

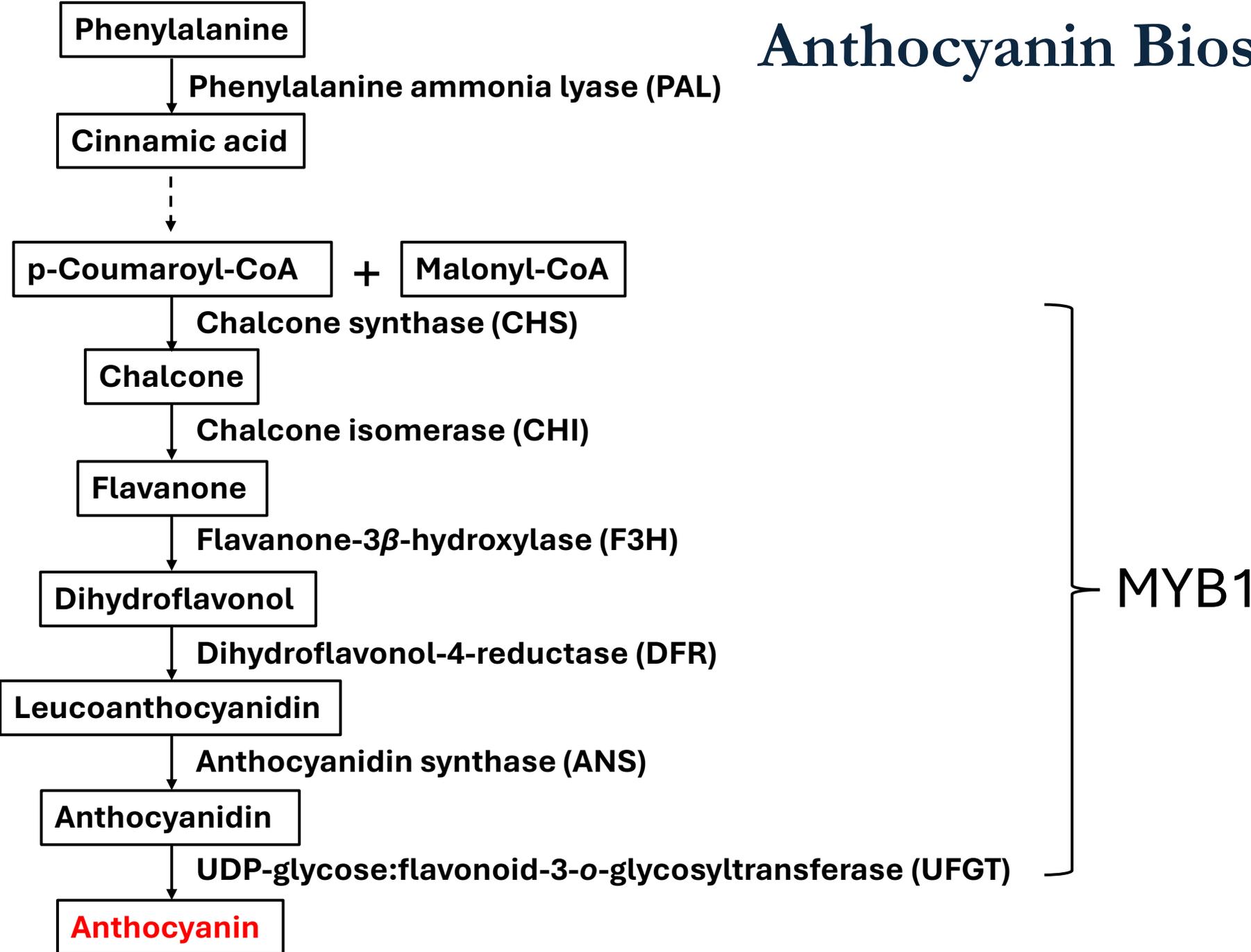
# Issues with Fruit Color Development and Mitigation Strategies



