

# Peach Rootstocks- What's on the Horizon?

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# 1) Effect of Rootstock and In-row Tree Spacing on Mineral Nutrition and Productivity of Peach Trees

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## **Optimal spacing for quad V peach:**

- Available rootstocks;
- Effect on mineral nutrients required for a healthy crop

## **Evaluate effects of 5 rootstocks at 3 in-row tree spacings on:**

- leaf and soil mineral nutrient content,
- fruit yield, size, and fruit quality of peaches.

# 2014 Quad V Peach Trial

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## In-row spacing: 5, 7.5, 10 ft

- 16 ft between rows
- Trees / acre: 545, 363 or 272

## Coralstar on 5 rootstocks

- Empyrean II (Penta)
- KV10123 (KV123)
- Bailey
- Krymsk 86 (K86)
- Guardian



## Quad V (Tatura) trellis with 8-gauge plastic wire

# Rootstocks in 2014 Trial

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Name	Origin	Species	Size
KV 10123	WV, USA	Peach	Semi-dwf
Bailey	USA	Peach	Semi-dwf
Penta (Empy.)	Italy	Plum	Semi-dwf
Guardian	GA/SC, USA	Peach	STD
Krymsk 86	Russia	Pch/ Plum	STD

# Tree Size Effects 2014 - 2019

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Rootstock	Size (% largest)
K86	100 <sup>a</sup>
Guardian	90 <sup>ab</sup>
Penta	86 <sup>ab</sup>
KV123	77 <sup>bc</sup>
Bailey	66 <sup>c</sup>

In-row Spacing	Size (% of largest)
10 ft.	100 <sup>a</sup>
7.5 ft.	69 <sup>b</sup>
5 ft.	55 <sup>c</sup>

# Tree Size

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**K86 > Guardian > Penta > KV123 > Bailey**

- Bailey and Penta switched places in 2018

➤ **Of rootstocks in trial, Bailey has the most tree size control**

➤ **K86 is ~10% > vigorous than standards such as Guardian**

➤ **Tree spacing exerts more tree size control than selected rootstocks**

- 5' Vs 10': 45% smaller
- 7.5' Vs 10': 31% smaller

# After 1 Year & After 6 Years



# After 1 Year & After 6 Years





# Yield 2016 - 2019

In-row spac'g (ft.)	Trees	Scaffolds	2016	2017	2018	2019	Cum.
	-- # per acre --		----- bushels / acre -----				
5	545	2178	197 <sup>a</sup>	541 <sup>a</sup>	108	829 <sup>a</sup>	1676 <sup>a</sup>
7.5	363	1452	135 <sup>b</sup>	410 <sup>b</sup>	111	740 <sup>a</sup>	1395 <sup>b</sup>
10	272	1088	108 <sup>b</sup>	346 <sup>c</sup>	93	572 <sup>b</sup>	1119 <sup>c</sup>

Rootstock	2016	2017	2018	2019	Cum.
	----- bushels / acre -----				
Bailey	222 <sup>a</sup>	444 <sup>a</sup>	96 <sup>b</sup>	762 <sup>a</sup>	1527 <sup>a</sup>
Guardian	198 <sup>ab</sup>	418 <sup>ab</sup>	81 <sup>b</sup>	727 <sup>a</sup>	1427 <sup>a</sup>
KV123	167 <sup>b</sup>	438 <sup>ab</sup>	71 <sup>b</sup>	747 <sup>a</sup>	1426 <sup>a</sup>
K86	90 <sup>c</sup>	493 <sup>a</sup>	157 <sup>a</sup>	778 <sup>a</sup>	1522 <sup>a</sup>
Penta	53 <sup>c</sup>	359 <sup>b</sup>	112 <sup>b</sup>	555 <sup>b</sup>	1081 <sup>b</sup>

# Yield

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## **Closer spacing increased**

