

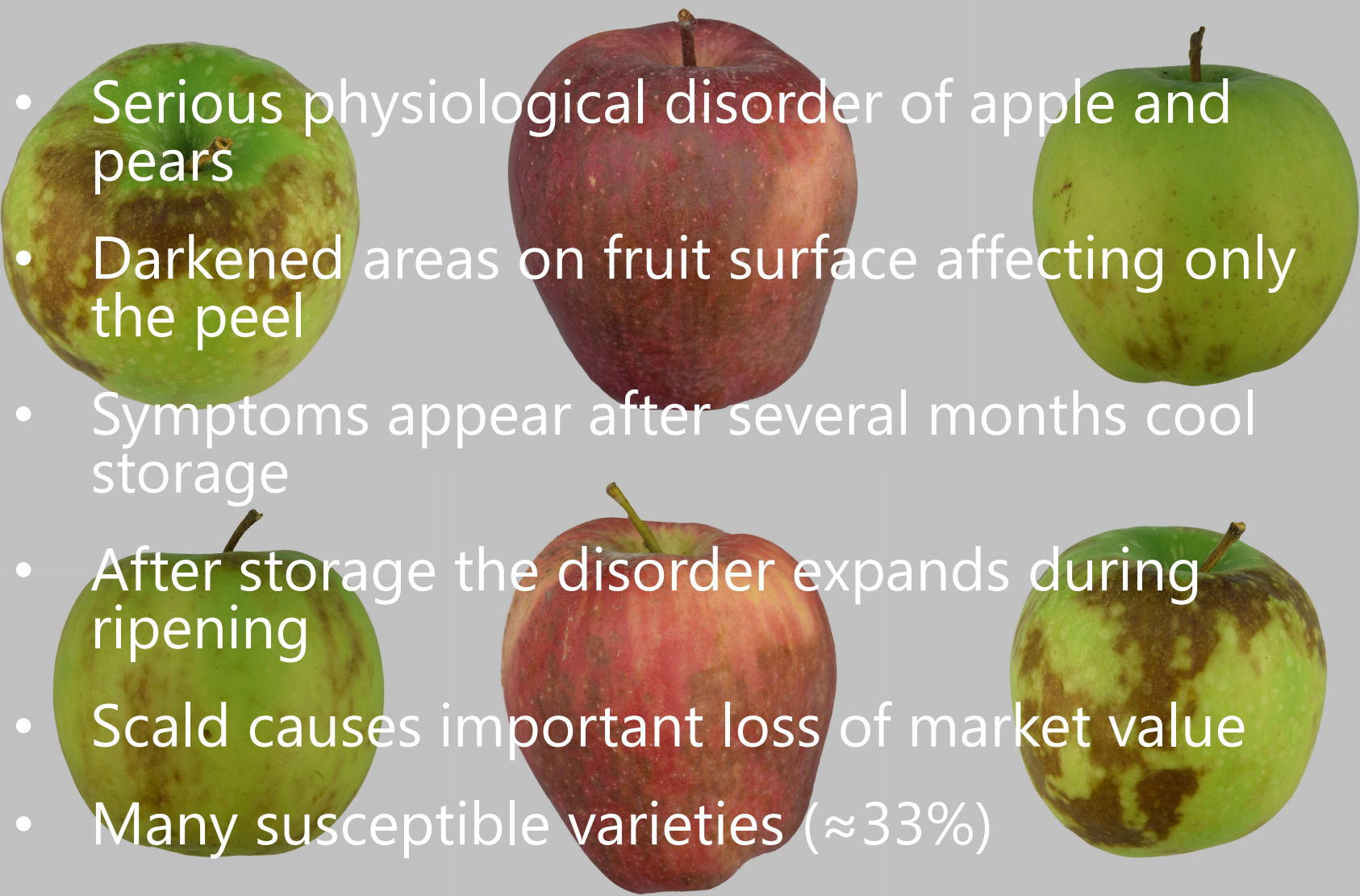


Scanning Report 2018

Superficial Scald Management: An Overview

Angelo Zanella, Stefan Stürz

Superficial Scald: Symptoms

- 
- Serious physiological disorder of apple and pears
 - Darkened areas on fruit surface affecting only the peel
 - Symptoms appear after several months cool storage
 - After storage the disorder expands during ripening
 - Scald causes important loss of market value
 - Many susceptible varieties ($\approx 33\%$)