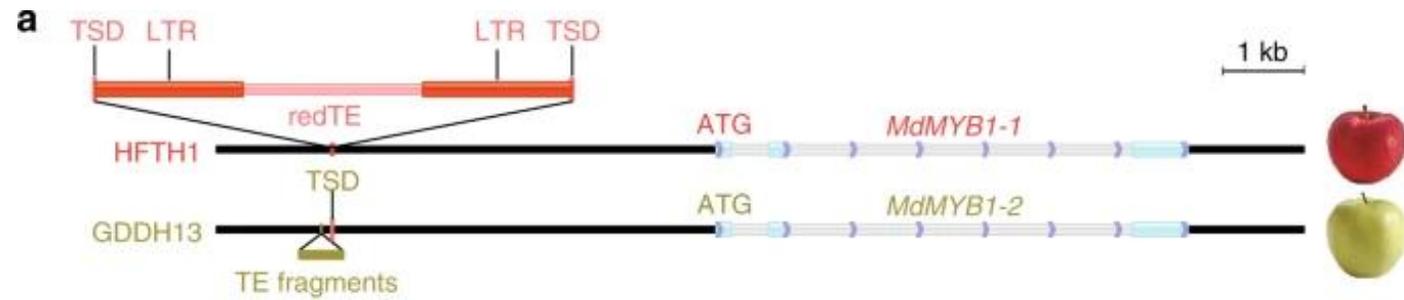
Lailiang Cheng and Terence Robinson

**Cornell University**

# Anthocyanin Biosynthesis



# The *MYB1* Gene Controls Apple Peel Color



**c**

Phenotype	Natural population		'Huayue' x'Honeycrisp' population	
	Number of accession	Accession with redTE	Number of progeny	Progeny with redTE
Red skin	112	112	41	41
Non red skin	33	0	34	0

