AGRICULTURAL EXPERIMENT STATION
COLORADO STATE UNIVERSITY

NC-140

XII ORCHARD SYSTEMS 2021

ISHS
International Society for Horticultural Science

July 26-30, 2021

Establishment performance

2017 NC-140 Semi-Dwarf Peach Rootstock Trial

Dr. Ioannis S. Minas
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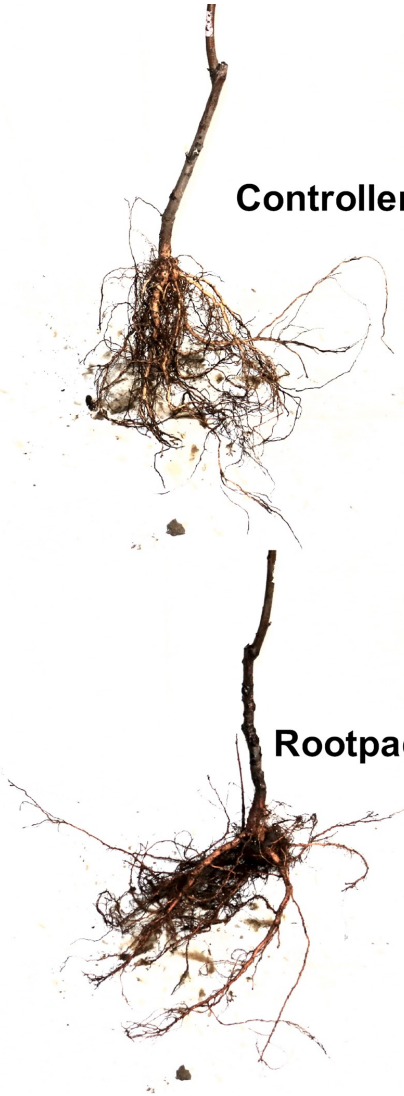

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Effect of canopy volume on light interceprion

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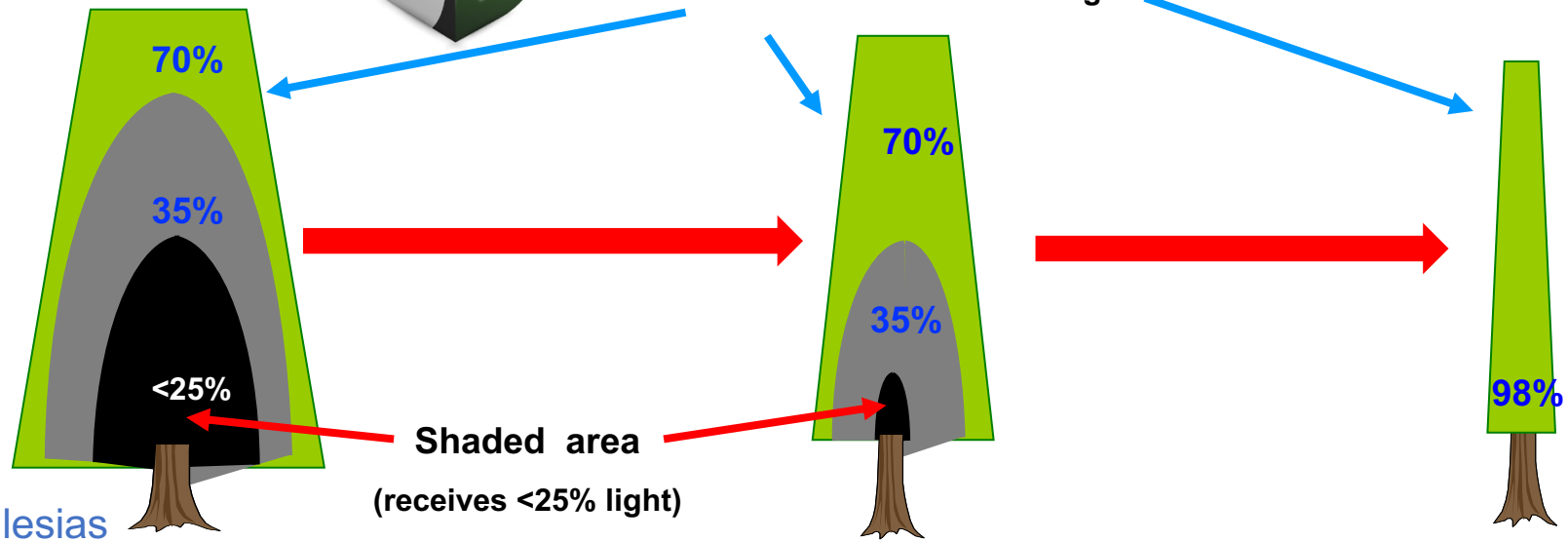
3D

2D

Well light exposed area
receives >70 % or 98% of light



Small trees are more efficient!