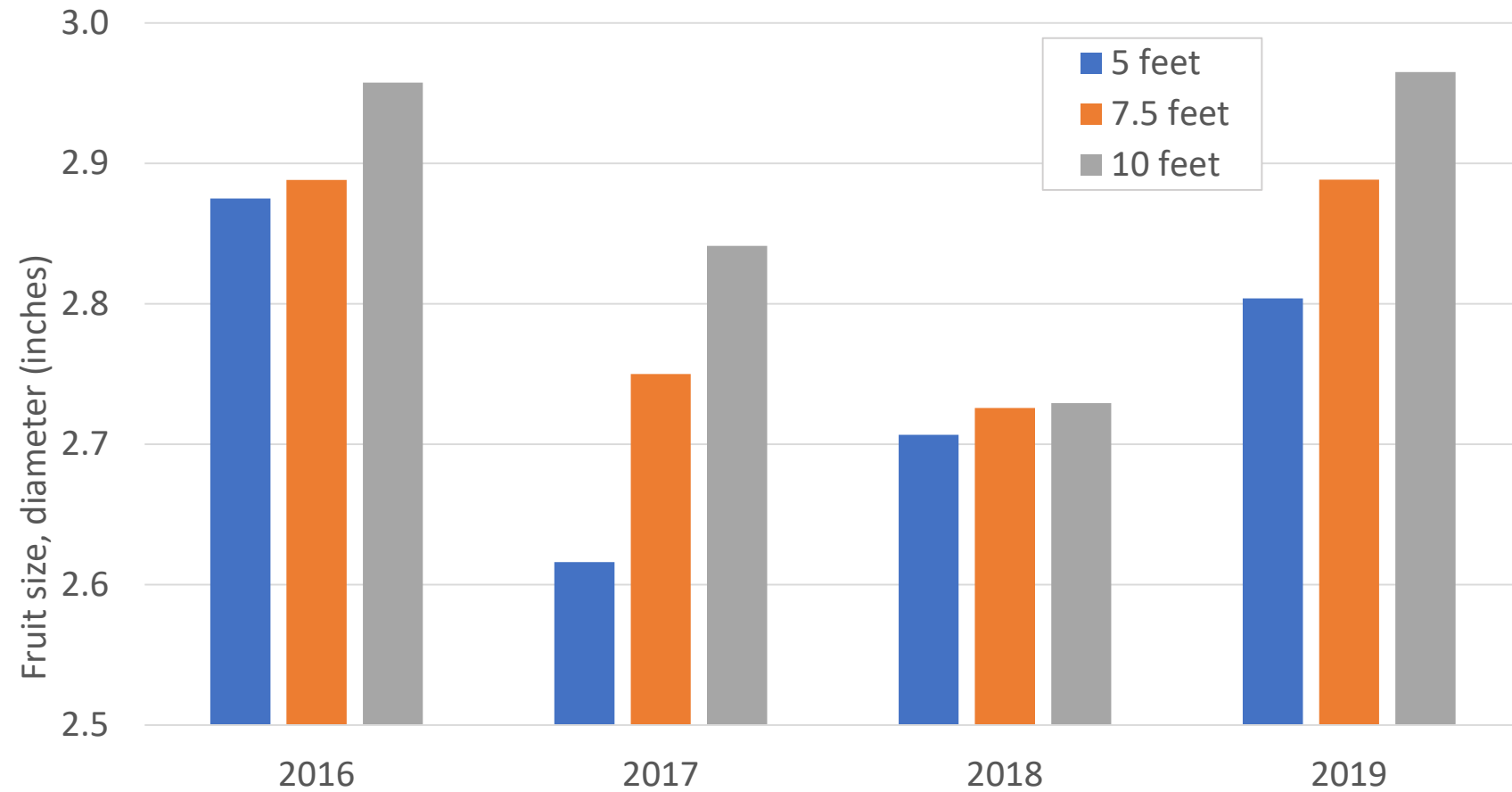
- Bearing surface and early yield per acre

## **Bailey and Guardian were more precocious (2016), than Penta and K86**

- By 2017, all rootstocks had higher annual yield than Penta

**After 4 crops, no yield difference by rootstock, except >Penta**

# Fruit Size By Spacing



# Fruit Size Effects 2016-2019

Rootstock	Avg fruit diameter (in.)	In-row Spacing	Avg fruit diameter (in.)
Bailey	2.97	10 ft.	3.02 a
Guardian	2.94	7.5 ft.	2.93 b
KV123	2.90	5 ft.	2.81 c
K86	2.94		
Penta	2.86		

p < 0.0001

N.S.