Etiology of Superficial Scald

- Induction:
 - Chilling shock at the beginning of storage

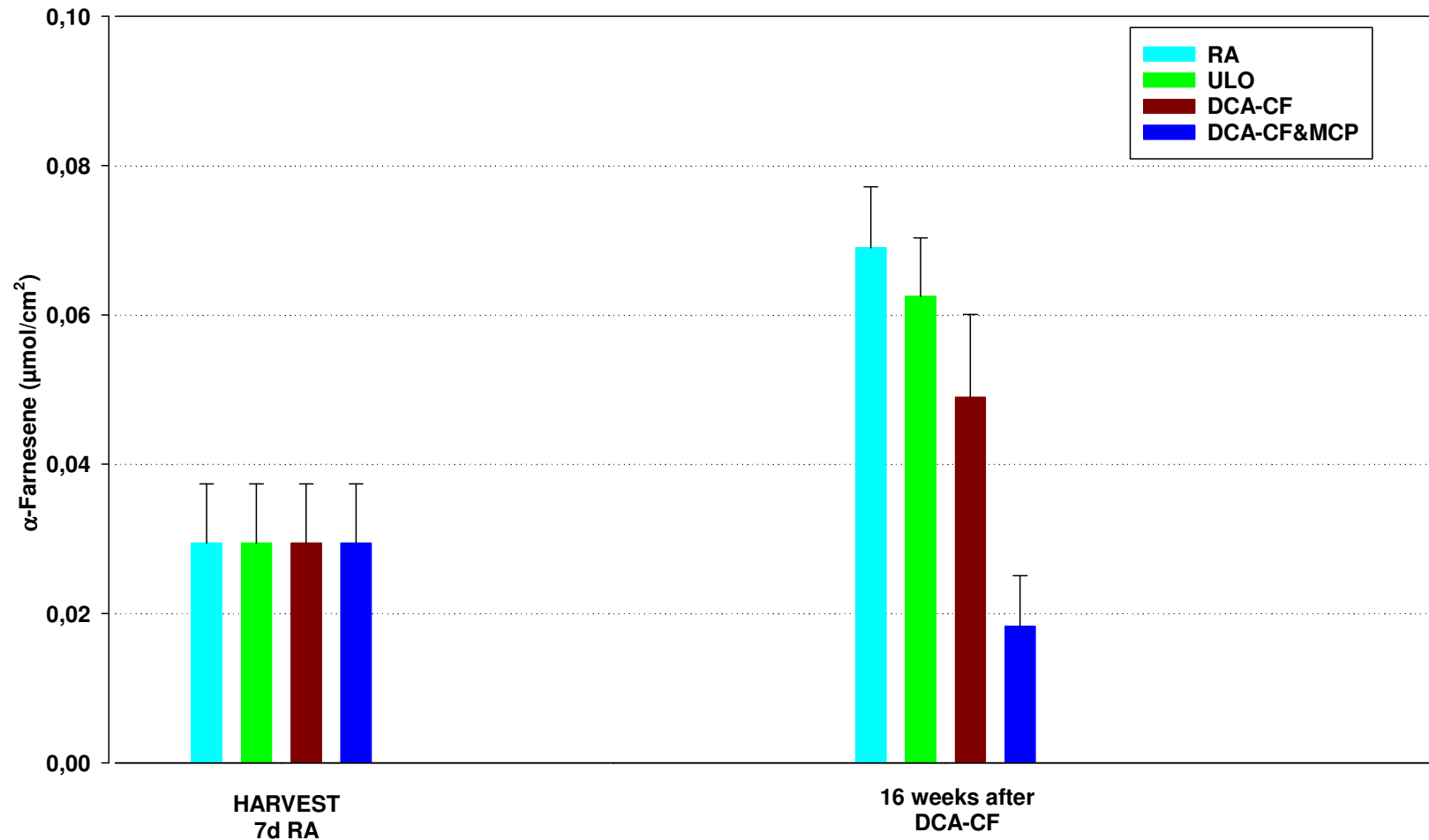
- Development:
 - Ethylen-dependent
 - CA-dependent

Preventing Induction of Superficial Scald

- Induction:
 - Chilling shock at the beginning of storage
- Prevention efforts:
 - Different conditioning treatments:
 - Slower cooling
 - Stepwise cooling

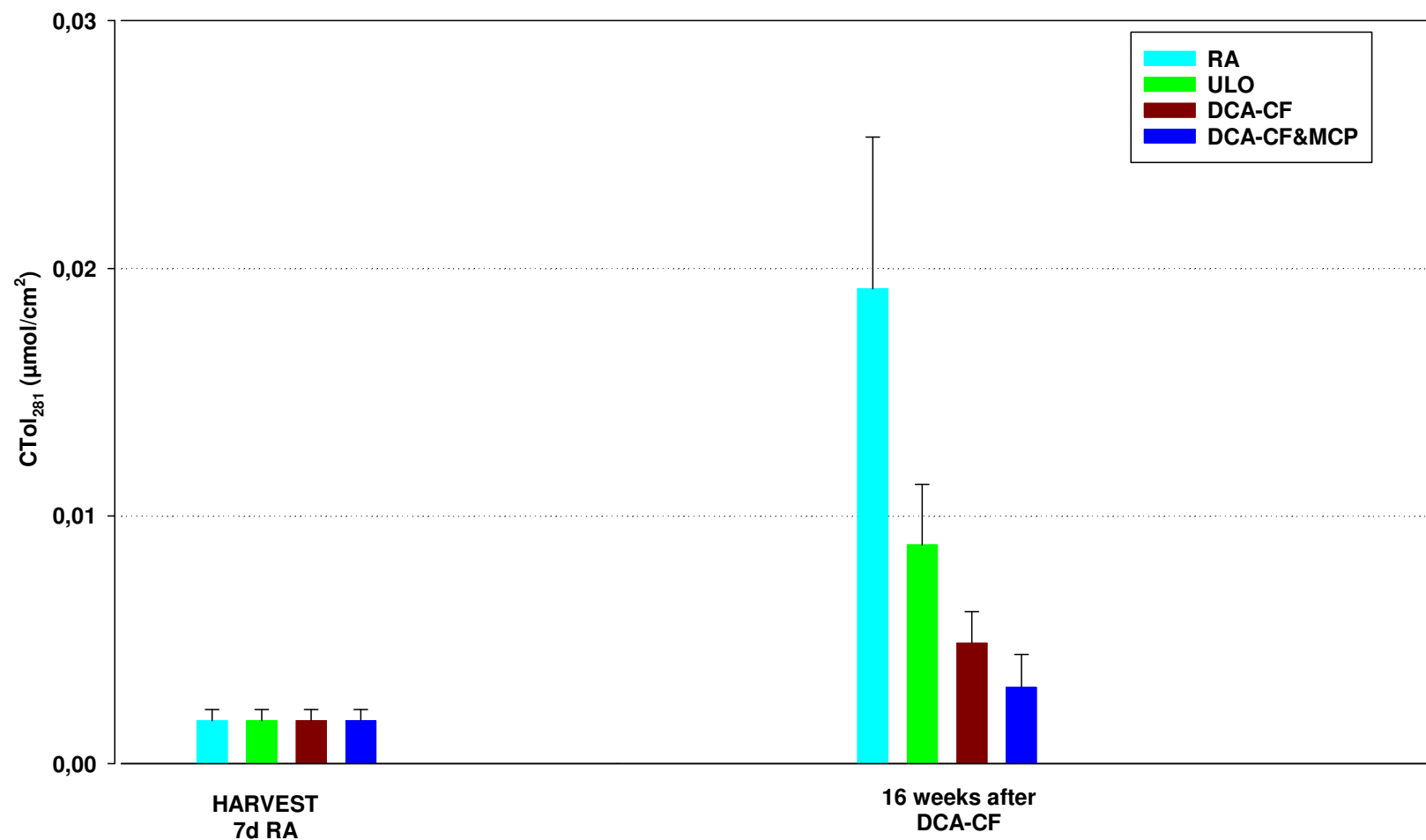
Scald Development Hypothesis 1: **α -farnesene oxidation**