# Fruit Color Development in 'Honeycrisp' Strains

4 WBH

2 WBH

1 WBH

Harvest

**Honeycrisp**



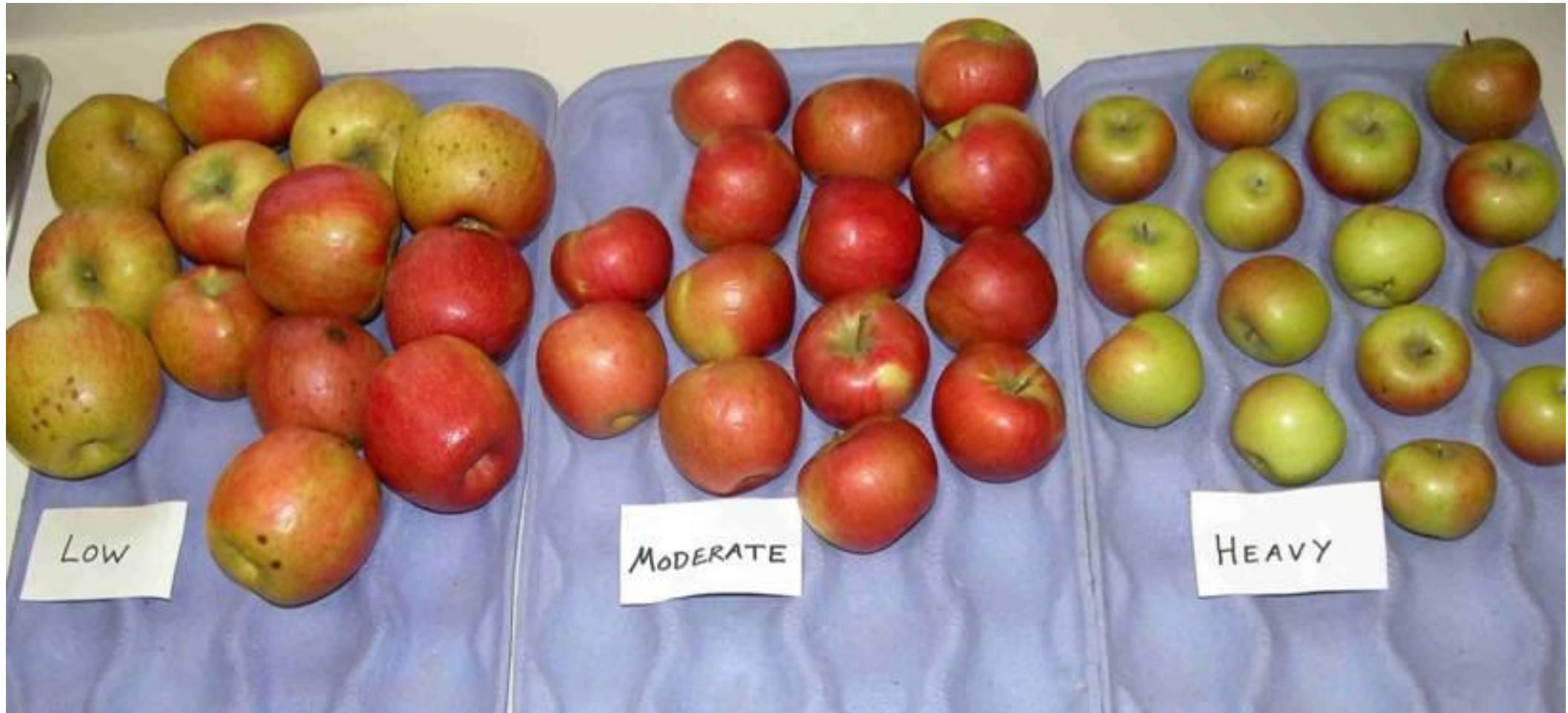
**Firestorm**



**Royal Red**



# Fruit Color & Bitter Pit in Relation to Cropload in 'Honeycrisp'

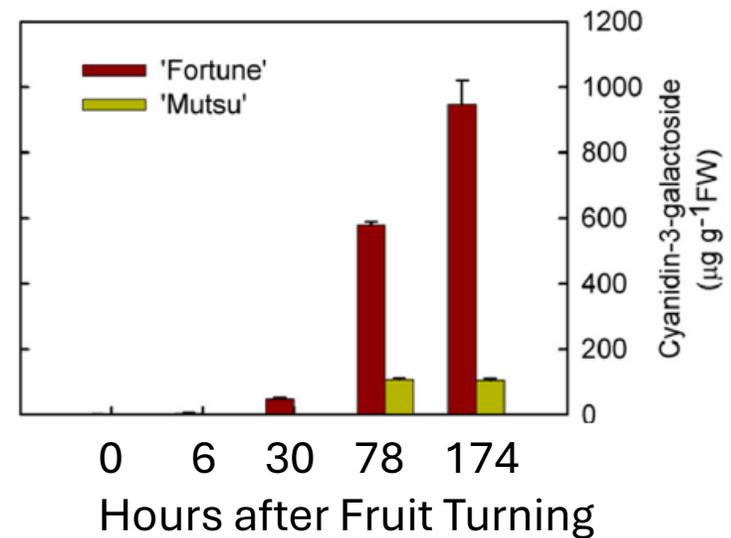
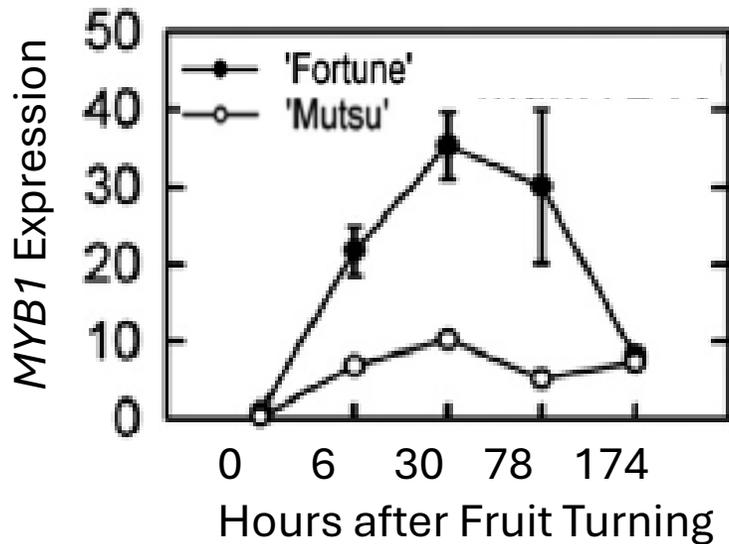