# Fruit Size

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## **Smaller fruit with closer spacing**

- **Fruit size is 6% smaller in 5 ft spacing than 10 ft**
- **Peak sizes still very marketable (>2.75 in)**
- **At 7.5': 3% smaller (25% more)**

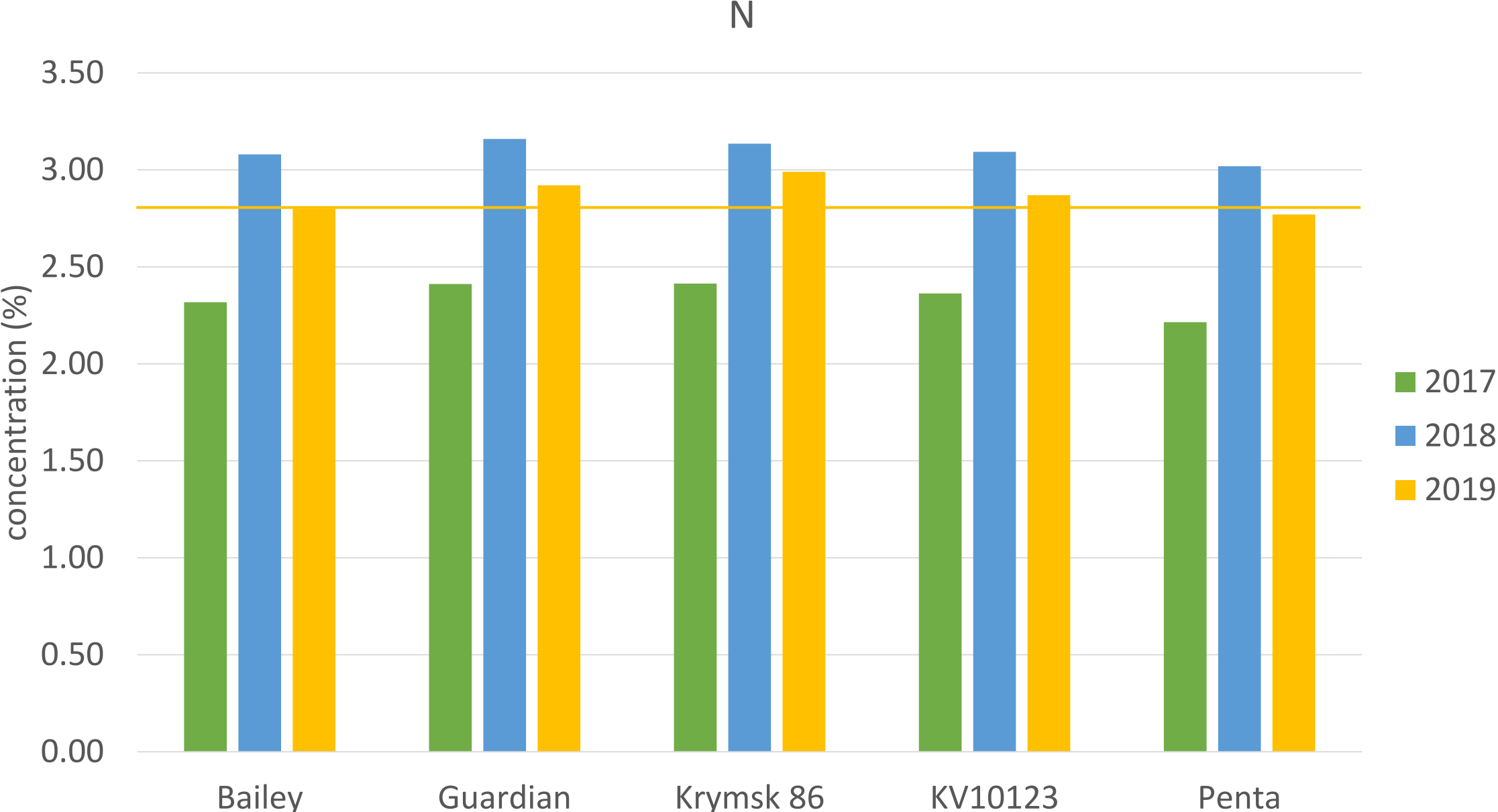
**Fruit size was not influenced by rootstock over the life of the study**

