

Strategies to Manage Bitter Pit in 'Honeycrisp' Apples



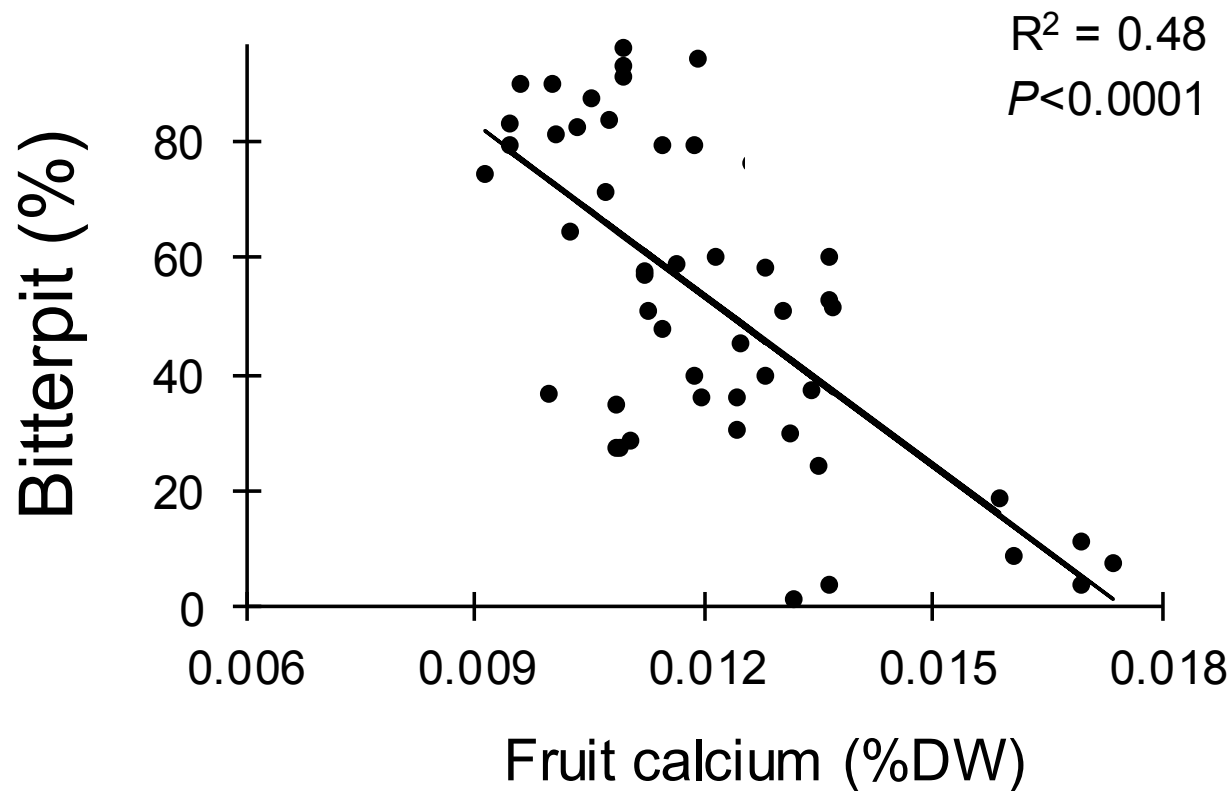
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Bitter Pit



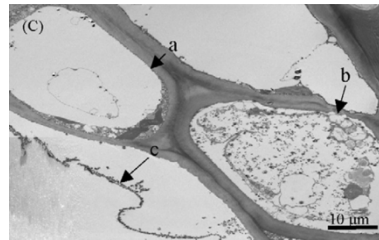
Honeycrisp Bitterpit in Relation to Fruit Ca