Picture from Dr. Jim Schupp

# Shading in the Lower Part of the Tree Canopy

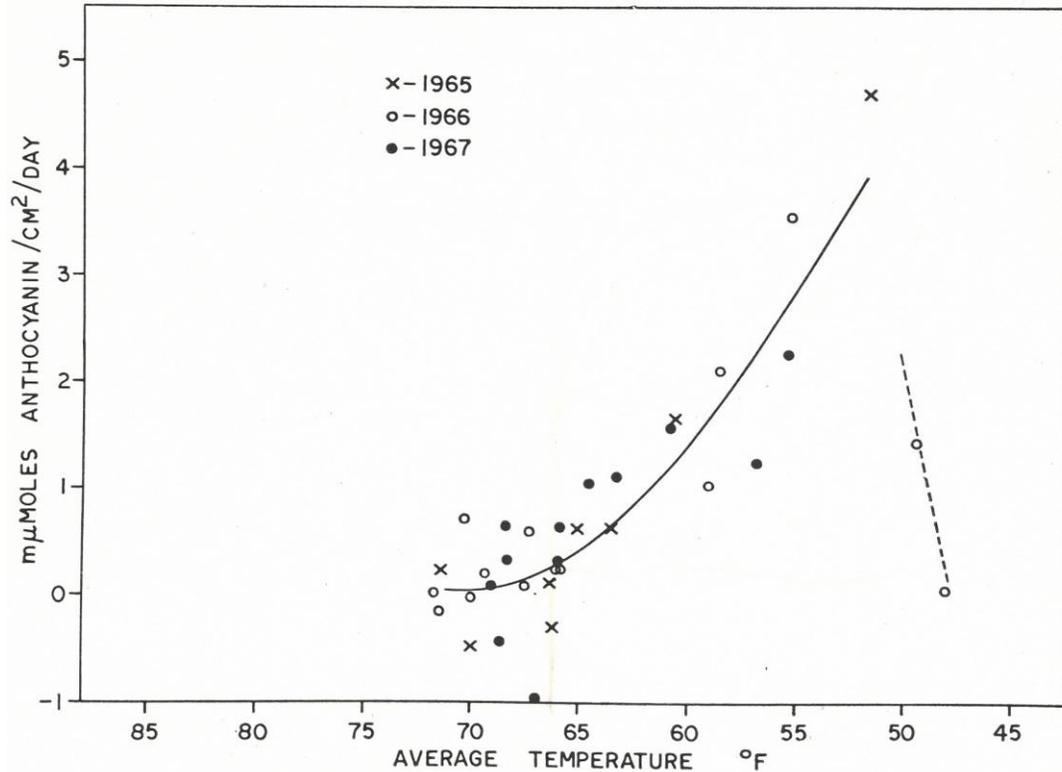


# Light Exposure Affects Fruit Color Development



