by modulating phospholipid degradation to produce PA in banana and transgenic tomato fruits. "We believe this research will strengthen our understanding of the co-regulatory mechanism of NACs in phospholipid degradation to produce PA and [membrane lipid](#) remodeling to negatively regulate cold tolerance in certain cold-sensitive fruits," the authors stated.

**More information:** Chunbo Song et al, NAC-mediated membrane lipid remodeling negatively regulates fruit cold tolerance, *Horticulture Research* (2022). [DOI: 10.1093/hr/uhac039](https://doi.org/10.1093/hr/uhac039)

Provided by Nanjing Agricultural University The Academy of Science

Citation: NAC-mediated membrane lipid remodeling negatively regulates fruit cold tolerance (2022, August 10) retrieved 10 July 2024 from <https://phys.org/news/2022-08-nac-mediated-membrane-lipid-remodeling-negatively.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.