- More well iluminated portion of the canopy
- More fruiting wood
- Fruits closer to main permanent structure

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Adopted from I. Iglesias

Rootstock influence on 'Redhaven' peach tree vigor, light availability, internal fruit quality & primary metabolism (@equal maturity & crop load)

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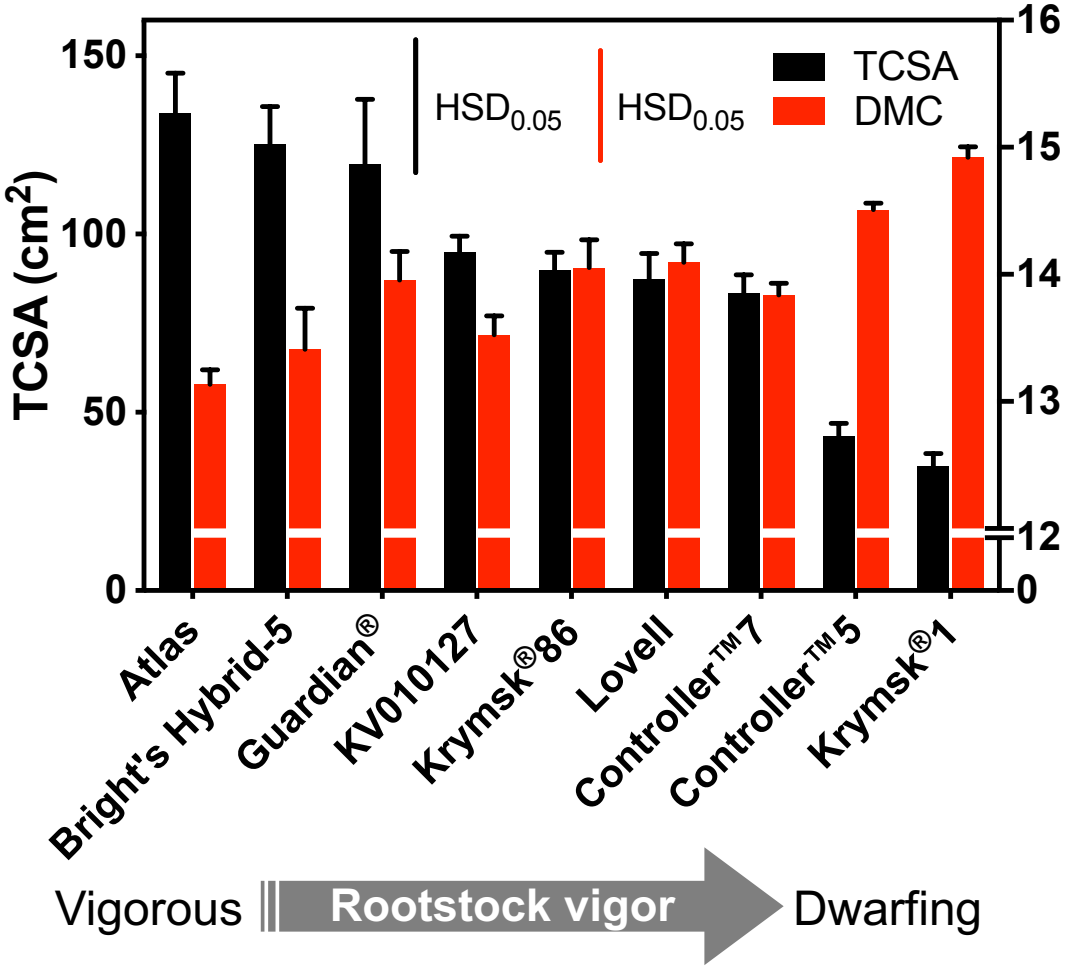
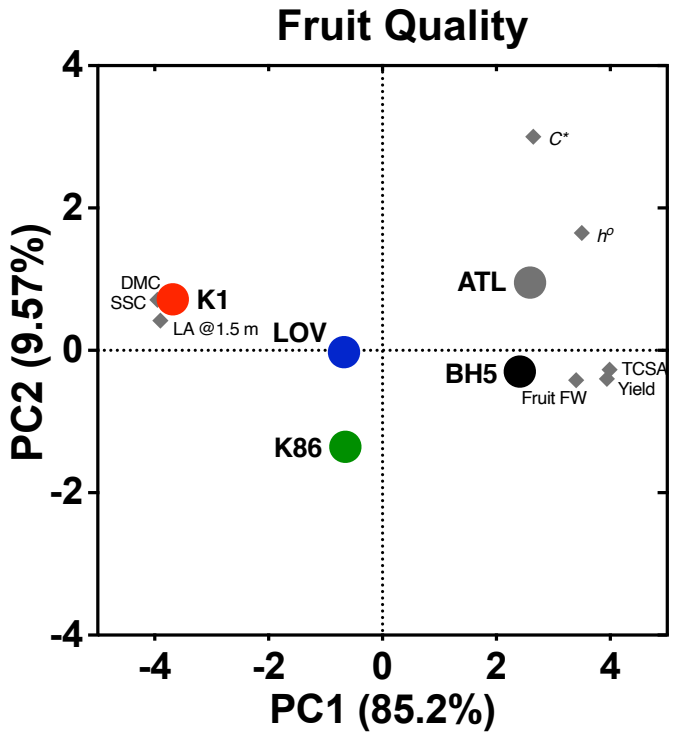
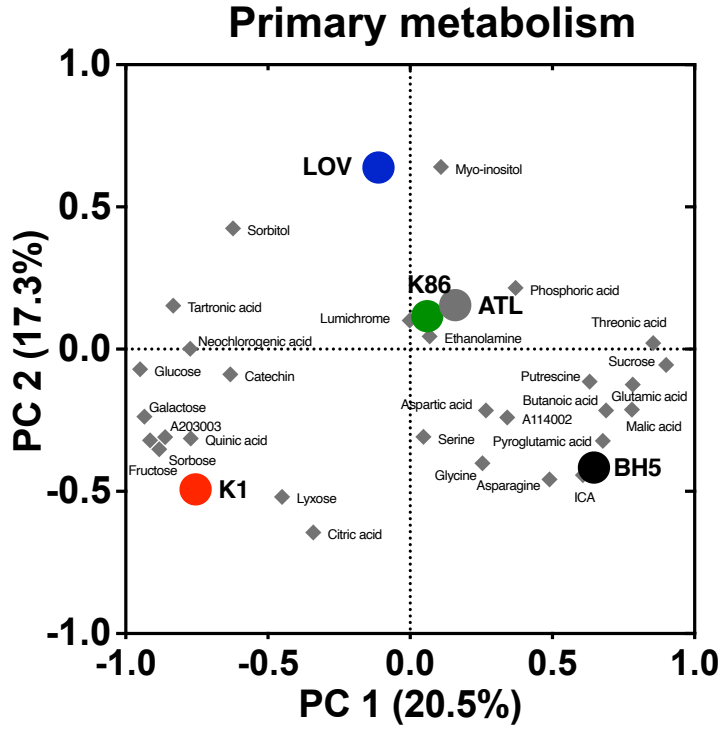
2009 NC-140 'Redhaven' Peach Rootstock Trial



