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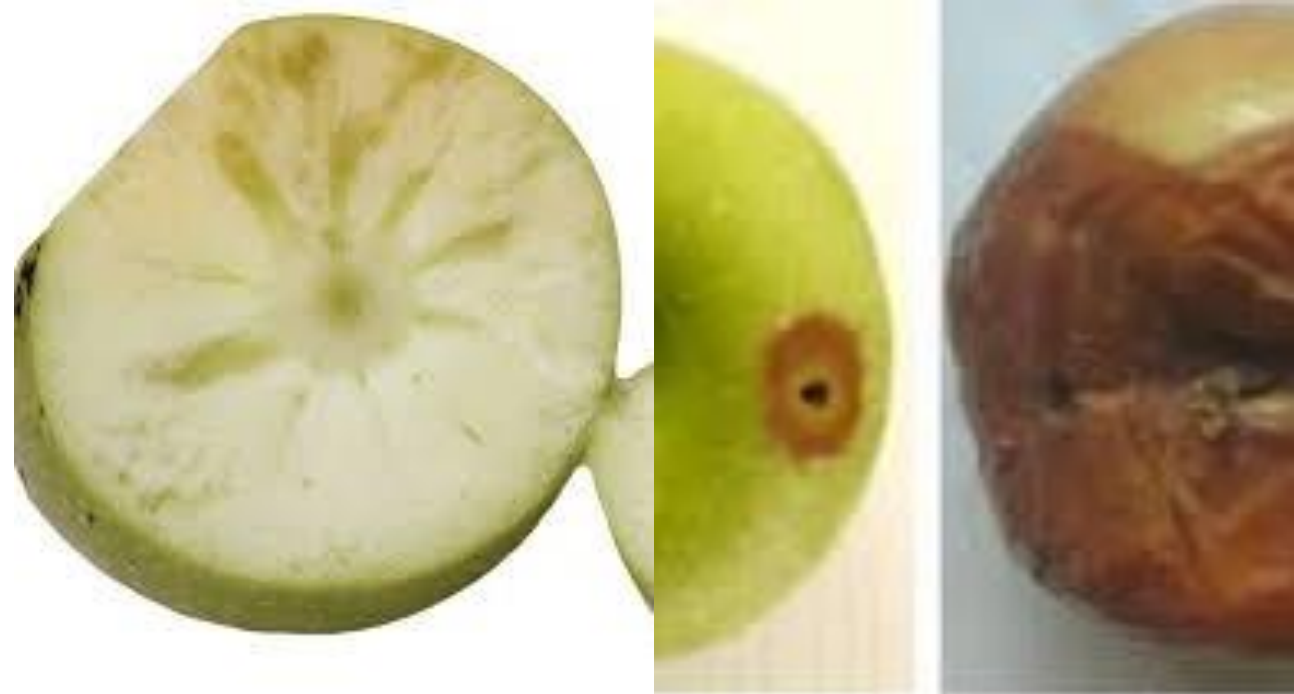
**EFFECTIVENESS OF GAMMA IRRADIATION
IN REPLACING CHEMICAL POSTHARVEST
TREATMENTS IN 'GRANNY SMITH' APPLES**