Bitterpit Susceptibility



Cell plamamembrane Ca level



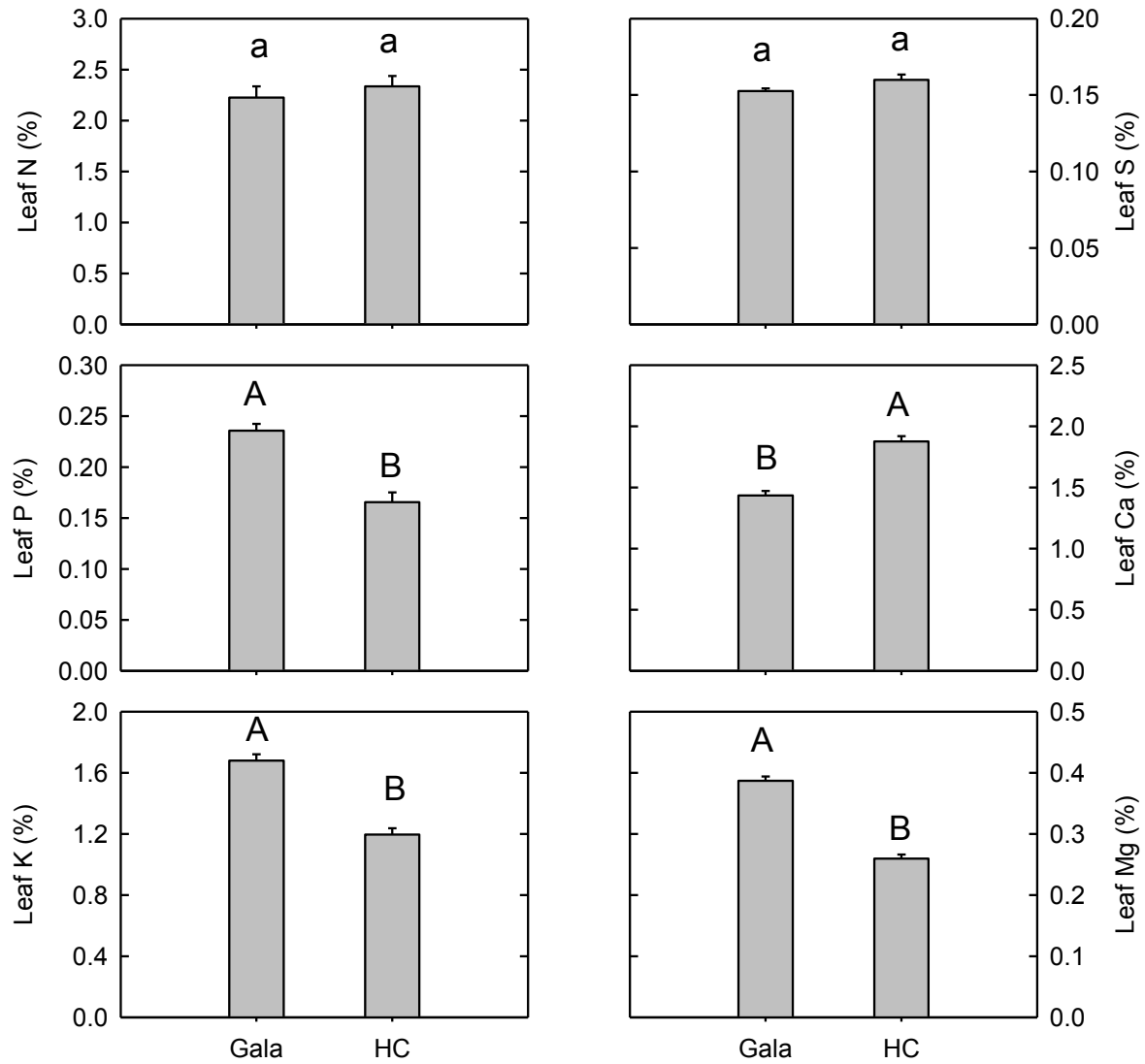
Cellular partitioning in fruit

Fruit Ca level & its balance with other nutrients

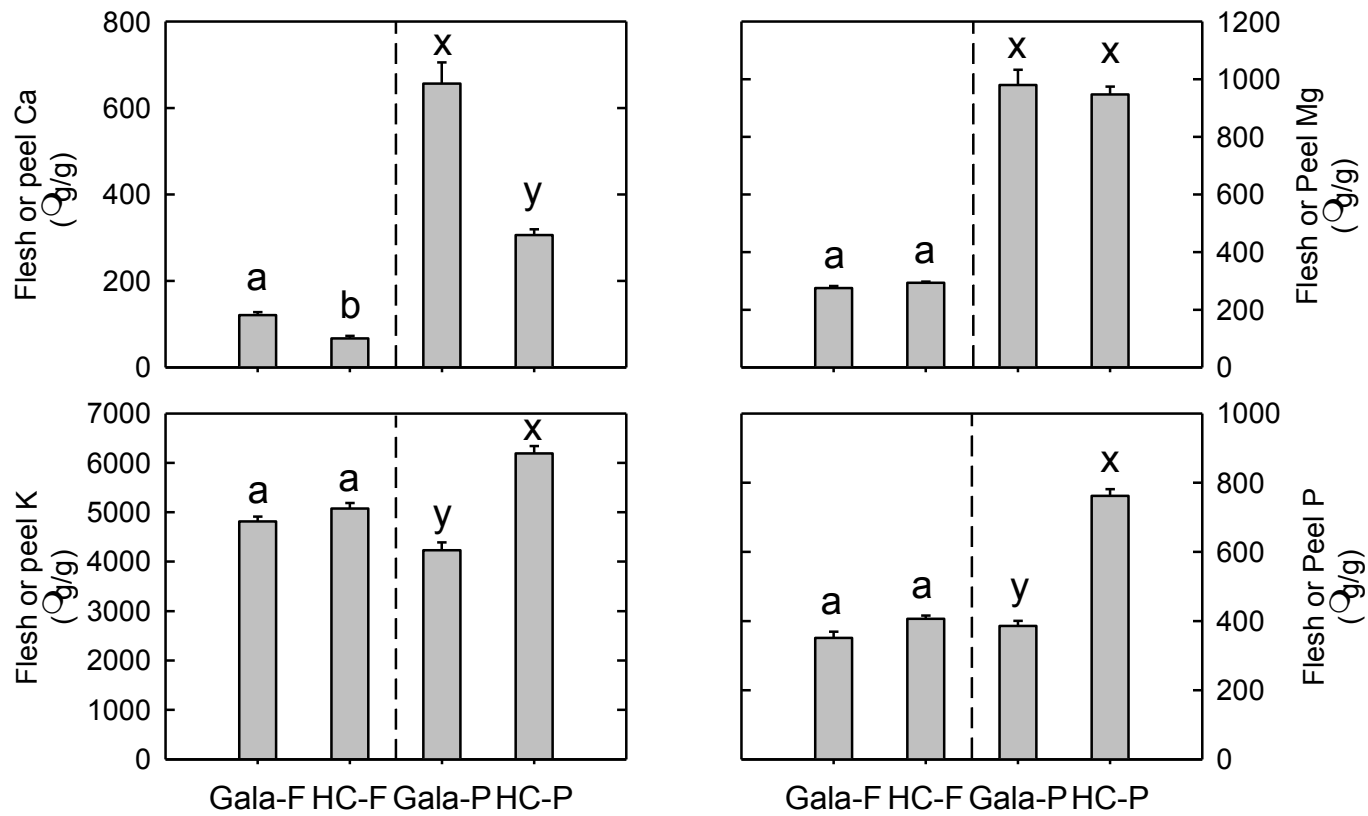