Vigorous | Rootstock vigor → Dwarfing





Dwarfing | Rootstock vigor → Vigorous

Minas et al., 2021. *In preparation*

Pieper et al., 2021. *In preparation*

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Super slender-axe on a 2D setting with M.9 in apple

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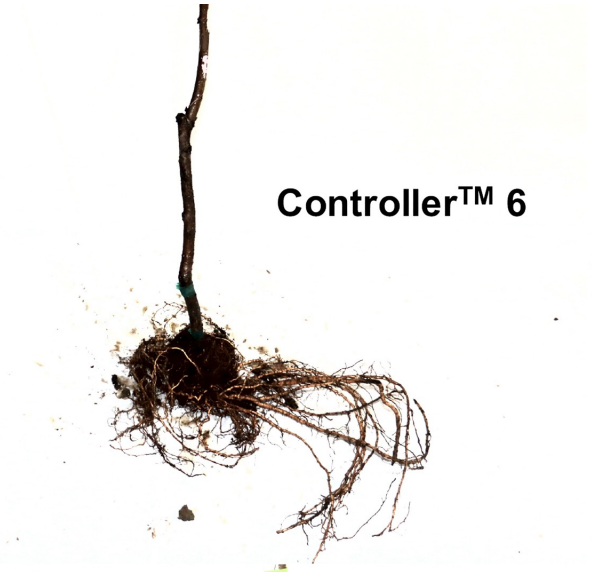
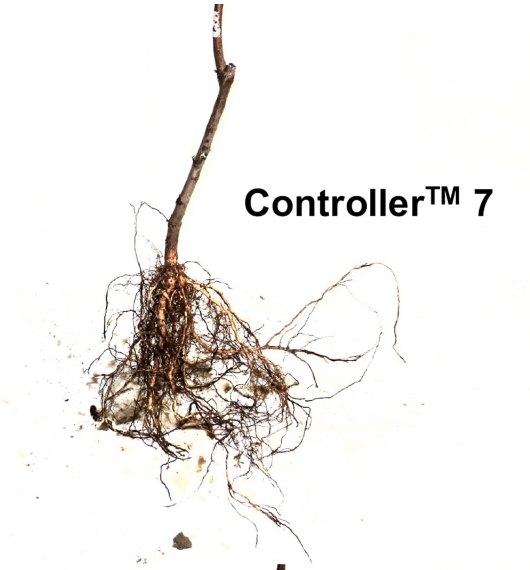
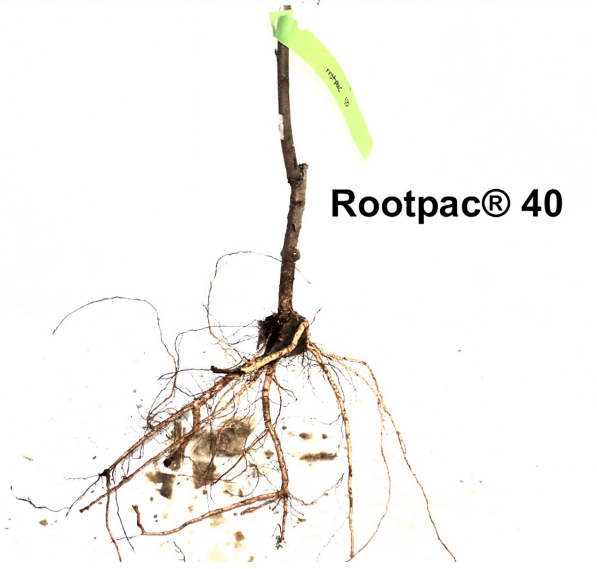
High-density cropping systems and 2D canopy architectures in Sweet Cherry

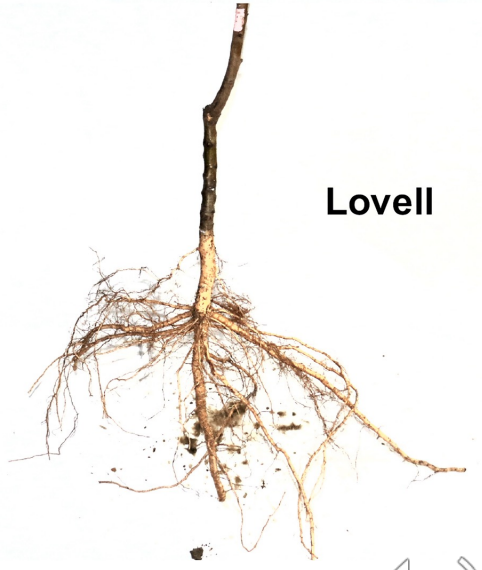
Source: L. Long, G. Lang, S. Musacchi, M. Whiting. 2015. Cherry Training Systems. Pacific Northwest Extension Publication 667.