Granny Smith apples



Storage disorders in Granny Smith apples

- Rot/decay
- Bitter pit
- Water Core
- Internal browning

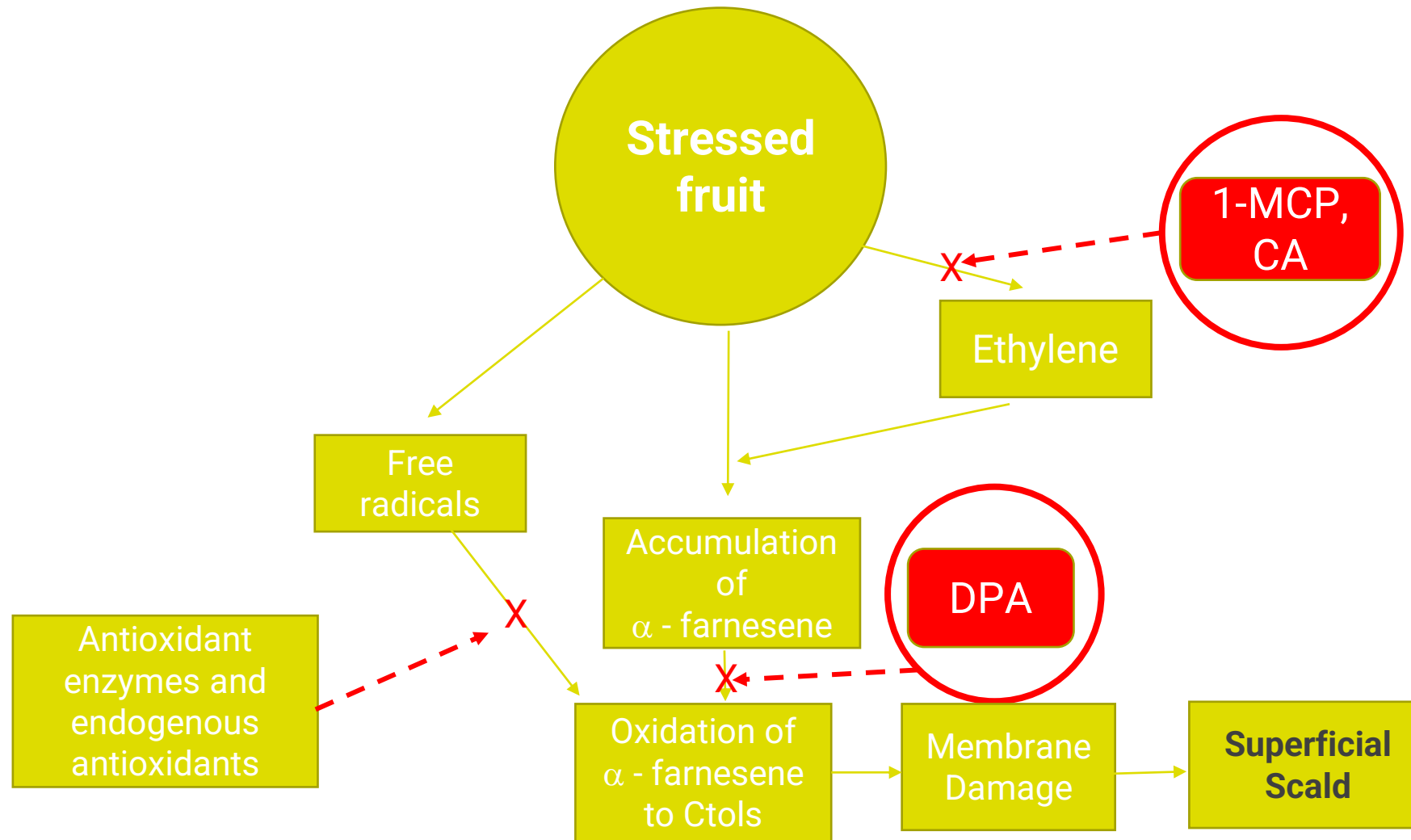




Superficial Scald



Superficial scald development



Insect Pests

- Codling moth
- Light brown apple moth



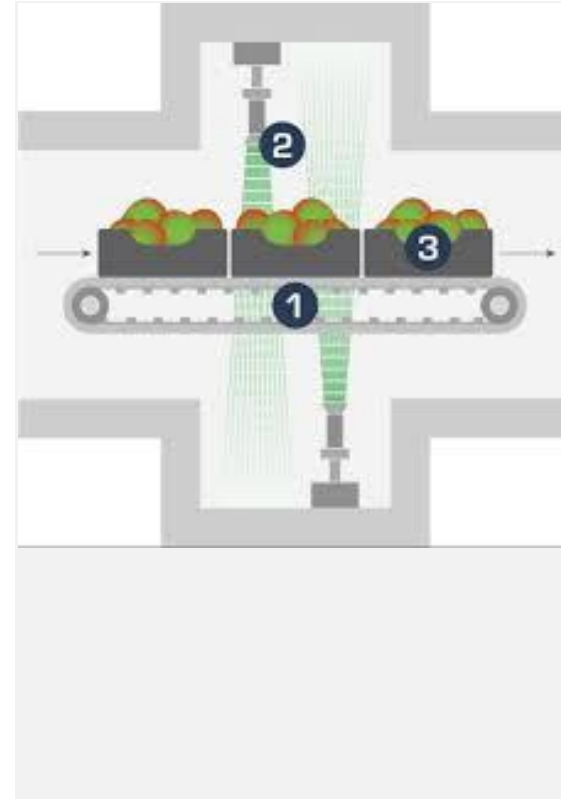


Methyl bromide: Quarantine treatment



Irradiation

250 Gy approved for California apples to be treated in California or Mexico (if tarped)

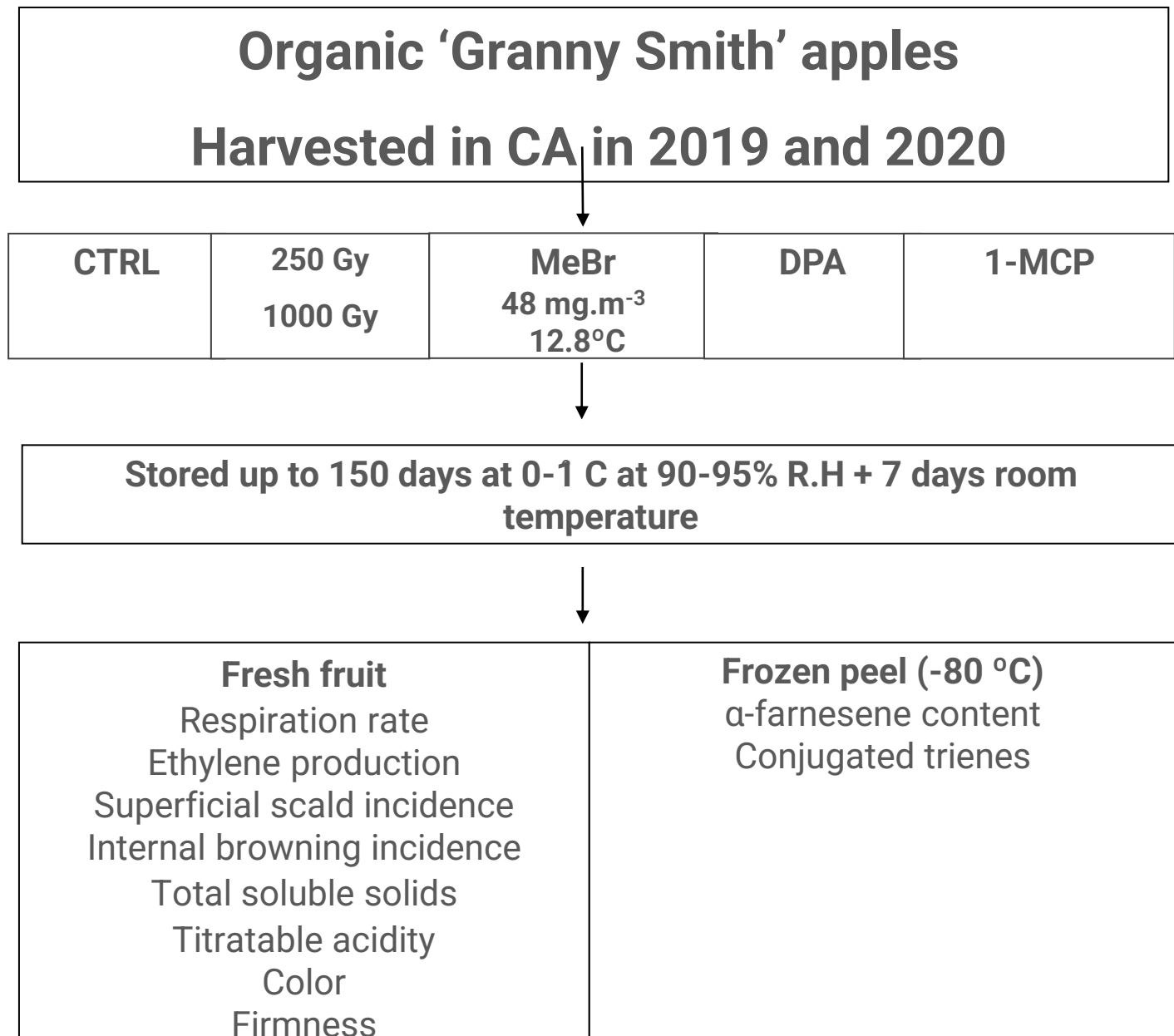


USDA APHIS PPQ, Phytosanitary Export Database, <https://pcit.aphis.usda.gov/PExD/faces/ViewPExD.jsf>

Objective

To compare low dose irradiation with DPA, 1-MCP, and MeBr treatments on the development of superficial scald and other physiological defects in 'Granny Smith' apples.

Experimental design



Superficial scald

	Season 2019	
	90 d at 0-1 °C + 7 d at 20 °C	150 d at 0-1 °C + 7 d at 20 °C
CONTROL		
1MCP		
DPA		
MeBr		
γ-240 Gy		

	Season 2020		
	60 d at 0-1 °C + 7 d at 20 °C	90 d at 0-1 °C + 7 d at 20 °C	150 d at 0-1 °C + 7 d at 20 °C
CONTROL			
1MCP			
DPA			
MeBr			
γ-240 Gy			
γ-860 Gy			