Partitioning btw leaves & fruit

Root uptake of Ca and other nutrients

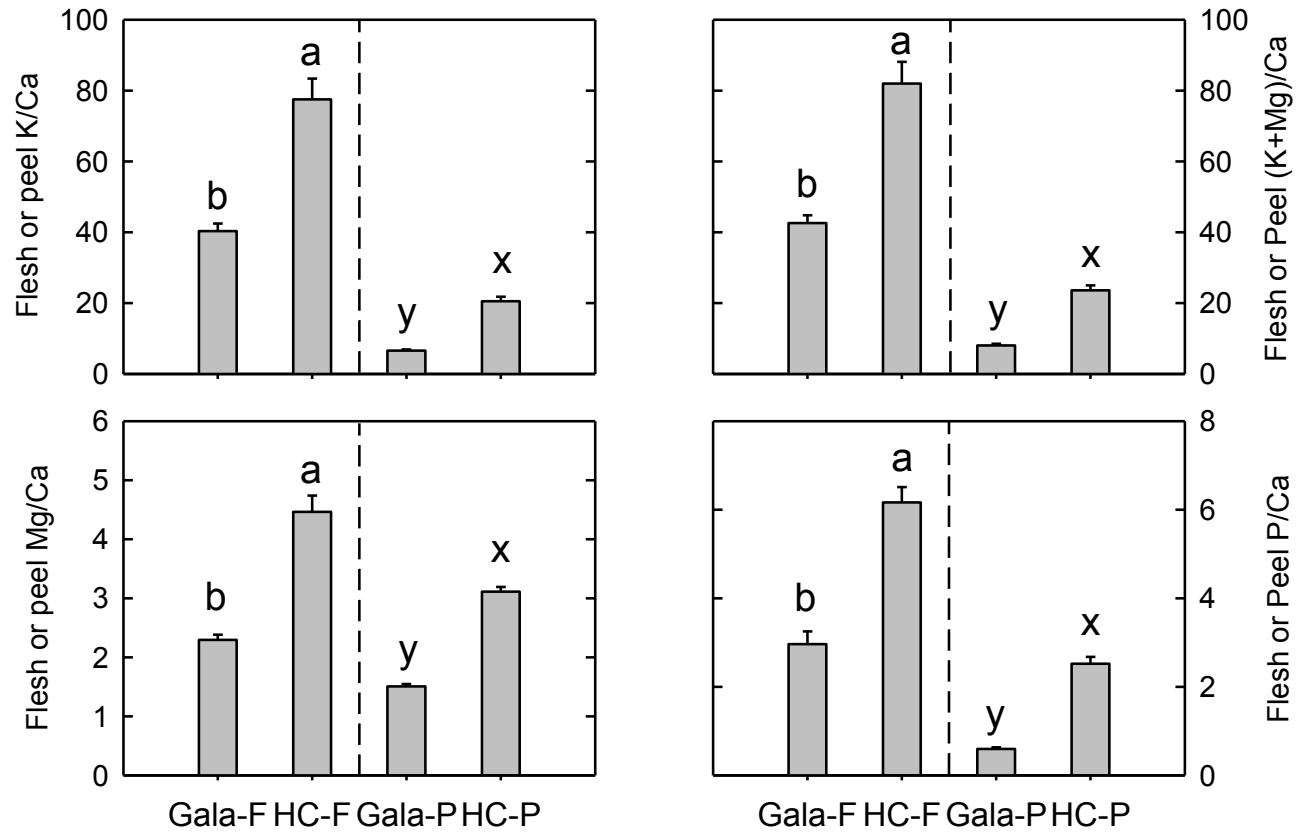
Leaf Nutrient Levels in Gala and Honeycrisp



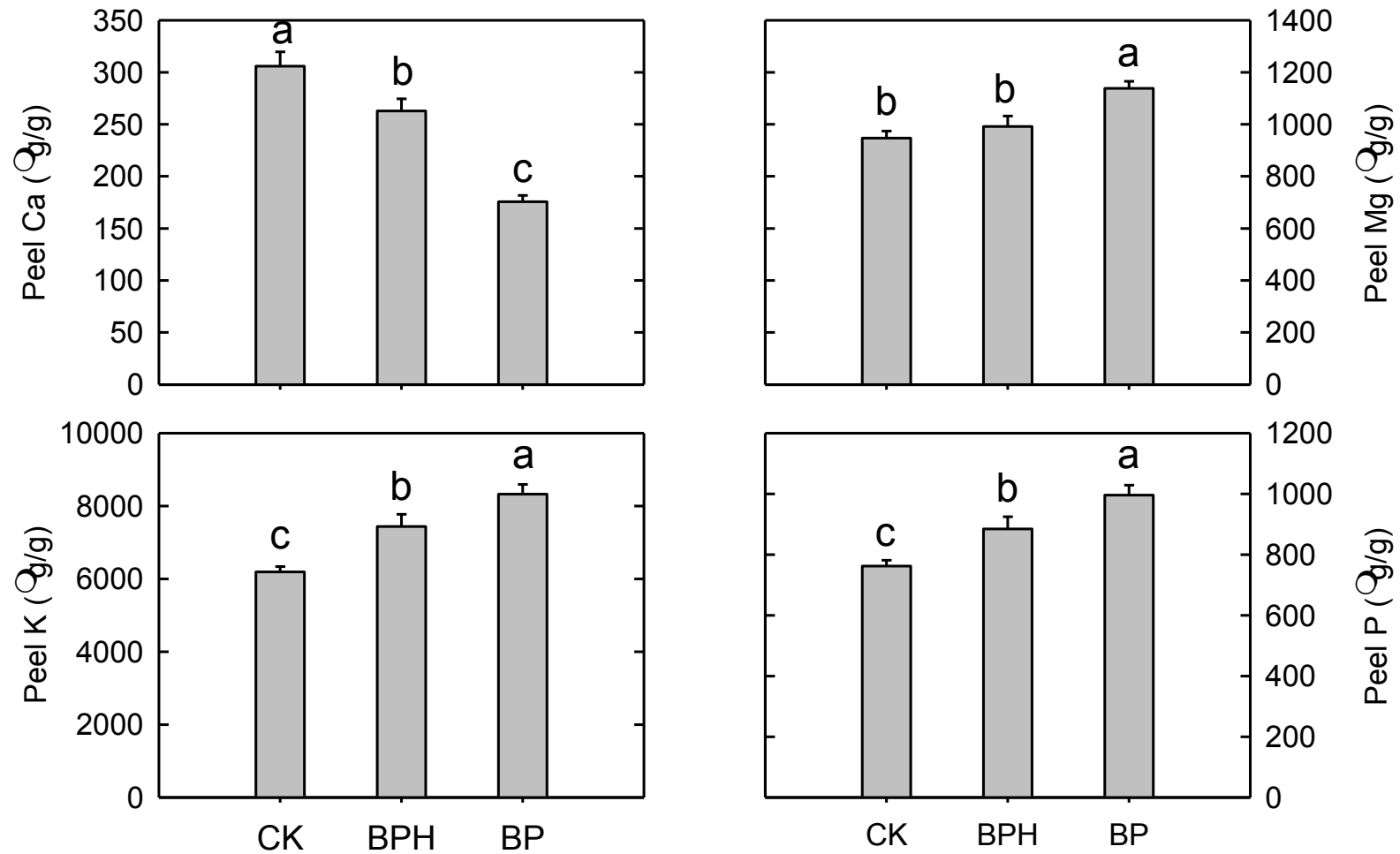
Fruit Nutrient Levels in Gala and Honeycrisp