The 2017 NC-140 Cresthaven Semi-Dwarf Peach Rootstock Trial









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Good Fruit Grower, February 1st, 2018

2017 NC-140 Cresthaven Semi-Dwarf Peach Rootstock Trial

Sites: AL, CO, GA, MI, NC, NY, ONT, PA, SC, UT
Coordinator: Ioannis Minas (Colorado State University)
Cultivar: 'Cresthaven'
Training system: KAC-V
Spacing: 1.8 x 4.5 m (6 x 15 feet)
Trees/ha: 1196 (/acre: 484)

Rootstock	Breeder, Country	Genetic origin
Controller™ 6 (HBOK 27)	UC Davis,USA	peach x peach hybrid (*Prunus persica* x *P. persica*)
Controller™ 7 (HBOK 32)	UC Davis, USA	peach x peach hybrid (*P. persica* x *P. persica*)
Controller™ 8 (HBOK 10)	UC Davis, USA	peach x peach hybrid (*P. persica* x *P. persica*)
MP-29	USDA-Georgia, USA	plum x peach interspecific hyb. (*P. umbellata* x *P. persica*)
Rootpac® 40 (Nanopac)	Agromillora Iberia, Spain	almond x peach interspecific hyb. [(*P. dulcis* x *P. persica*) x (*P. dulcis* x *P. persica*)]
Rootpac® 20 (Densipac)	Agromillora Iberia, Spain	plum x peach interspecific hybrid (*P. besseyi* x *P. persica*)
Guardian®	Clemson/USDA, USA	peach seedling (*P. persica*)
Lovell	G.W. Thissell, USA	peach seedling (*P. persica*)

2017 NC-140 Semi-Dwarf Cresthaven Peach Rootstock Trial

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3rd leaf -2019

Rootstock performance (all sites)

Rootstock	Survival (%)	Suckers (count)	TCSA (cm^2) at planting	TCSA (cm^2) 2019	% of Lovell 2019	% of Guard. 2019
Controller™6	87.7[a]	0.3[b]	0.4[f]	24.3[cd]	78.9	60.1
Controller™7	85.0[ab]	0.1[b]	0.7[ef]	18.7[de]	60.7	46.3
Controller™8	89.0[a]	0.3[b]	1.0[d]	21.1[de]	68.5	52.2
MP-29	86.8[ab]	0.1[b]	2.2[a]	16.6[e]	53.9	41.1
Rootpac®20	86.1[ab]	4.1[a]	0.8[de]	29.1[bc]	94.5	72.0
Rootpac®40	72.1[b]	0.0[b]	0.5[ef]	16.4[e]	53.2	40.6
Guardian®	96.0[a]	0.9[b]	1.8[b]	40.4[a]	131.2	100.0
Lovell	94.0[a]	1.1[b]	1.3[c]	30.8[b]	100.0	76.2
Estimated HSD	15.7	3.0	0.2	6.5		