90-day storage at 0 °C



Control



DPA



G240

1MCP = 1-methylcyclopropene

DPA = diphenylamine

MeBr = methyl bromide

G250 = Gamma 240 Gy

G800 = Gamma 860 Gy



1MCP

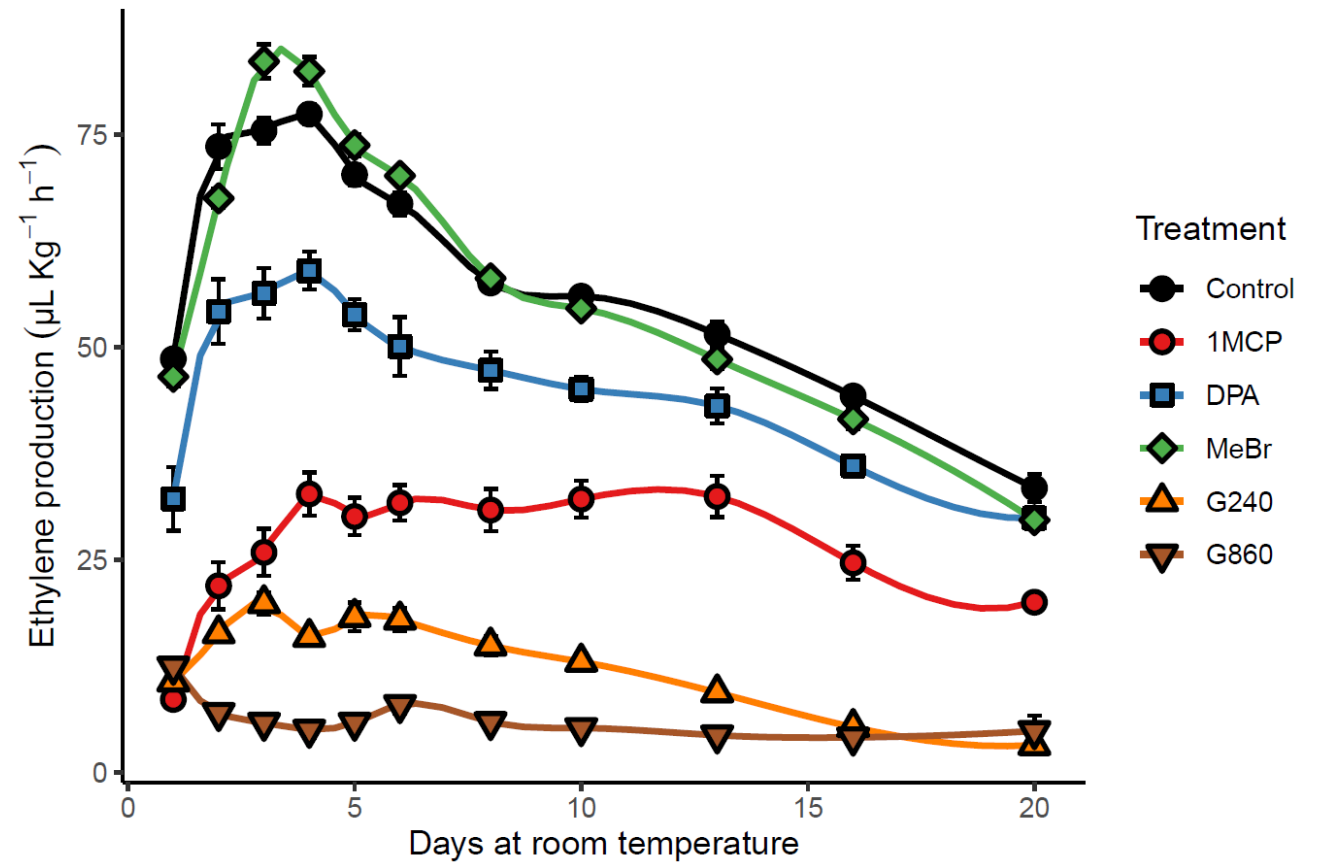
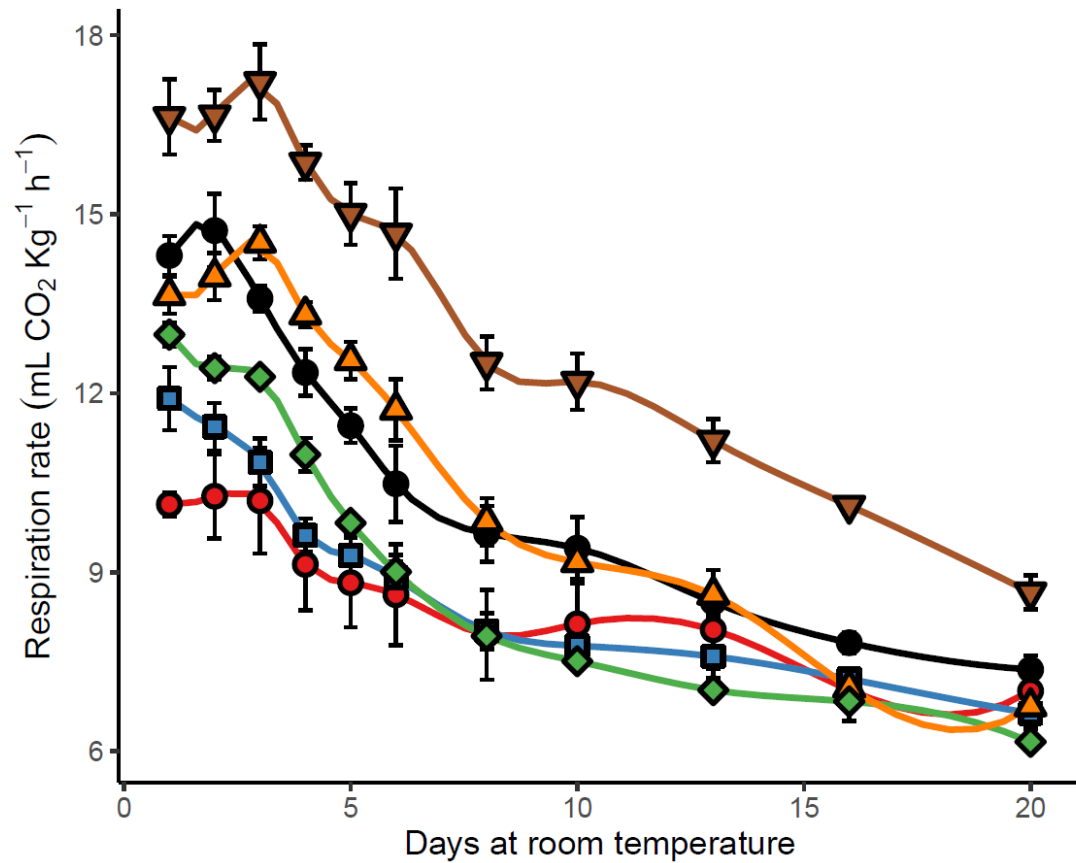