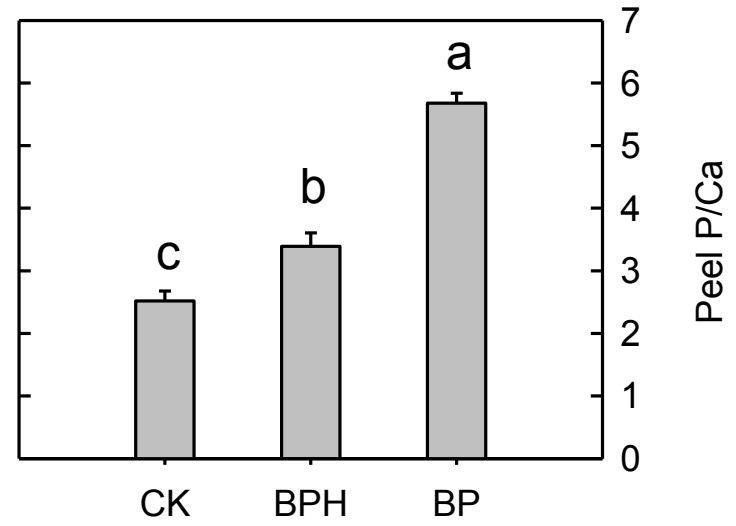
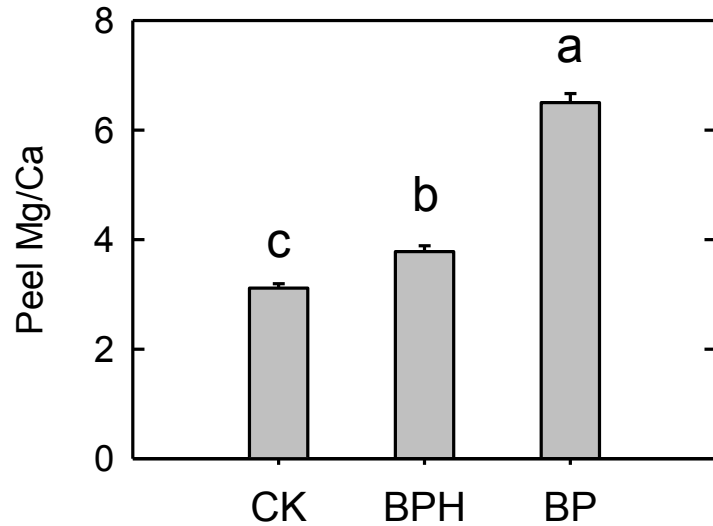
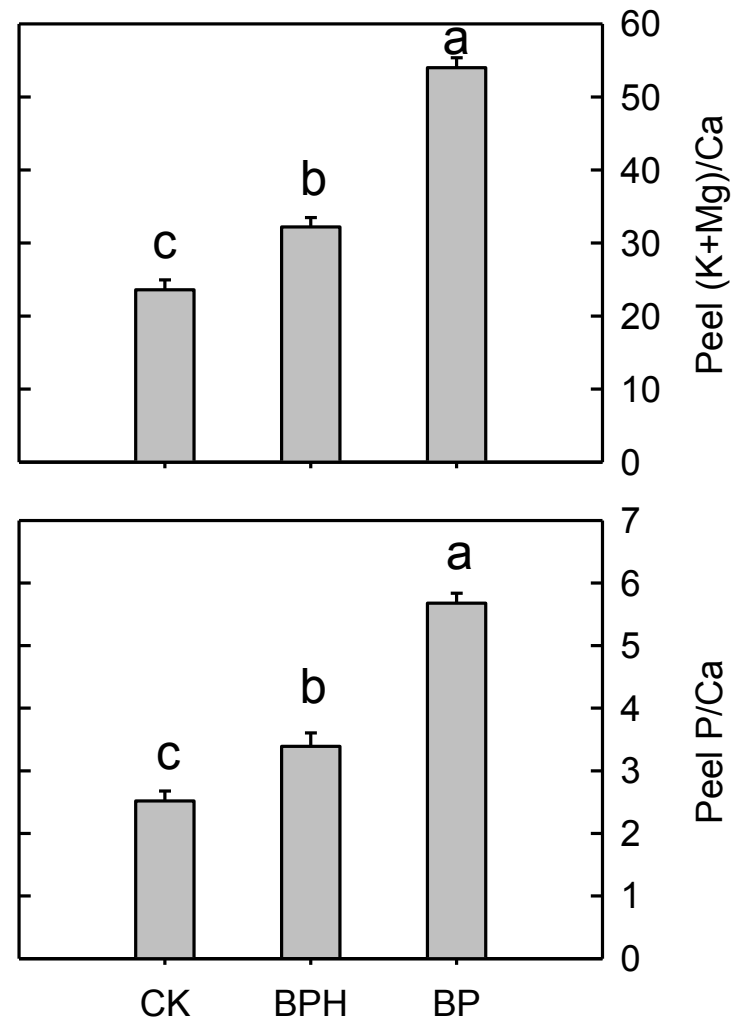
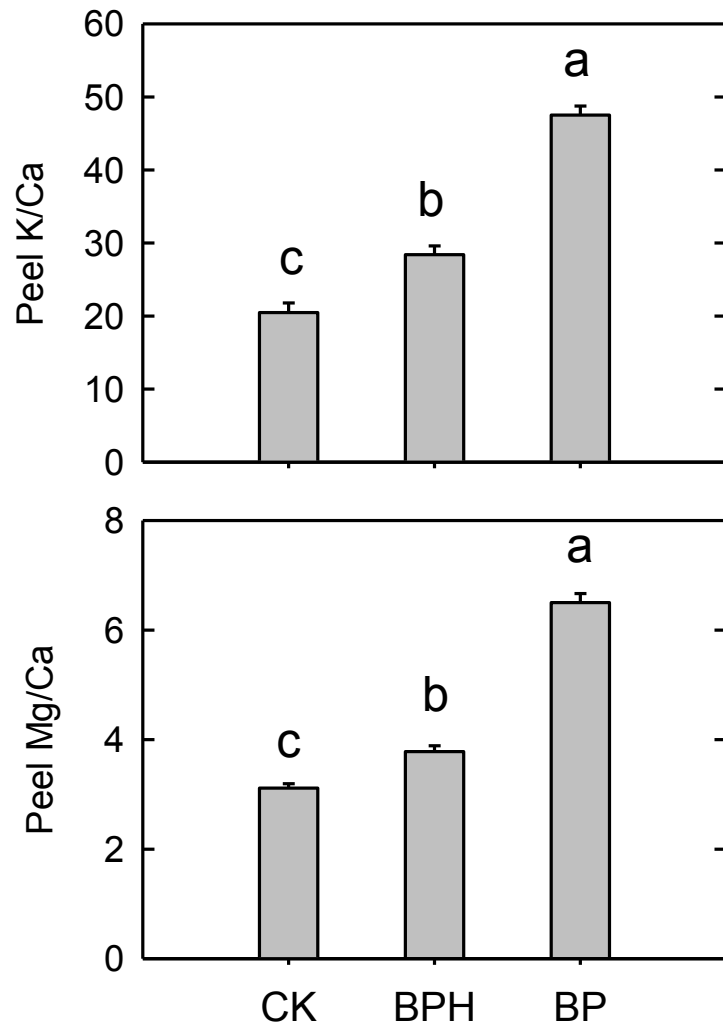
Fruit Nutrient Ratios in Gala and Honeycrisp