α -Farnesen in Red Delicious



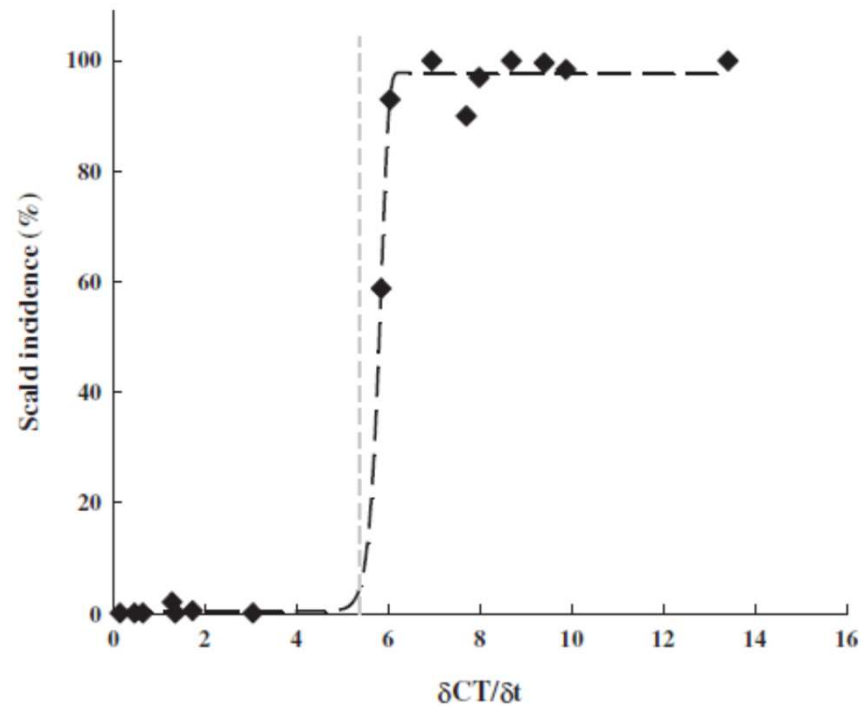
Scald Development Hypothesis 1: **α -farnesene oxidation**

CT₂₈₁ in Red Delicious



Superficial Scald Prediction 1

- Model based on CTols accumulation dynamics*:



* Bordonaba et al. (2013). Dynamic changes in conjugated trienols during storage may be employed to predict superficial scald in 'Granny Smith' apples. LWT Food Sci. Technol. 54 (2), 535–541.