# Spacing: Leaf N 2019

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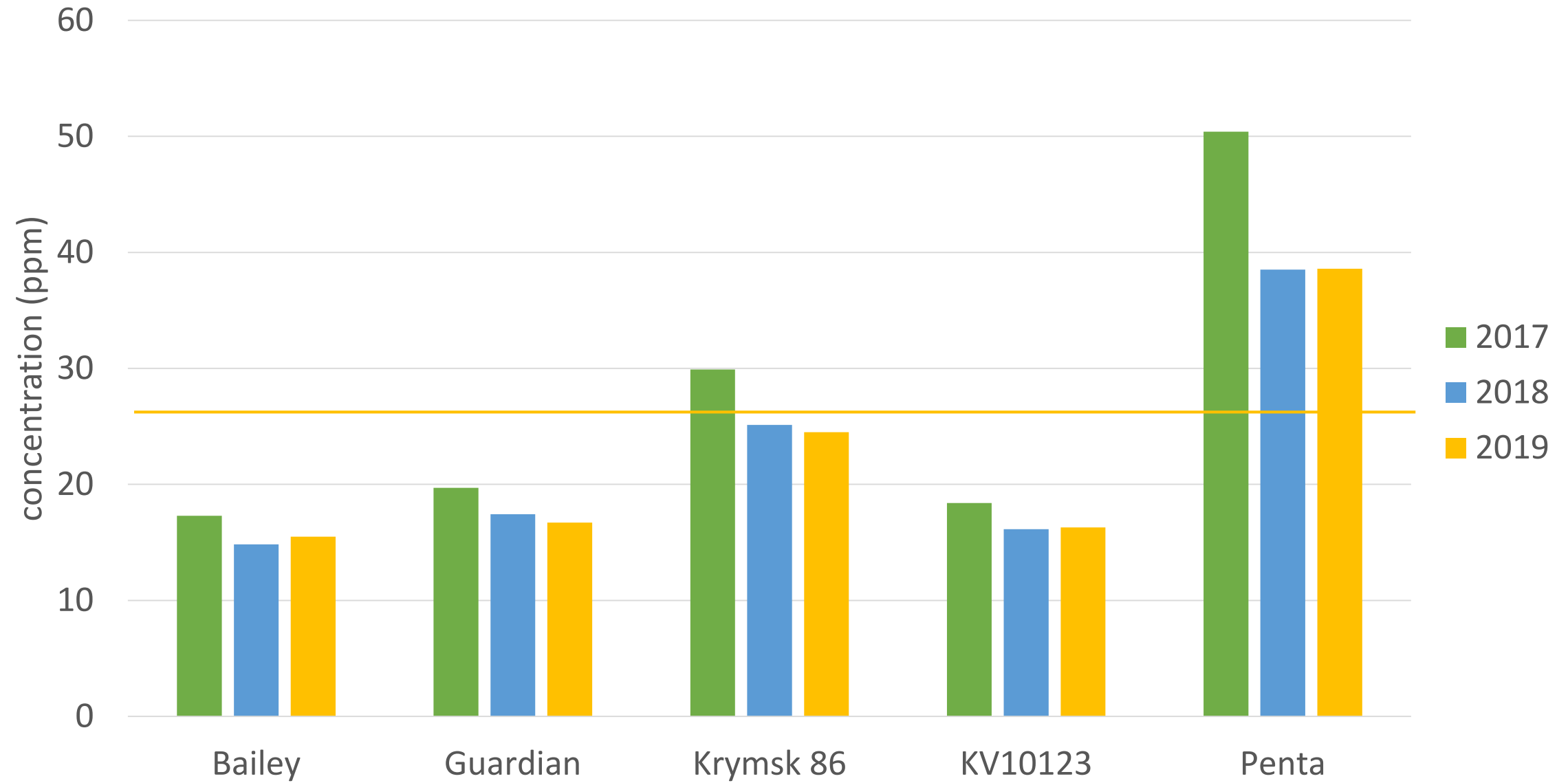
Spacing		N	
10		3.0	a
7.5		2.9	b
5		2.8	c
p-value		0.000	

Rootstock effects on leaf mineral nutrient concentrations, 2017-2019



# Rootstock effects on leaf mineral nutrient concentrations, 2017-2019

Zn





# Foliar Mineral Nutrition

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**Leaf minerals were sufficient 2017-2019, exc Zn**

- **K, Ca & Mg were on high side (high Mg and K saturation in soil)**

**Lower N at closer spacing in 2019 – competition**

**Penta rootstock: high levels of several mineral nutrients.**

- **Smaller crops borne on Penta trees**

# 1) Rootstock Summary

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**Bailey was the best rootstock for precocity, productivity and moderate vigor**

**KV10123 was also a productive semi-dwarf tree**

**Guardian was a productive standard sized tree**

**Krymsk 86 would be a good rootstock where a vigorous productive tree is desired**

**Penta was least productive rootstock – not recommended**

**Penta had higher levels of several mineral nutrients**

**All rootstocks responded similarly to changes in spacing**

# 1) In-Row Spacing Summary

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**In-row 5' or 7' vs 10': 50% to 25% > yield on 45% to 31% smaller trees**