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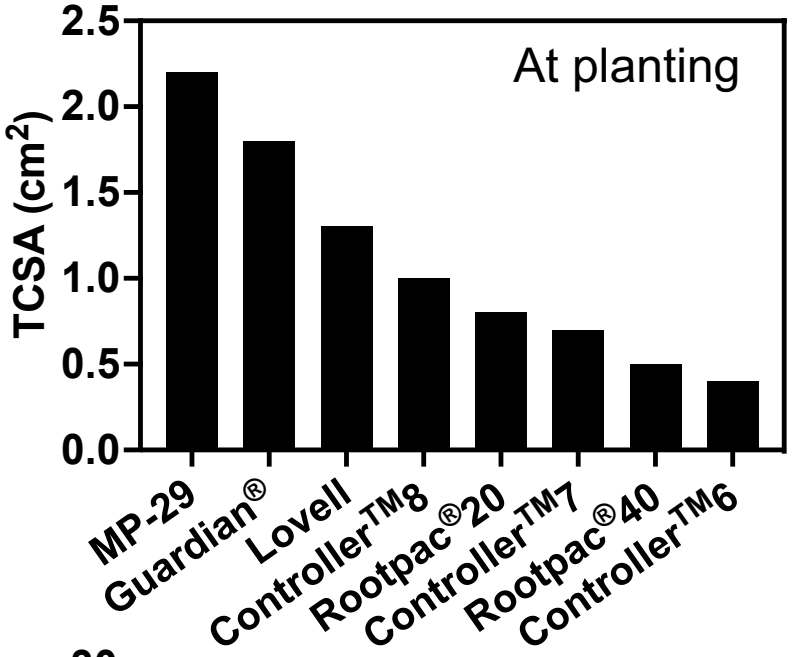
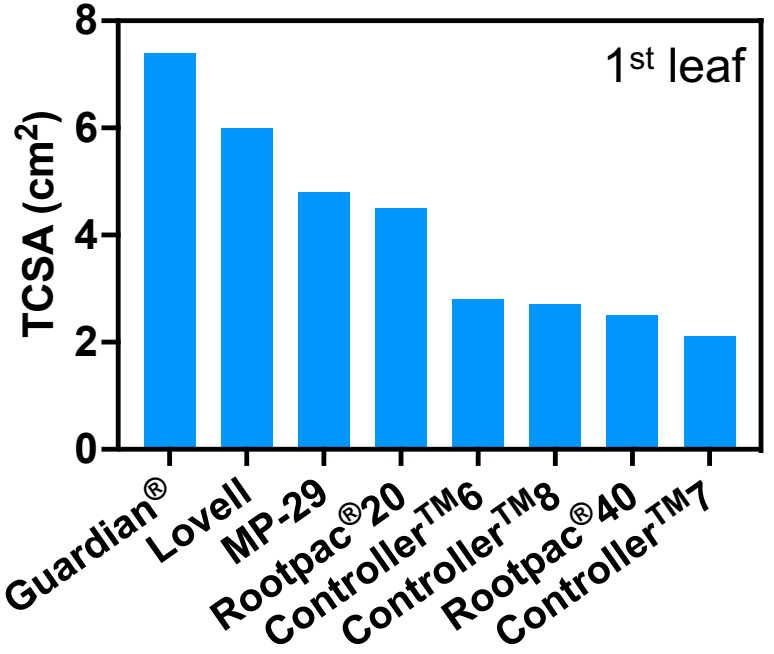
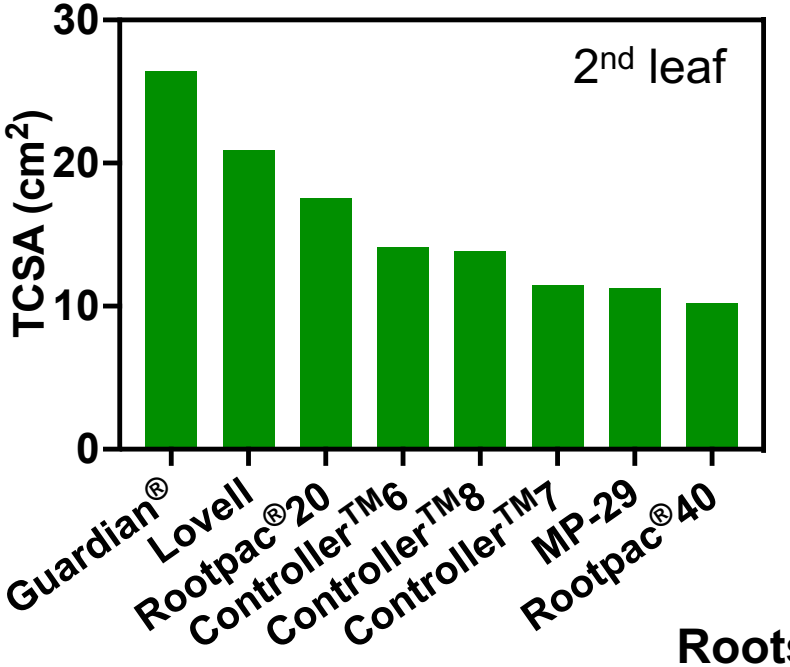
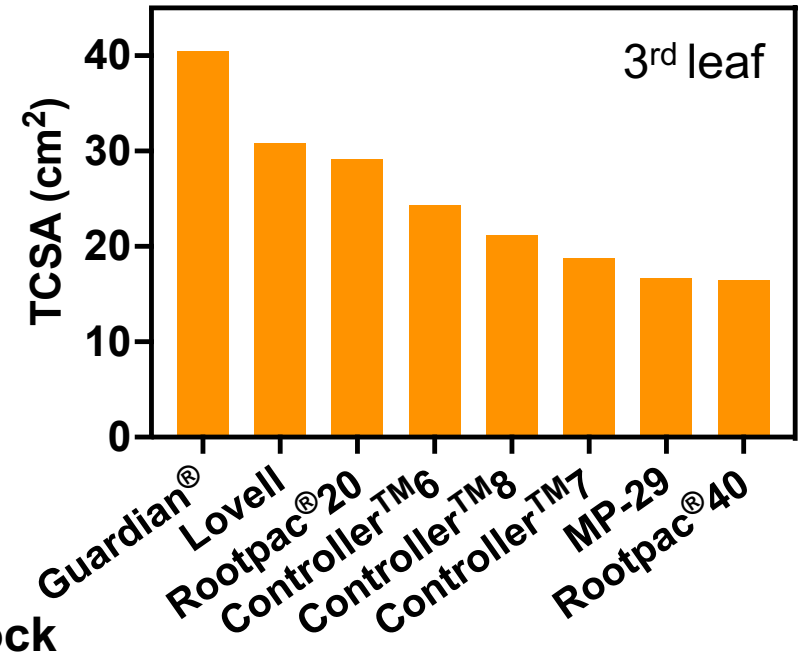
**Mean separation in columns by Tuckey's HSD (P=0.05). HSD was calculated based on the number of observations per mean.*