Peel Nutrient Levels in Honeycrisp fruit



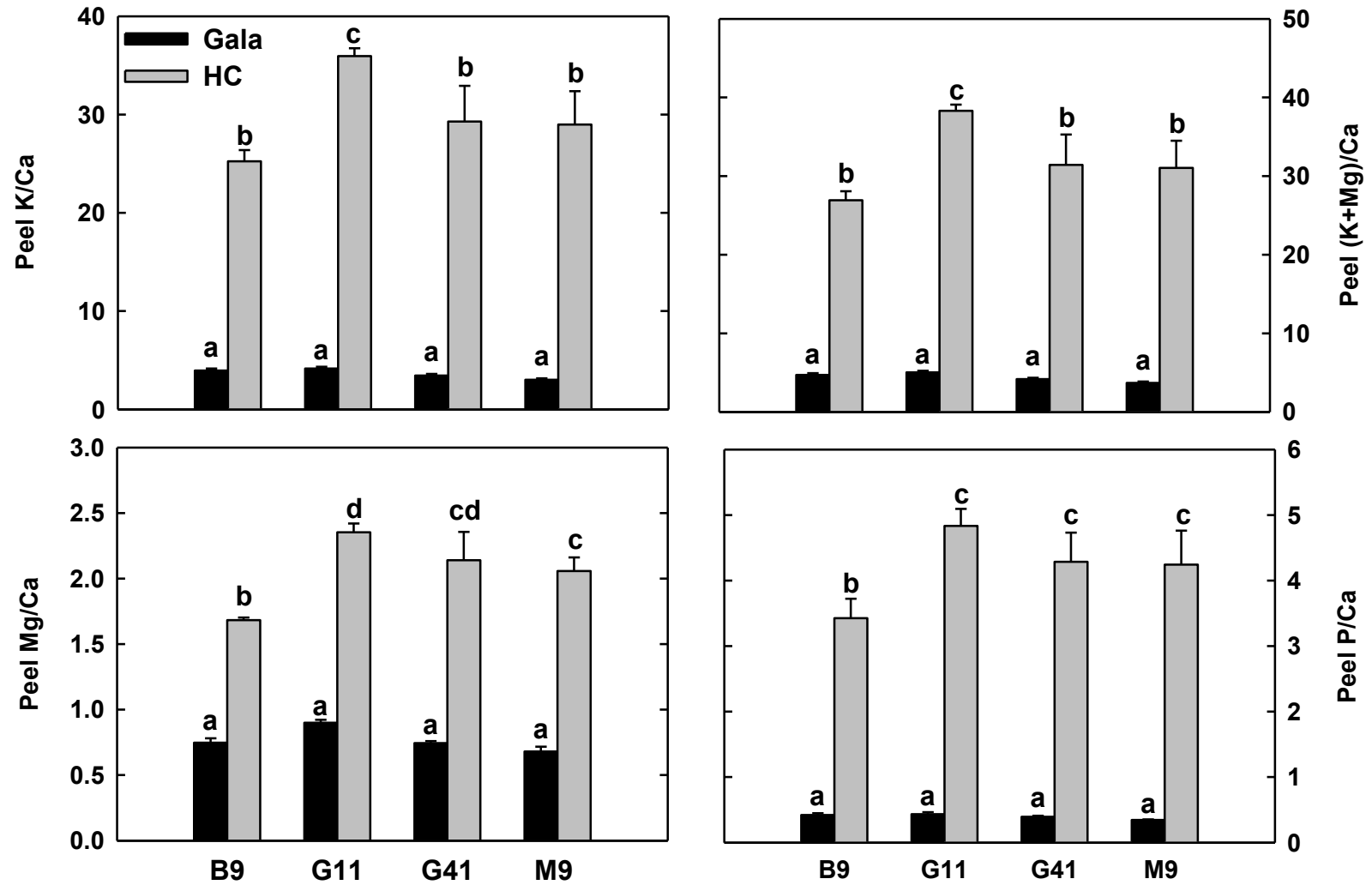
Peel Nutrient Ratios in Honeycrisp fruit