**Fruit size is 6% smaller at 5 ft spacing than 10 ft**

- **Peak sizes still very marketable (2.75 in.)**
- **Use 7.5 ft. spacing for small cultivars (only 3% smaller)**

**Mineral nutrition differences small compared to changes in tree vigor and yield**

**Increased yield and competition at closer spacing – annual leaf analysis advised**

# NC-140 Peach Rootstock Research:

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- 6 long-term trials completed since 1984
- 26 sites in North America
- 71 scientists
- 49 selections tested
- New trial planted in 2017

## 2) 2017 NC-140 Rootstock Trial

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**Spacing: 6 ft. x 16.5 ft.**

- Free-standing Perp. V

**Cresthaven on 8 rootstocks**

- Controller 6
- Controller 7
- Controller 8
- Guardian
- Lovell
- MP-29
- Rootpak 20
- Rootpak 40

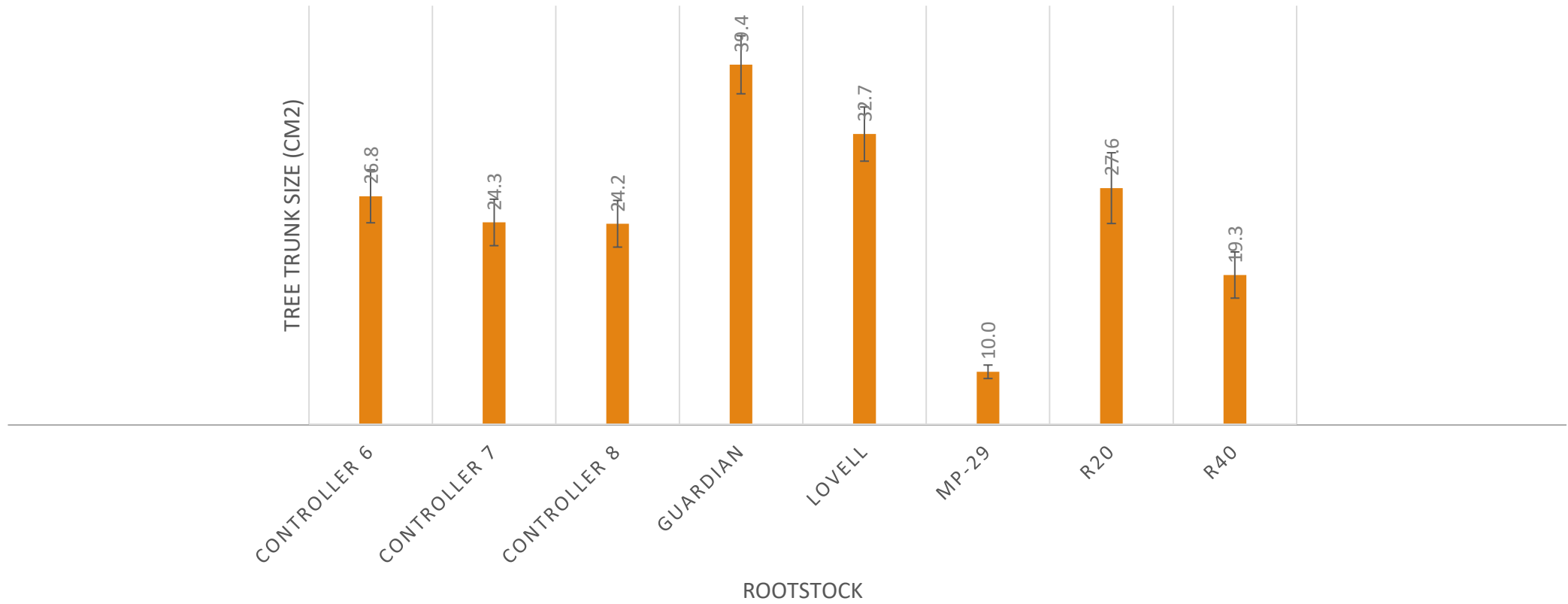


# Rootstocks in 2017 NC-140 Trial

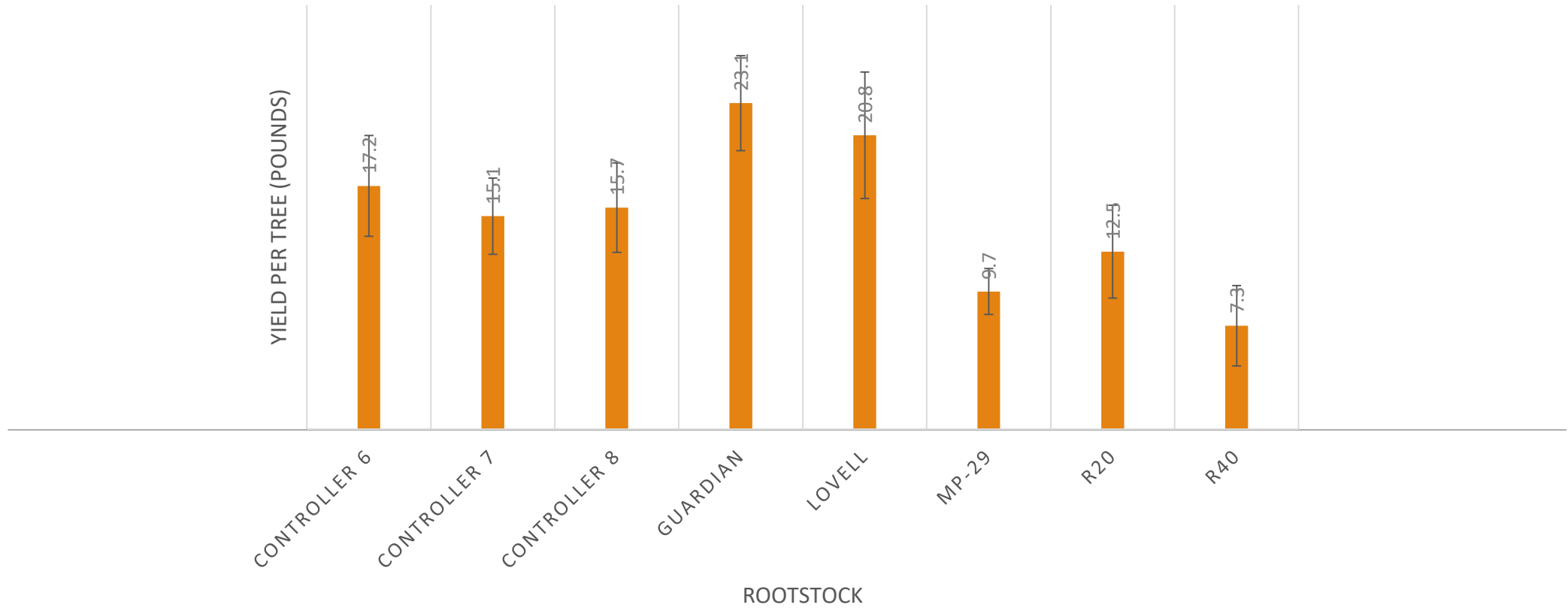
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Name	Origin	Species	Size
MP 29	GA/FL, USA	Plum/Pch	Dwarf
Rootpak40	Spain	Almd/Pch	Dwarf
Controller 8	CA, USA	Peach	Semi-dwarf
Controller 7	CA, USA	Peach	Semi-dwarf
Controller 6	CA, USA	Peach	Semi-dwarf
Rootpak 20	Spain	Plum/Pch	Semi-dwarf
Lovell	CA, USA	Peach	STD
Guardian	GA/SC, USA	Peach	STD