Superficial Scald Prediction 2

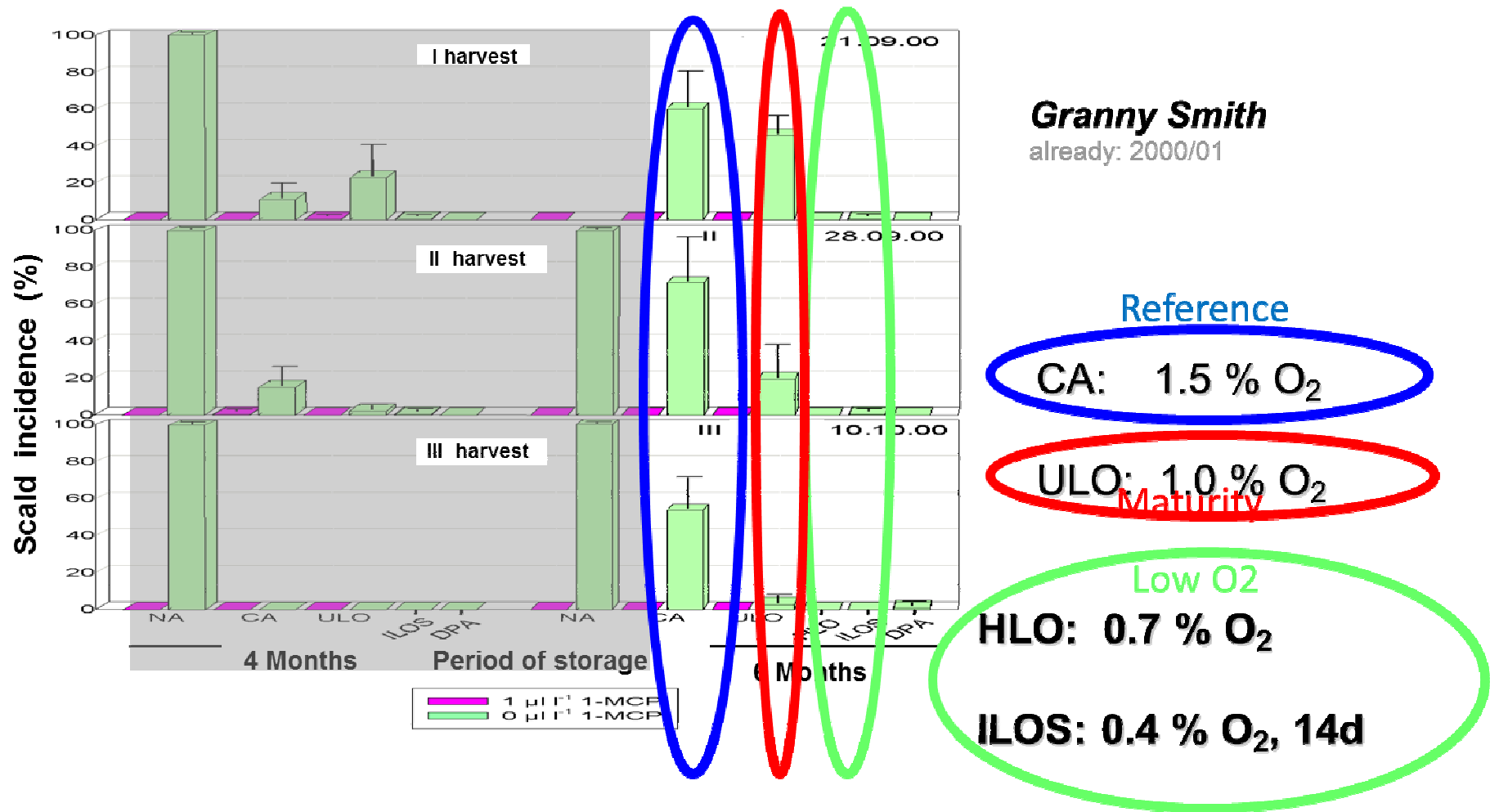
- Model based on orchard climate:
 - Scald risk of fruits from orchards that have experienced less than 150 cumulative hours below 10° C is increased
 - Temperatures above 25° C during the month prior to harvest increase the risk of scald development

Possible Prevention of Scald Development

by means of storage technologies:

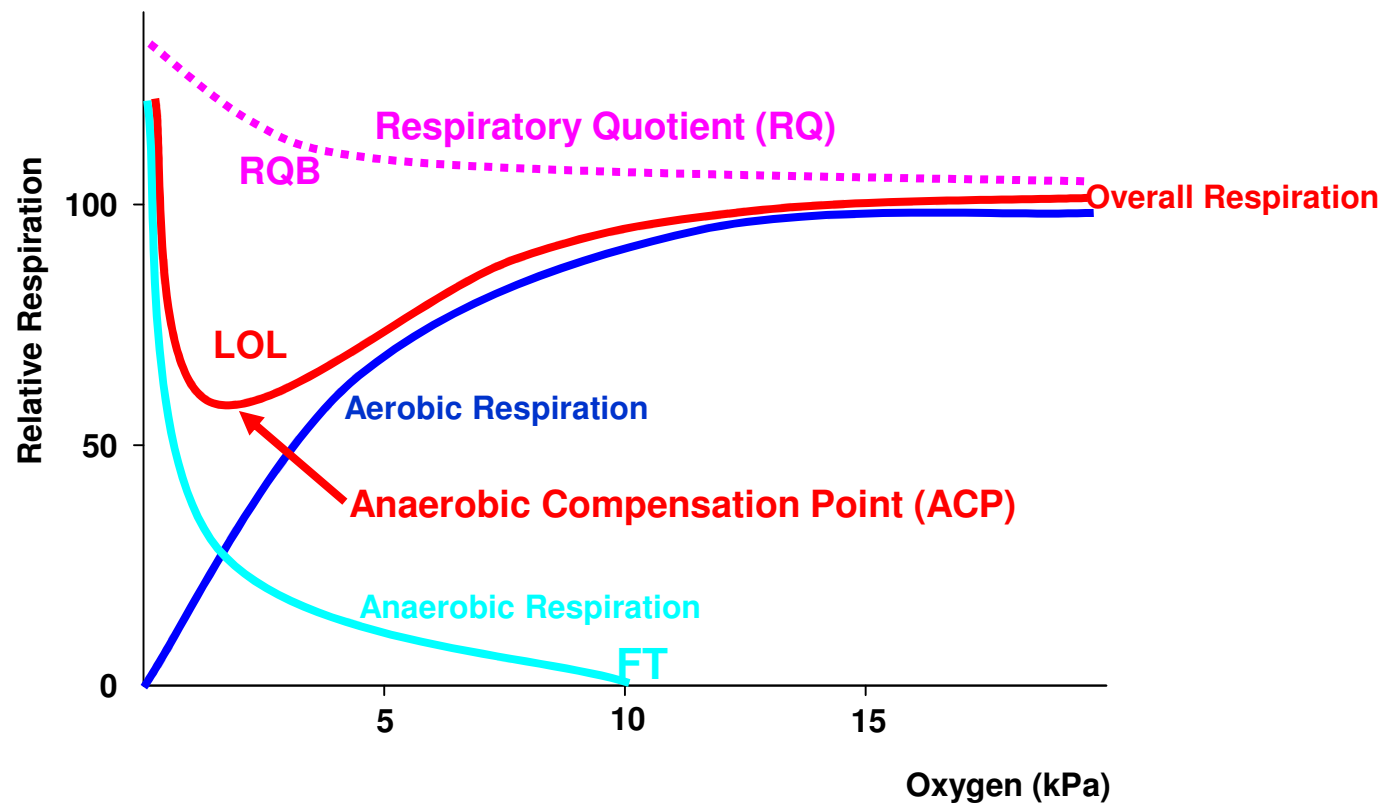
- Hypobaric storage
- N₂-flushing atmosphere
- Ethanol post-harvest treatment
- ILOS Initial Low Oxygen Stress
- HLO 0.7 % O₂ - 0.7 % CO₂