# McIntosh Apple Anthocyanin Synthesis in Relation to Temperature

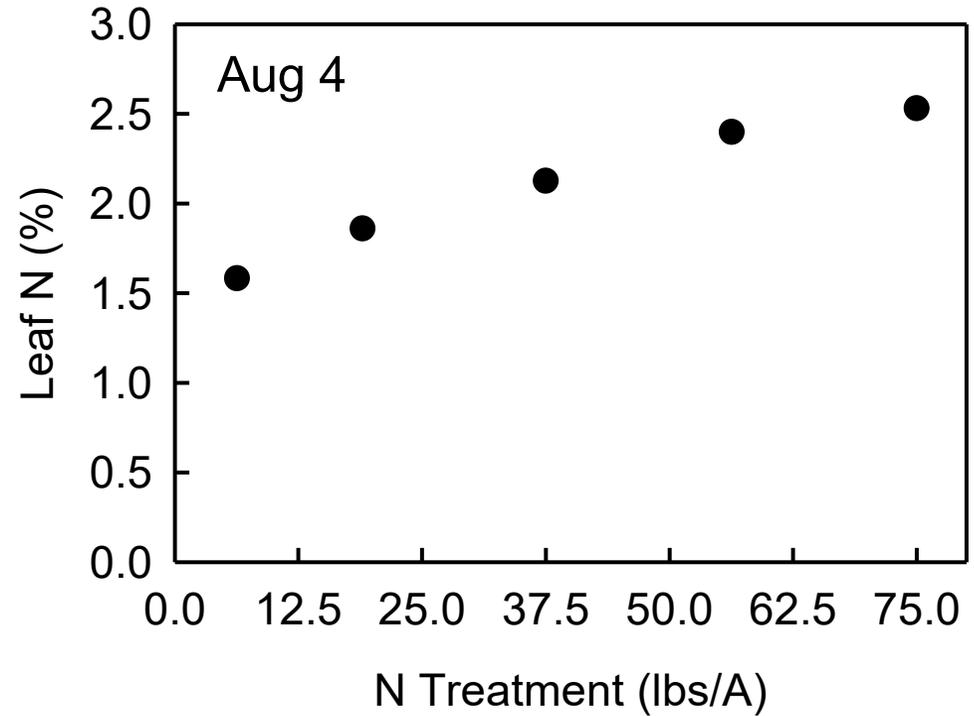
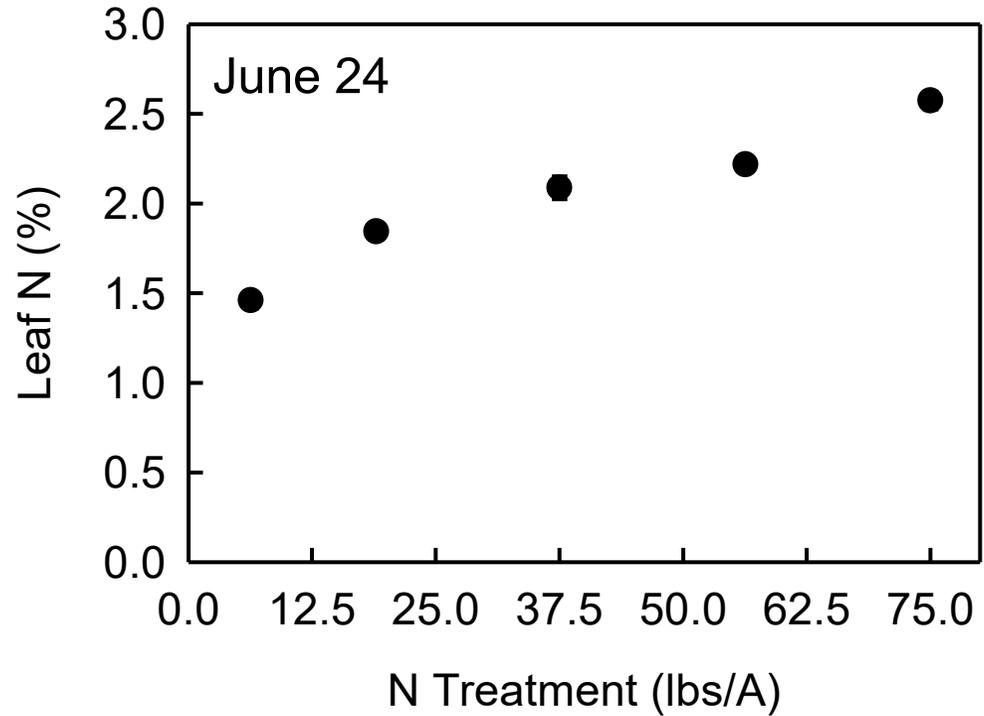
(Leroy Creasy, 1968)