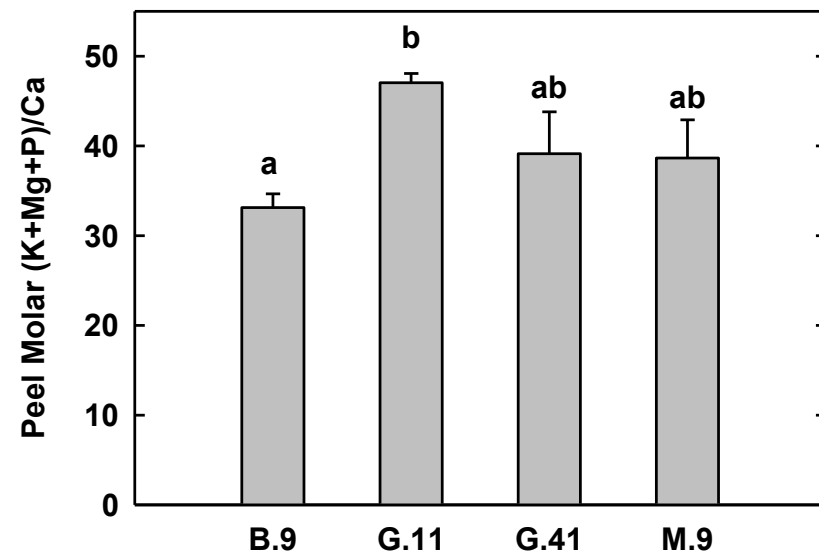
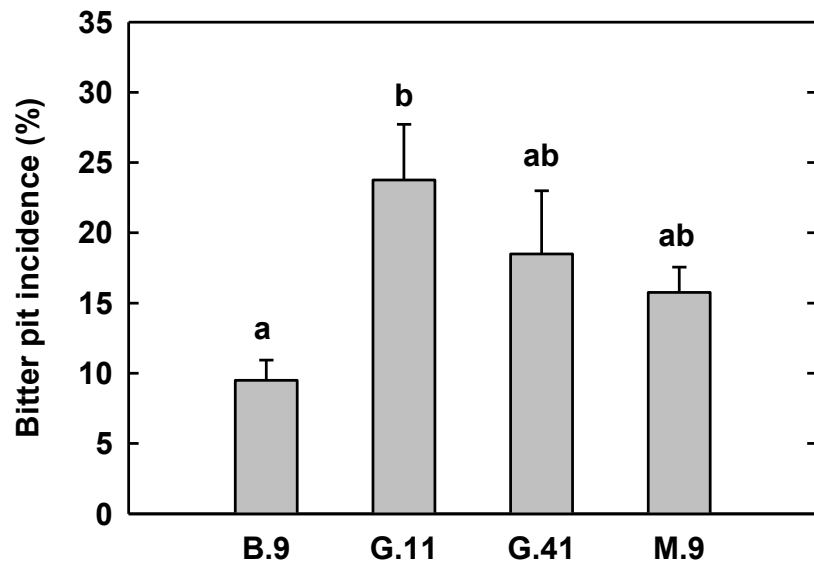
Conclusions

- **Less Ca is partitioned to fruit in ‘Honeycrip’ than in ‘Gala’**
- **Imbalances of Ca with K, Mg and P are closely associated with bitterpit**

Rootstock effects on peel nutrient ratios in Honeycrisp & Gala

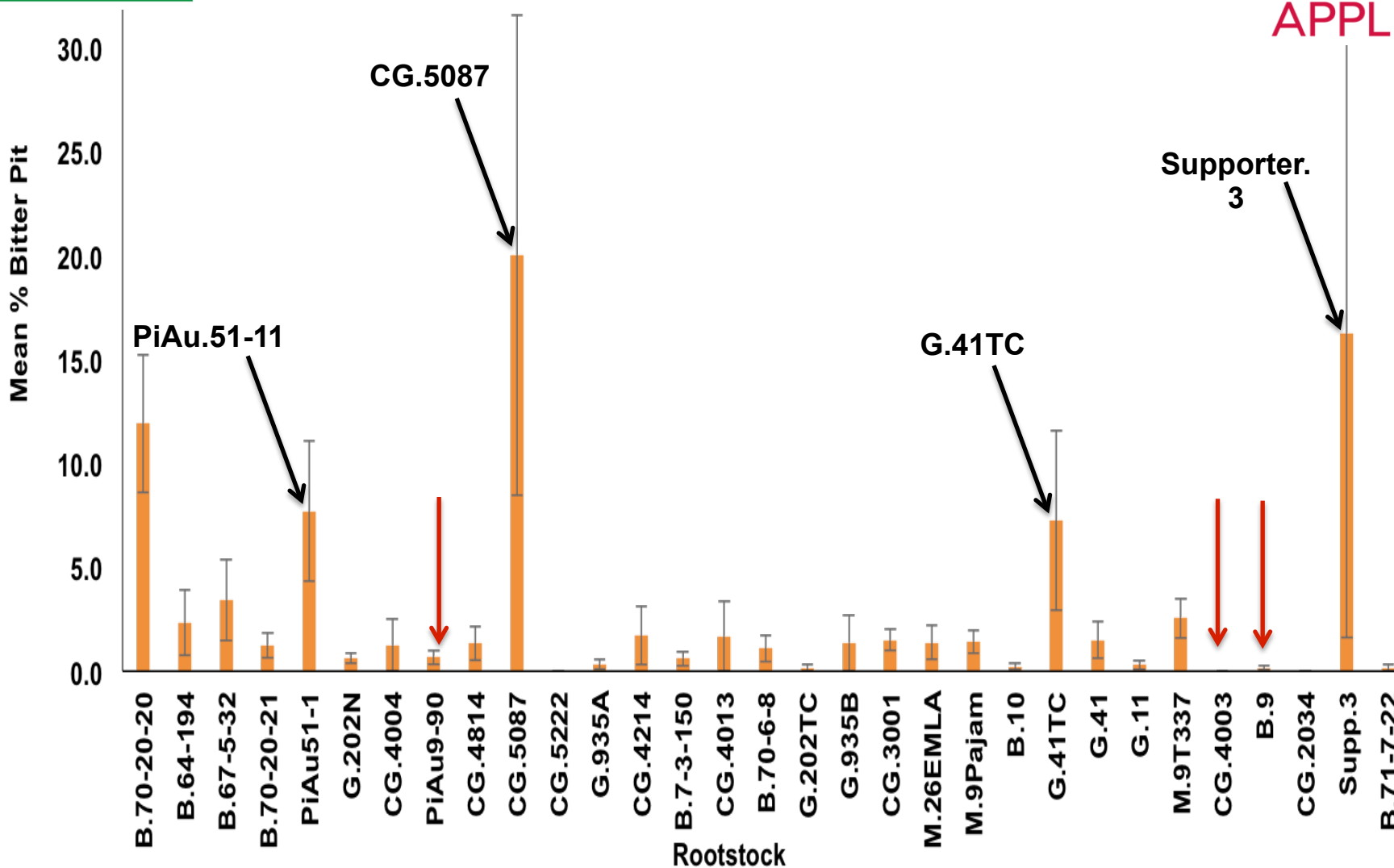


Rootstock Effects on Bitter Pit Incidence of Honeycrisp





2013 Incidence of 'Honeycrisp' Bitter Pit (Sparta)



From Dr. Greg Lang



Bitter pit incidence in ‘Honeycrisp’ apples from trees on rootstocks selected for low or high incidence (Based on data from 2013, 2015 & 2016)