A very low O₂ atmosphere or a high maturity degree reduce the scald development



The Lower O₂ Limit in Plant (LOL)

LOL: Change from predominately aerobic to fermentative respiration



Current Technologies

- DCA by the means of chlorophyll fluorescence:

DCA-CF.



- DCA by the means of respiratory quotient:

DCA-RQ
in development.

$$RQ = \frac{[CO_2]}{[O_2]}$$

*Collaboration with: Agroscope; Isolcell;
Van Amerongen; KU Leuven.*

Current technologies

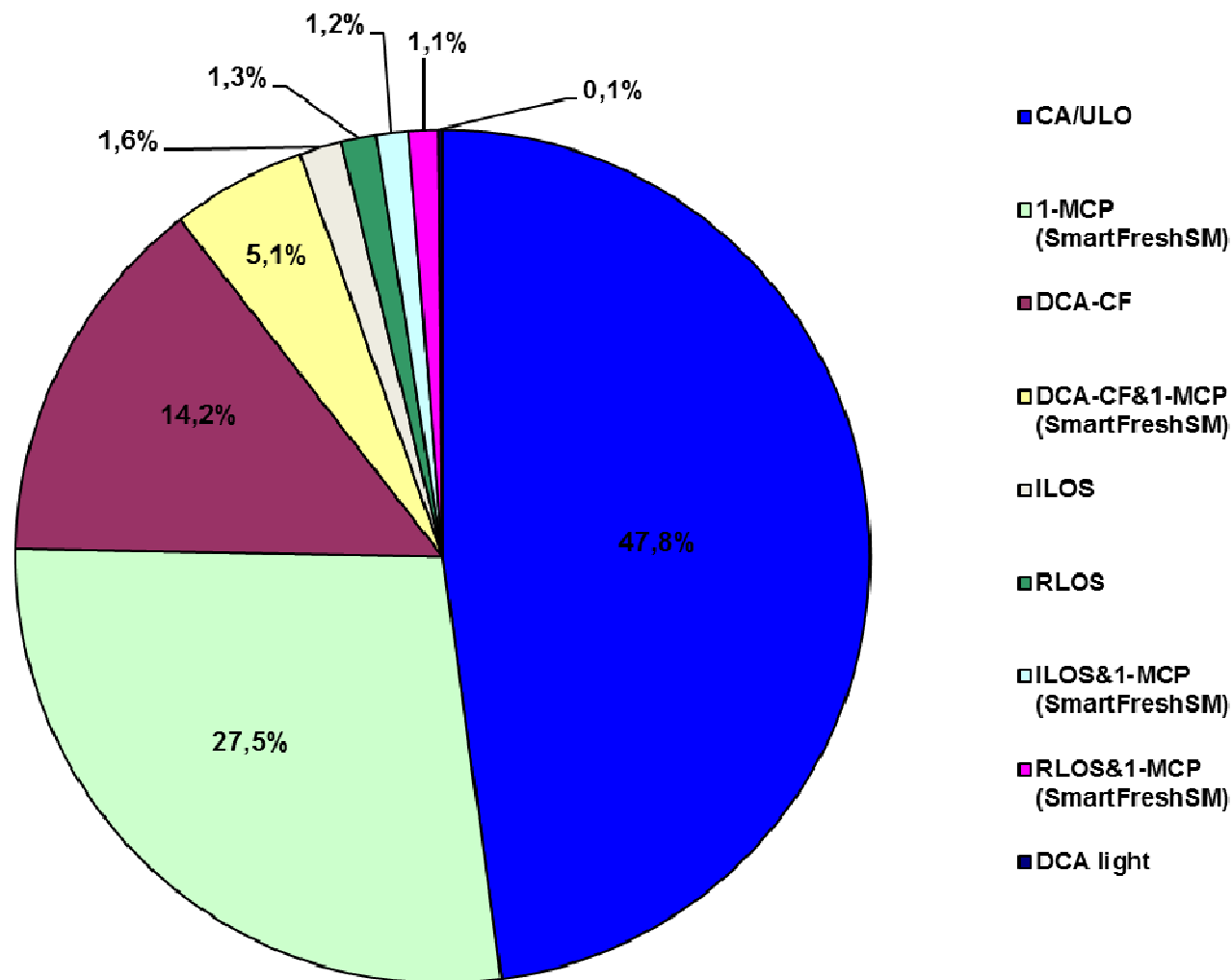
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DCA-RQ.
- 1-methylcyclopropene (1-MCP, SmartFresh by AgroFresh)
 - when 1-MCP applied, often stepwise cooling of core importance