# N Supply on Firestorm Honeycrisp Fruit Color Development



# Honeycrisp Leaf N in Response to N Supply



# Gala and Honeycrisp fruit color in response to K supply

## Buckeye Gala



Optimal Leaf K: 1.3 to 1.8%  
Optimal Fruit K: 0.7 to 0.9%

## Firestorm Honeycrisp

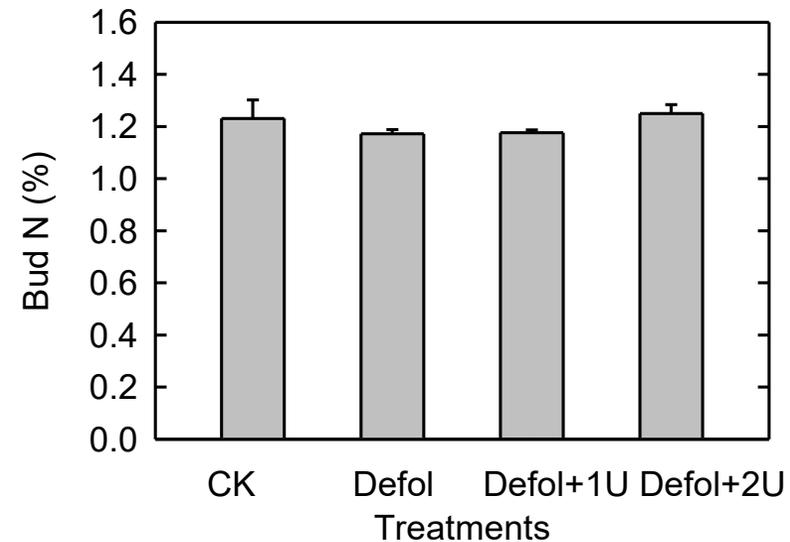
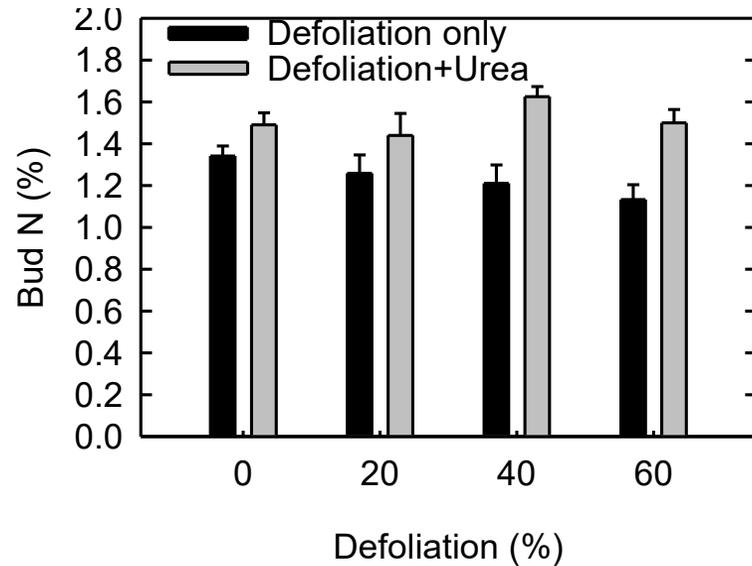
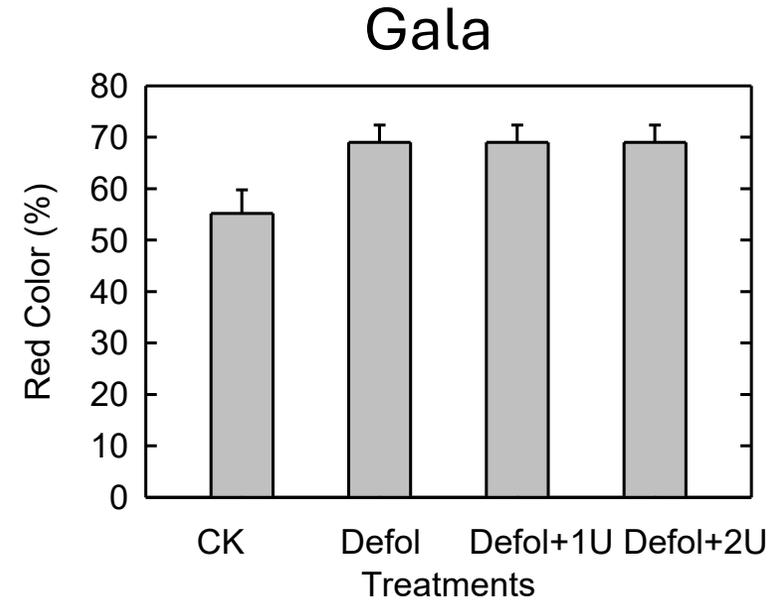
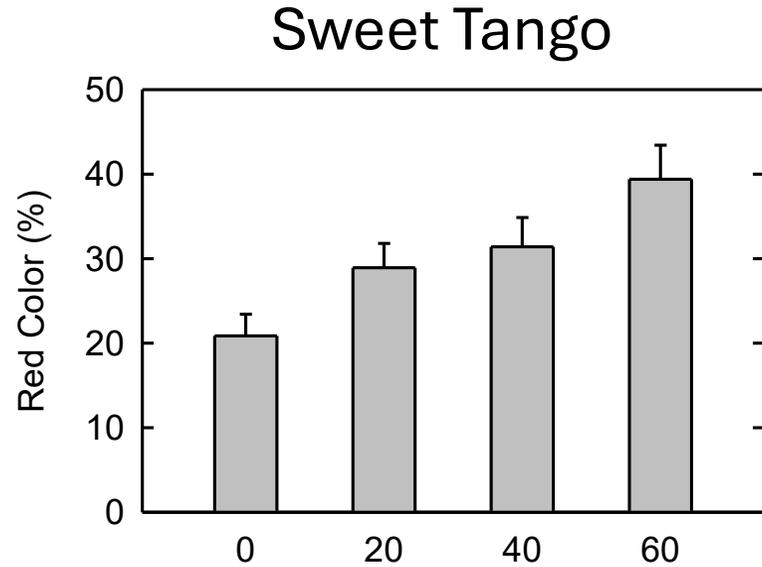