TCSA at planting and during establishment years









Rootstock

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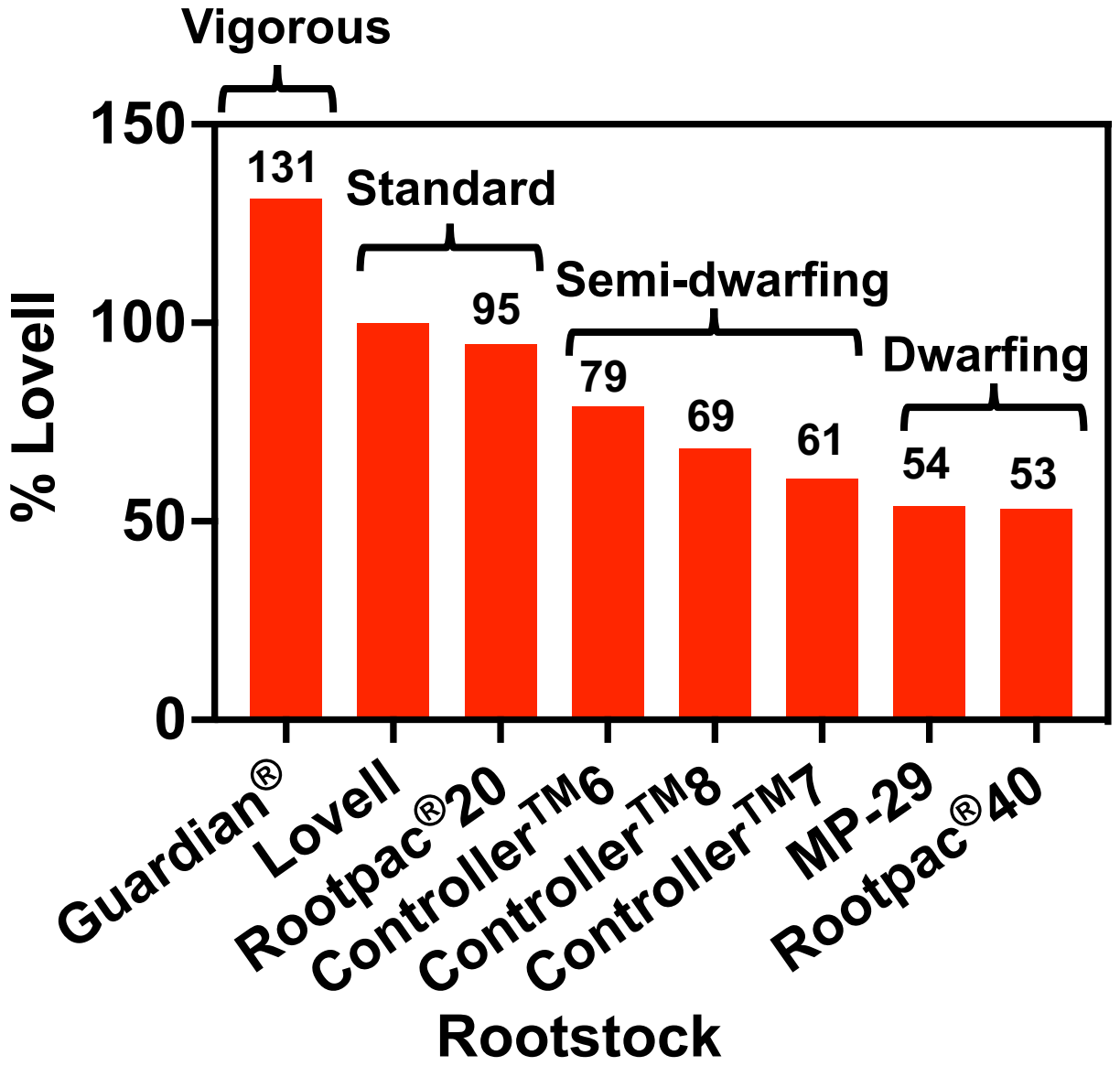
Relative peach tree size after the first 3 establishment seasons