MeBr

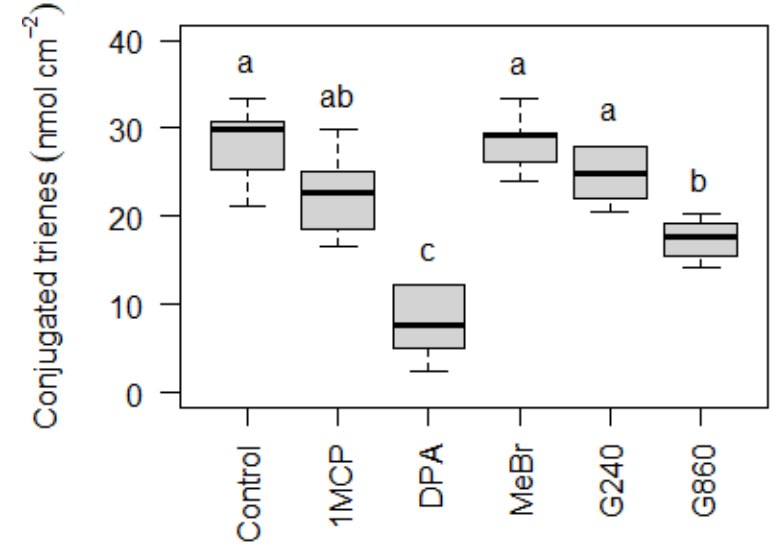
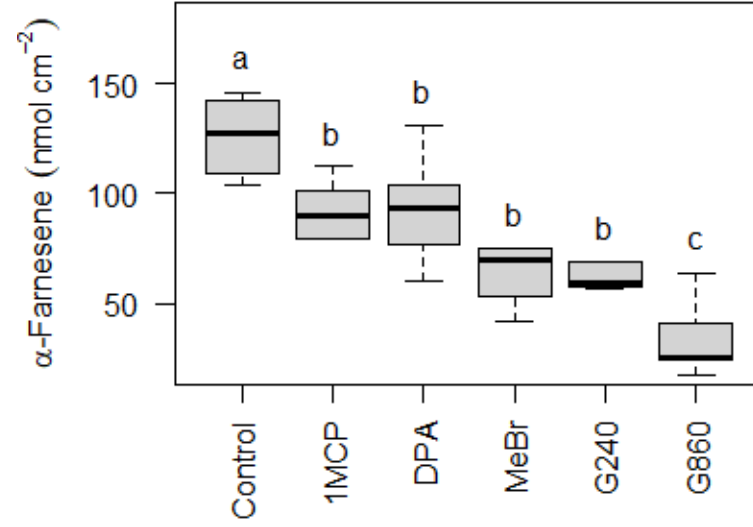