Current technologies

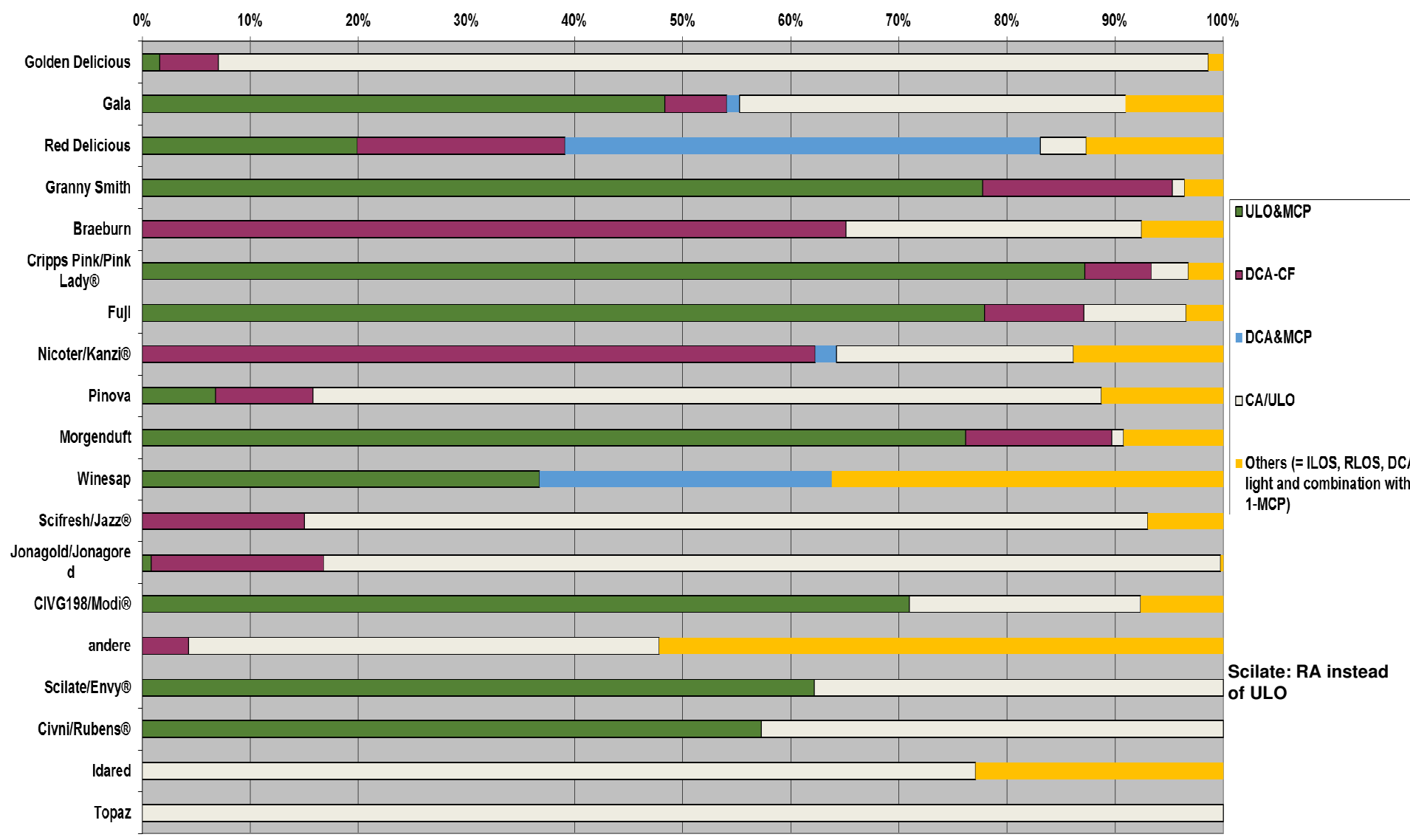
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- Further step: Combination of DCA-CF & 1-MCP