# TREE SIZE 2019



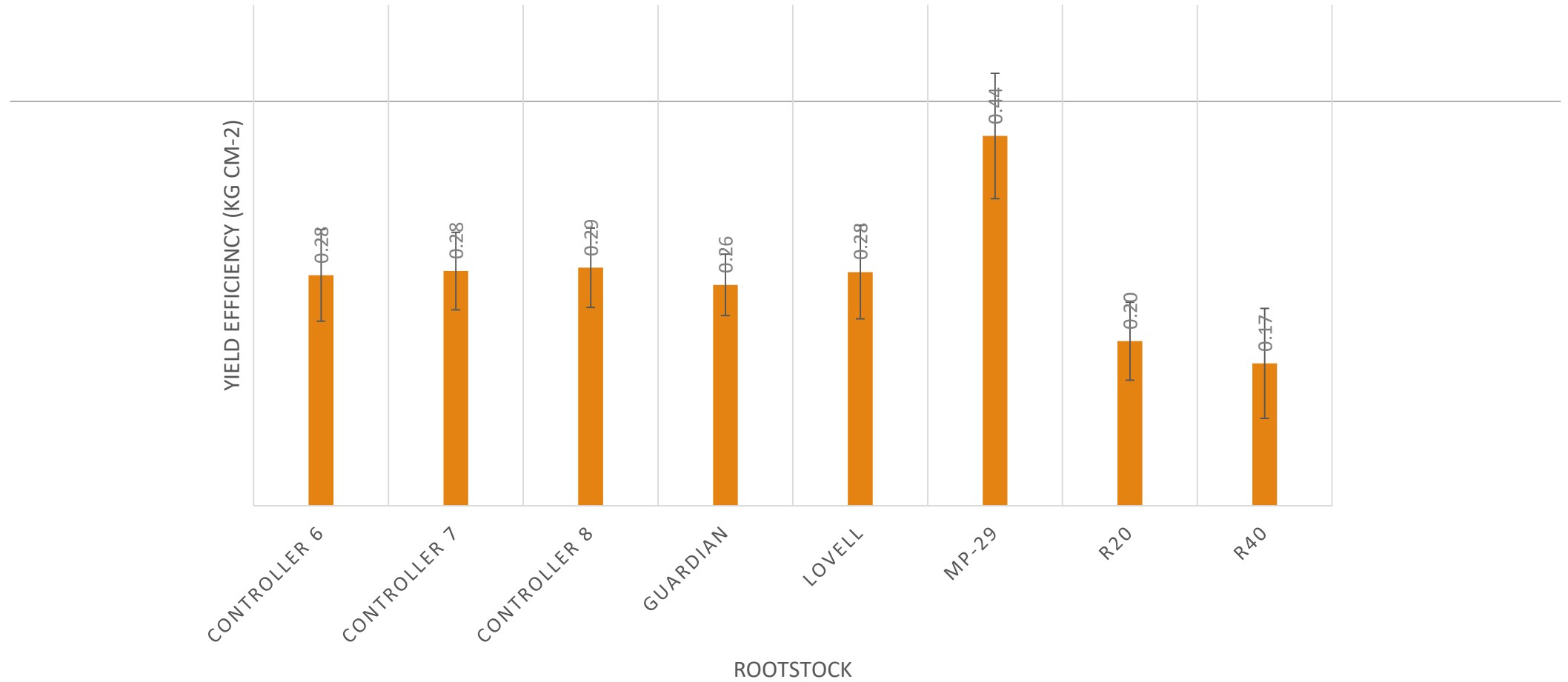
# YIELD (LB) 2019



Bars indicate one standard deviation from the sample mean

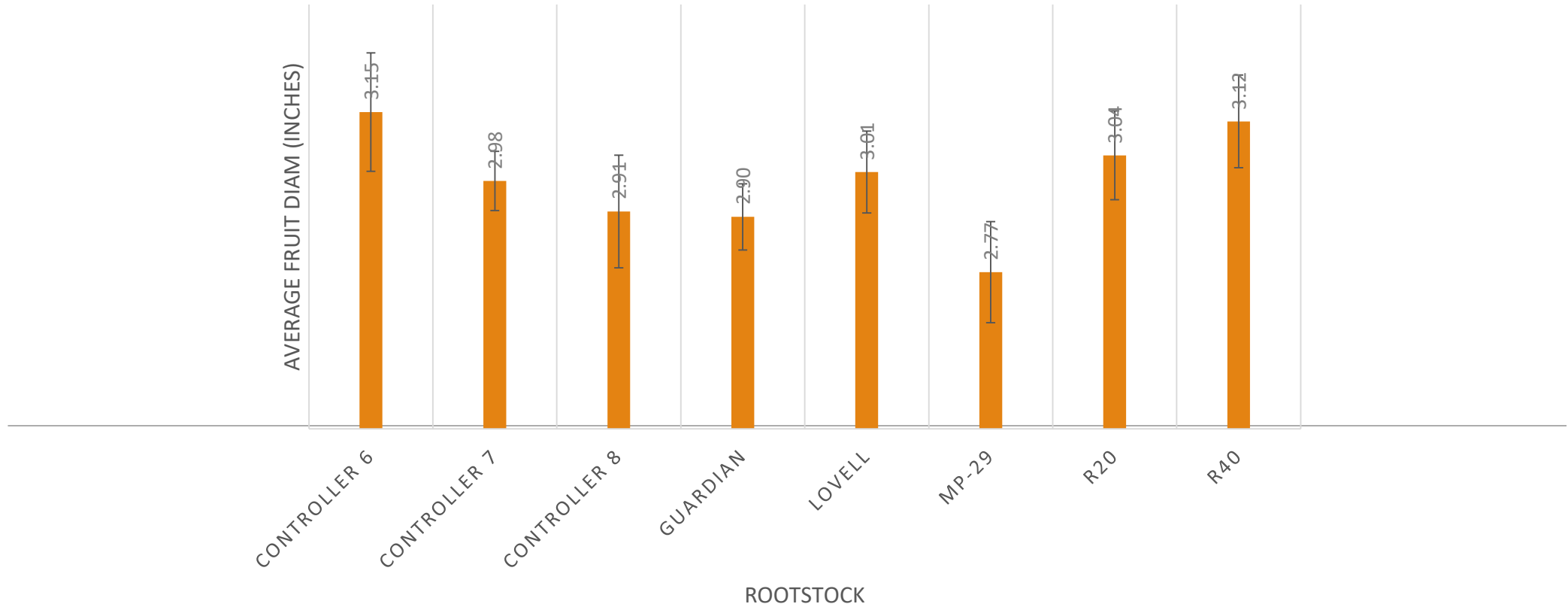


# YIELD EFFICIENCY 2019



Bars indicate one standard deviation from the sample mean

## AVERAGE FRUIT SIZE (IN) 2019



Bars indicate one standard deviation from the sample mean

# Year 3 Rootstock Comparison

Rootstock	% of Lovell	
	<u>Trunk size</u>	<u>Yield</u>
<b>Controller 6</b>	82	83
<b>Controller 7</b>	74	72
<b>Controller 8</b>	74	75
<b>Guardian</b>	120	111
<b>Lovell</b>	100	100
<b>MP-29</b>	31	47
<b>R20</b>	84	60
<b>R40</b>	59	35

# Rootstocks of Interest-Small to Large

Name	Origin	Species	Size (% Lovell)	Yid Efficiency	Mortality (SE PA)
MP 29	GA/FL, USA	Plum/Pch	31(?)	V. High(?)	Low(?)
Rootpak40	Spain	Almd/Pch	60(?)	Low(?)	High(?)
Controller 8	CA, USA	Peach	70	High	Low
Controller 7	CA, USA	Peach	75	M-High	Low
Controller 6	CA, USA	Peach	80(?)	M-High(?)	Low(?)
Rootpak 20	Spain	Plum/Pch	80(?)	Low(?)	Low(?)
KV 10123	WV, USA	Peach	86	M-High	Low
Bailey	USA	Peach	90	M-High	Low
Lovell	CA, USA	Peach	100	Medium	Low
Guardian	GA/SC, USA	Peach	105	Medium	Low
Krymsk 86	Russia	Pch/ Plum	115	Medium	Low

# On-Farm Trials in 2020

## Controller size-controlling rootstocks

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Harrow Blood x Okinawa crosses

Semi-dwarf (70% Std)

High cumulative yield

- Similar yield to trees on standard rootstocks

Yield efficiency

Precocious

Survival = High