1.0 to 1.3%  
0.5 to 0.7%

# Strategies to Enhance Red Color Development in Honeycrisp

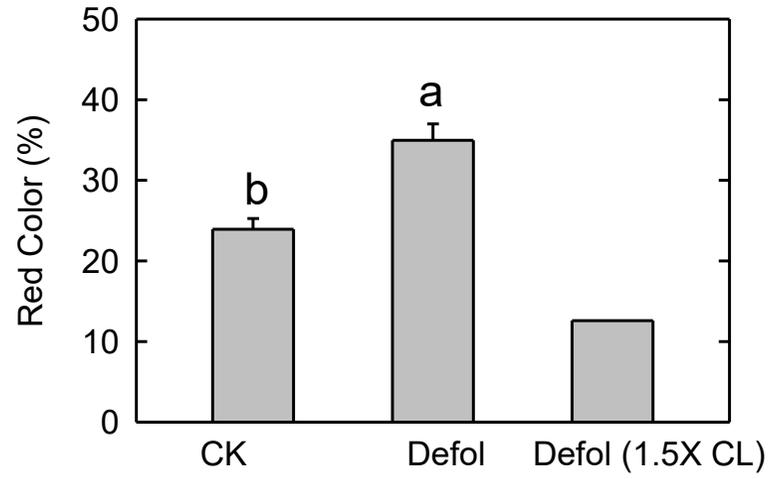
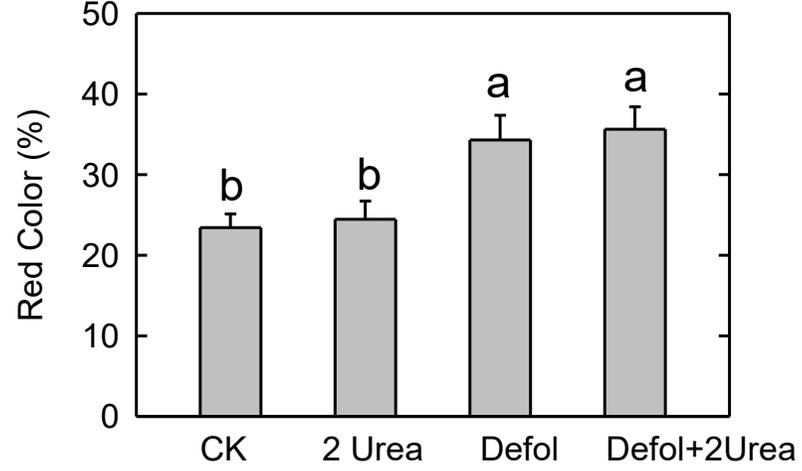
- Use strains that still develop good color at high temperature (less sensitive to heat).
- Adjust crop load to a medium level using precision crop load management approaches (4~5 Frts/cm<sup>2</sup> TCA Years 3 to 4; 5 to 6 Frts/ cm<sup>2</sup> TCA Year 5 to 8).
- Ensure optimal tree nutrient status (Leaf N ~2%; Leaf K 1.0 to 1.3%)
- Increase fruit light exposure via partial defoliation and reflective groundcover
- Apply growth regulators (Ethrel, Jasmonate, Accede, etc) near harvest.