G860

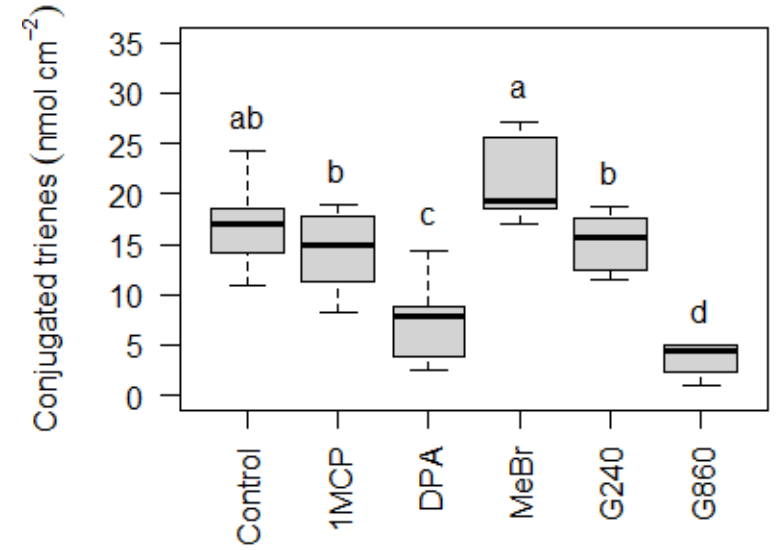
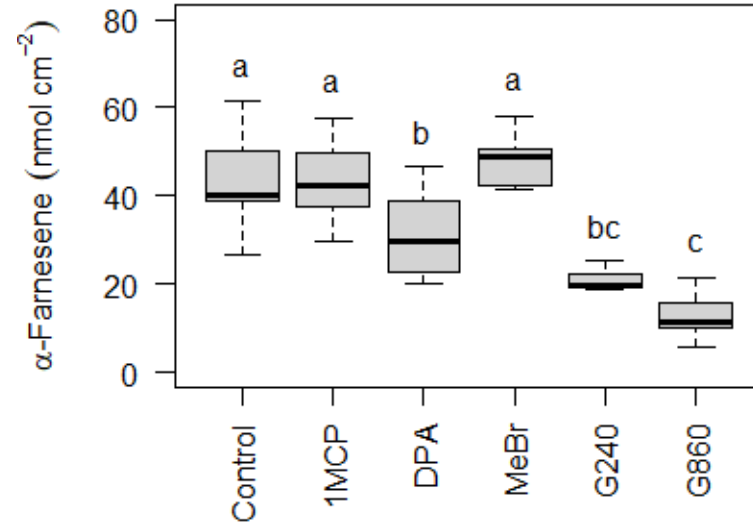
Fruit respiration rate and ethylene production 90-day storage at 0 °C















Day 90



Day 90 + 7



Internal Browning

		Season 2020	
		90 d at 0-1 °C + 7 d at 20 °C	150 d at 0-1 °C + 7 d at 20 °C
CONTROL			
1MCP			
DPA			
MeBr			
γ-240 Gy			
γ-860 Gy			



Control



DPA



G240



MeBr



G860



Conclusions

- Apples irradiated at 240 Gy were similar to MeBr treated apples in terms of superficial scald. 1-MCP and DPA treated apples maintained better quality.
- Superficial scald development in the irradiation treated fruit was not ethylene-dependent.
- Concentration of conjugated trienes was correlated with incidence of superficial scald in non-irradiated fruit.
- In irradiated fruit, scald was not related to CT concentration, suggesting that this was a different type of necrosis.
- Irradiation stress caused internal browning.

2017 x-ray




Next Steps

- Determine the type of necrosis in fruit peel
- Evaluate impacts of irradiation modalities
- Explore the interaction of cold stress, storage, and irradiation
- Evaluate role of complementary technologies in reducing disorders
- Careful control of all factors
- Use transcriptional, proteomic and metabolomic analysis for a comprehensive understanding



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