# Controller On-Farm Trial 2020

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Flamin Fury PF Lucky 13

Four rootstocks:

Controller 6, 7 and 8, + Krymsk 86

30 trees of each

10 farms across PA



# Controller On-Farm Trial 2020

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Containerized trees

Spacing:

10-12 ft in-row

16- 18 ft between rows

Freestanding quad V / open vase



# Krymsk 86

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Peach x plum inter-specific hybrid

Russia

Tree size is ~115% standard

Productive

Low mortality

A likely replacement for Lovell



# Controller™ 6

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Another HBxOK cross from UC Davis

Formerly HBOK 27

Reported tree size is 45% that of Nemaguard (STD)

Selected for:

- Size control
- Low suckering
- Root knot nematode resistance

# Controller™ 7

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Another HBxOK Prunus persica from UC Davis

Semi-dwarf: tree size 79% that of Lovell

Precocious

Good cumulative yield and average yield efficiency

Low suckering

Low mortality

# Controller™ 8

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Harrow Blood x Okinawa cross

- P. persica cross from UC Davis

Semi-dwarf: 70% Lovell

High cumulative yield

- Similar yield to trees on standard rootstocks

High yield efficiency (lb fruit / tree size)

Precocious

Mortality low

# Acknowledgements

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- **FREC Team**
- **PA Peach & Nectarine Program**
- **State Horticultural Assoc PA**