Rootstock	Incidence of Bitter Pit (%)		
	2013	2015	2016
<i>Low Bitter Pit</i>			
Bud.9	<1	<2	<4
PiAu.9-90	<1	<1	<4
CG.4003* (n=4)	0	<2	<1
<i>High Bitter Pit</i>			
PiAu.51-11	~8	54	24
Supporter.3	~17	53	6
CG.5087	~20	15	15
G.41TC	~8	15	3



From Dr. Greg Lang

Bitter Pit in Relation to Cropload in Honeycrisp



Courtesy of Dr. Jim Schupp

Cropload Effects on Fruit Nutrients and Bitterpit

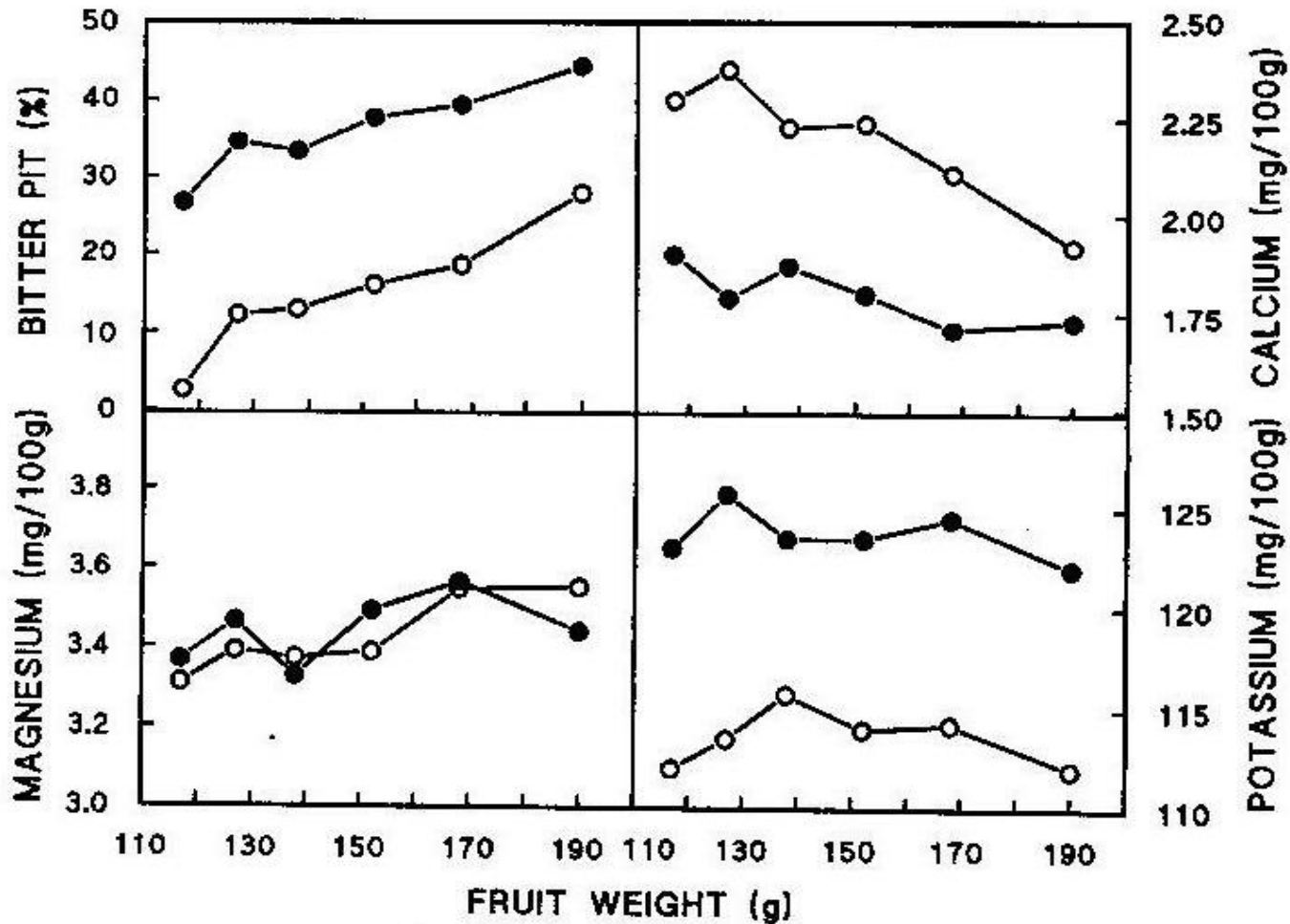


Fig. 1. Bitter pit incidence and Ca, Mg, and K concentrations of fruit from heavy-(○) and light-(●) cropping trees. Data are the means from four orchards for each fruit weight. SEDs and *P* values for the mean data are given in Table 1.

Management Strategies

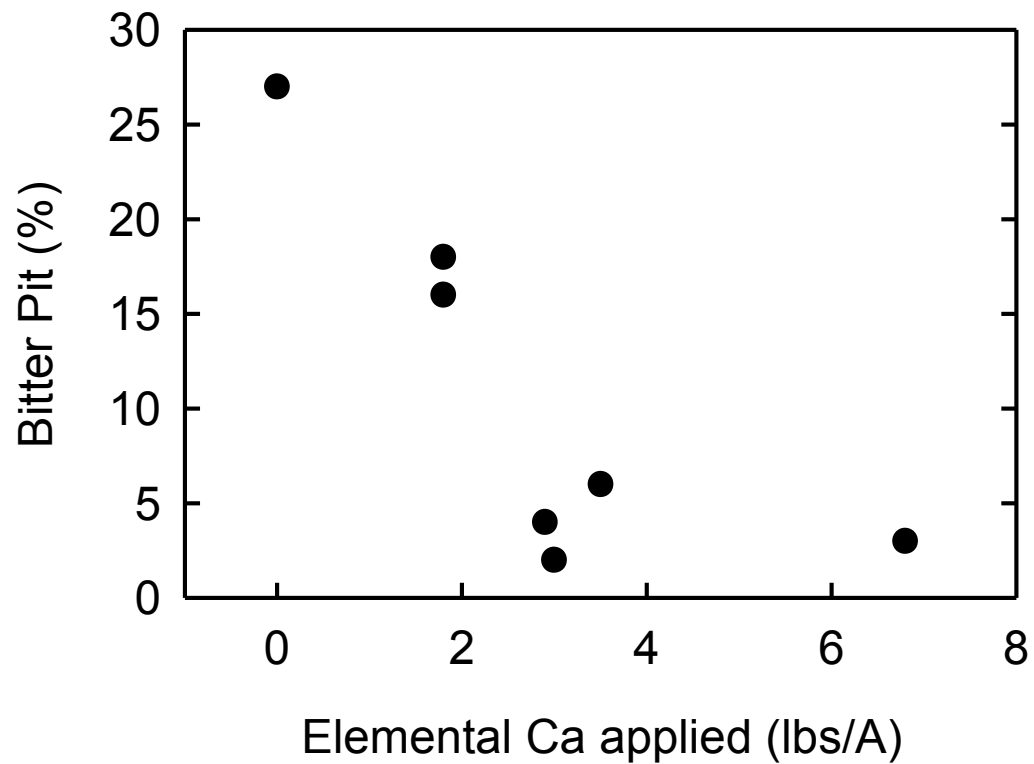
- Adjust soil pH to ensure adequate Ca supply in soil
- Promote and maintain root growth and Ca uptake (B, Zn, water availability)
- Control tree vigor to mitigate competition with fruit for Ca.
- Avoid low cropload situation
- Strictly control K (N, Mg and P) to balance fruit Ca with K.