Storage technology status in South-Tyrol 2016-17

- 52 % Novel Technology in Commercial Scale



Cultivar dependent selection of storage technologies in ST 2016-17

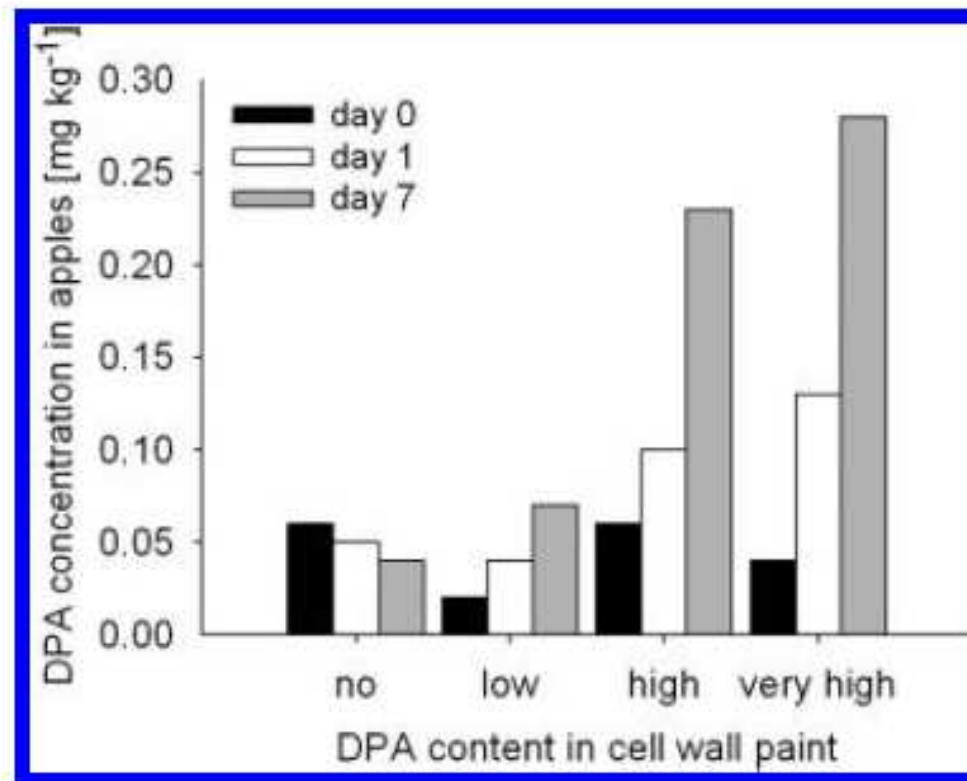


Cross-contamination with diphenylamine (DPA)

- Postharvest treatment by drenching or thermonebulisation with diphenylamine (DPA) can prevent in large scale superficial scald
- DPA was banned practically from EU,
→ starting with 2012
- DPA MRL:
→ 2011: 5 ppm

Residues of former scald prevention by means of diphenylamine (DPA)

DPA in wall paint vs. apple



Robatscher P., Eisenstecken D., Sacco F., Pöhl H., Berger J., Zanella A., Oberhuber M. (2012). Diphenylamine Residues in Apples Caused by Contamination in Fruit Storage Facilities. *J. Agric. Food Chem.*, 2012, 60 (9), 2205–2211.

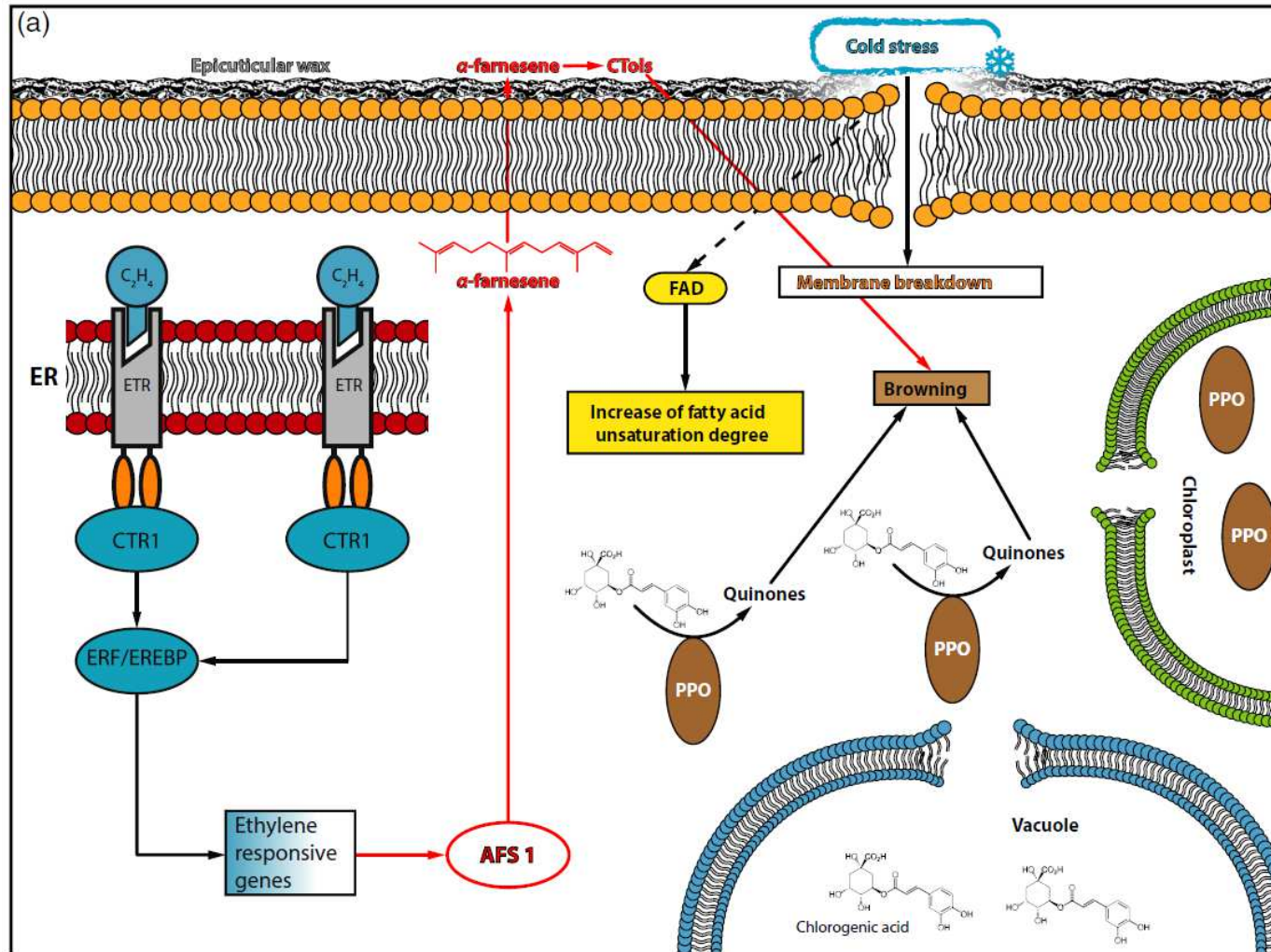
Existing DPA related concerns

- Cross-contamination: detected DPA-residues on never treated fruits
- Re-definition of MRL:
 - 2011: 5 ppm
 - 2015: 0.1 ppm
 - 2017: 0.1 ppm
 - 2019: 0.05 ppm ?