# Sweet Tango and Gala in Response to Partial Defoliation/Foliar Urea



% defoliation is only referring to the lower half of the tree canopy

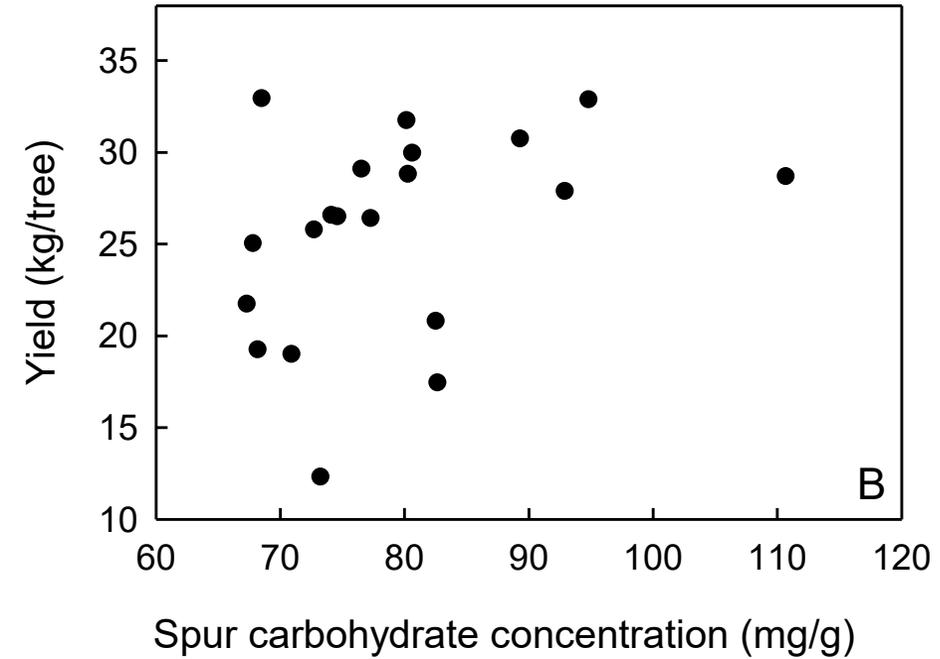
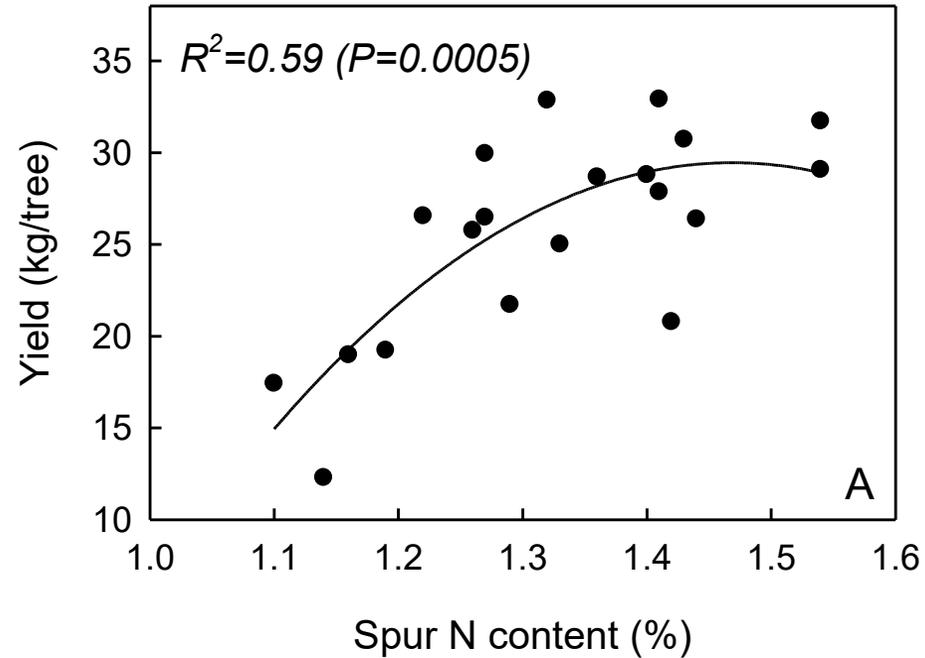
# Royal Red Honeycrisp in Response to Partial Defoliation/Foliar Urea



\*Refers to 50% defoliation of the lower half of the tree canopy

1.5X CL: 50% more crop load

# Fruit yield of 'McIntosh'/M.9 trees in relation to reserve N & carbohydrates (Foliar urea in combination with manual defoliation experiment)



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