Calcium Sprays

- 4 sprays of 1.5 to 2 lbs of CaCl_2 (78%) or its equivalent per 100 gallons (dilute basis) at 10 to 14 day intervals beginning 7 to 10 days after petal fall.
- 2 sprays of 3 to 4 lbs per 100 gallons at 2 week intervals starting from mid-season.

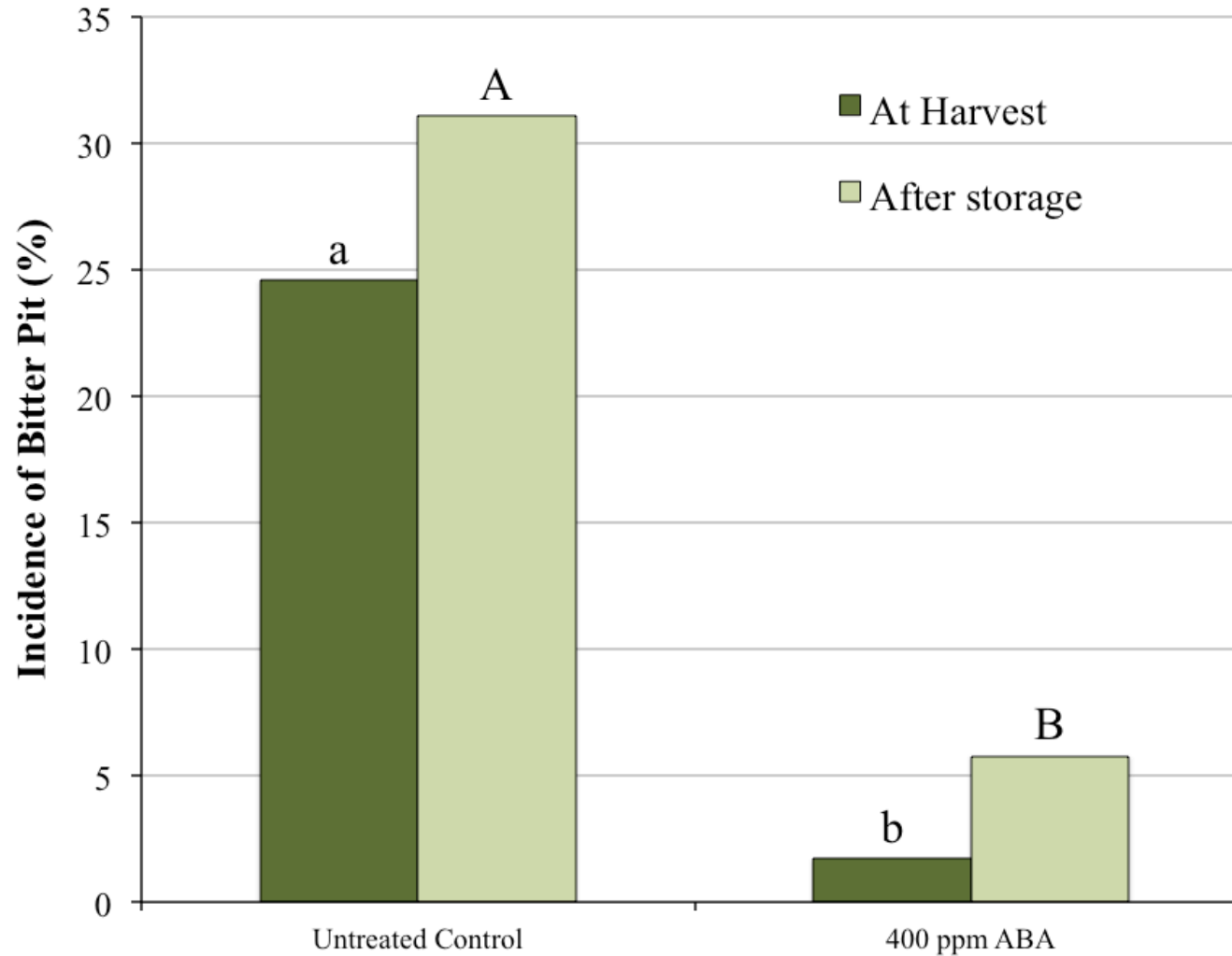
This program provides 3.4-4.5 lbs of actual Ca per acre

Bitterpit Occurrence vs. Amount of Ca Applied



Rosenberger et al, 2004

Effects of ABA sprays on Bitter Pit in Honeycrisp



Poliana Francescato
Geneva, NY - 2015

Partitioning of a Water Soluble Dye, Acid Fuchsin

Untreated control



ABA (350 ppm)



Poliana Franciscatto

Acknowledgments

- Terence Robinson, Poliana Francescato, Greg Lang, Phil Schwallier, Chris Watkins, Dave Rosenberger, Steve Hoying, Mario Miranda Sazo, Huaiyu Ma, Yongzhang Wang, Hufeng Li & Kaspar Kuehn
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