Physiology of scald control

- Still not fully revealed
- Low O₂ possibly inhibiting the oxidation of α-farnesene into conjugated trienols
- Cultivar dependent metabolomic reconfiguration strategy under hypoxia
- 1-MCP suppresses ethylene action
- 1-MCP affects lipid composition and sorbitol household of the fruits
 - Improved cold stress tolerance
 - Reduced scald development

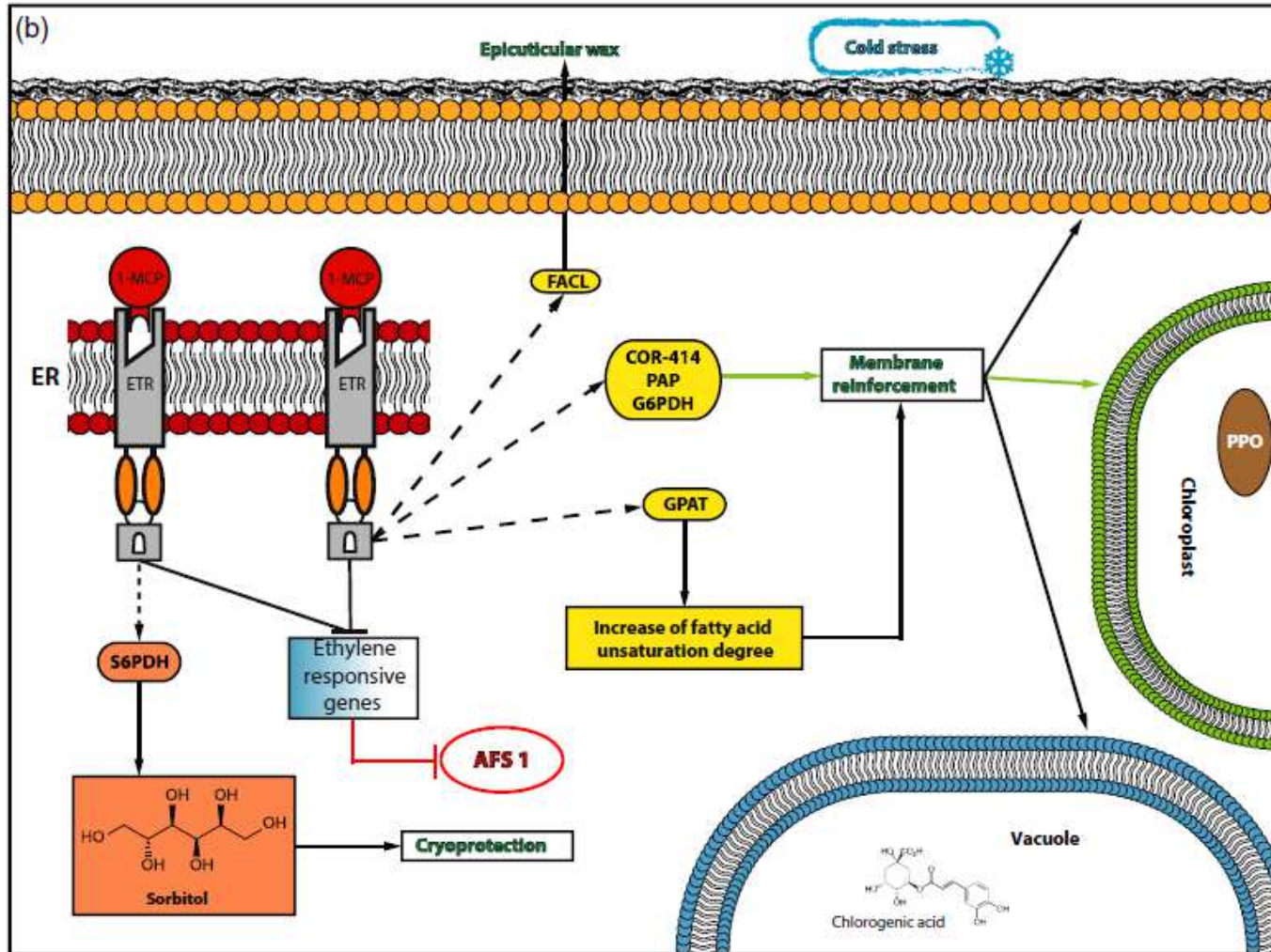
Scald Development Hypothesis 2 (2017): disorganization of organelles*



***Apple fruit superficial scald resistance mediated by ethylene inhibition is associated with diverse metabolic processes.**

Busatto N., Farneti B., Commisso M., Bianconi M., Iadarola B., Zago E., Ruperti B., Spinelli F., Zanella A., Velasco R., Ferrarini A., Chitarrini G., Vrhovsek U., Delledonne M., Guzzo F., Costa G., Costa F. (2017).
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Danke für Ihre Aufmerksamkeit.
Grazie per la Sua attenzione.
Thank you for your attention.



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