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2017 NC-140 Semi-Dwarf Cresthaven Peach Rootstock Trial

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3rd leaf -2019

Site Performance

Site	Survival (%)	Suckers	TCSA (cm^2) at planting	TCSA (cm^2) 2019
AL	97.1[a]	1.3[abc]	n/a	43.2[a]
CO	97.5[a]	2.4[a]	1.2[a]	13.5[e]
GA	72.5[b]	1.2[abc]	n/a	15.7[de]
MI	98.8[a]	n/a	1.0[ab]	19.1[de]
NC	73.7[b]	0.4[bc]	0.9[b]	27.8[bc]
NY	48.7[c]	2.1[ab]	1.0[ab]	33.0[b]
ONT	90.0[a]	0.0[c]	1.0[ab]	21.5[cd]
PA	100.0[a]	0.4[bc]	n/a	27.1[bc]
SC	100.0[a]	0.7[bc]	1.2[ab]	30.3[b]
UT	96.0[a]	0.1[c]	n/a	28.8[b]
Estimated HSD	16.3*	1.7	0.3	7.3

**Mean separation in columns by Tuckey's HSD (P=0.05). HSD was calculated based on the number of observations per mean.*

2017 NC-140 Semi-Dwarf Cresthaven Peach Rootstock Trial

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3rd leaf -2019

Rootstock performance (all sites)

Rootstock	Julian 90% Bloom	Julian 10% Ripe	Yield (kg/tree)	Fruit FW (g)	Yield efficiency (kg/cm²)
Controller™6	103.0	226.2	4.7^{bc}	249.2^{a}	0.17^{ab}
Controller™7	102.9	221.8	4.3^{bc}	228.7^{ab}	0.18^{ab}
Controller™8	102.5	225.7	4.4^{bc}	230.9^{ab}	0.16^{ab}
MP-29	92.8	221.6	4.6^{bc}	210.4^{b}	0.26^{a}
Rootpac®20	100.1	221.8	6.5^{b}	230.3^{ab}	0.19^{ab}
Rootpac®40	101.7	219.2	3.0^{c}	241.6^{ab}	0.14^{b}
Guardian®	104.1	223.5	9.8^{a}	210.4^{b}	0.22^{ab}
Lovell	107.8	228.4	6.9^{b}	227.3^{ab}	0.19^{ab}
Estimated HSD	ns	ns	2.9	38.8	0.1

**Mean separation in columns by Tuckey's HSD (P=0.05). HSD was calculated based on the number of observations per mean.*

2017 NC-140 Semi-Dwarf Cresthaven Peach Rootstock Trial

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3rd leaf -2019

Site Performance

Site	Julian 90% Bloom	Julian 10% Ripe	Yield (kg/tree)	Fruit FW (g)	Yield efficiency (kg/cm²)
AL	75.1^{e}	197.5^{e}	9.5^{ab}	227.1^{c}	0.22^{b}
CO	102.0^{d}	238.6^{c}	0.9^{d}	199.8^{d}	0.05^{c}
GA	n/a	n/a	0.6^{d}	127.9^{e}	0.03^{c}
MI	n/a	n/a	n/a	n/a	n/a
NC	n/a	n/a	2.8^{d}	213.9^{cd}	0.08^{c}
NY	128.0^{b}	246.0^{b}	6.9^{bc}	194.6^{d}	0.23^{b}
ONT	145.0^{a}	n/a	n/a	n/a	n/a
PA	n/a	224.0^{d}	7.2^{bc}	202.2^{d}	0.26^{b}
SC	69.8^{f}	197.3^{e}	6.4^{c}	266.9^{b}	0.21^{b}
UT	112.0^{c}	252.2^{a}	11.3^{a}	298.4^{a}	0.42^{a}
Estimated HSD	5.4	6.2	2.3	25.0	0.13

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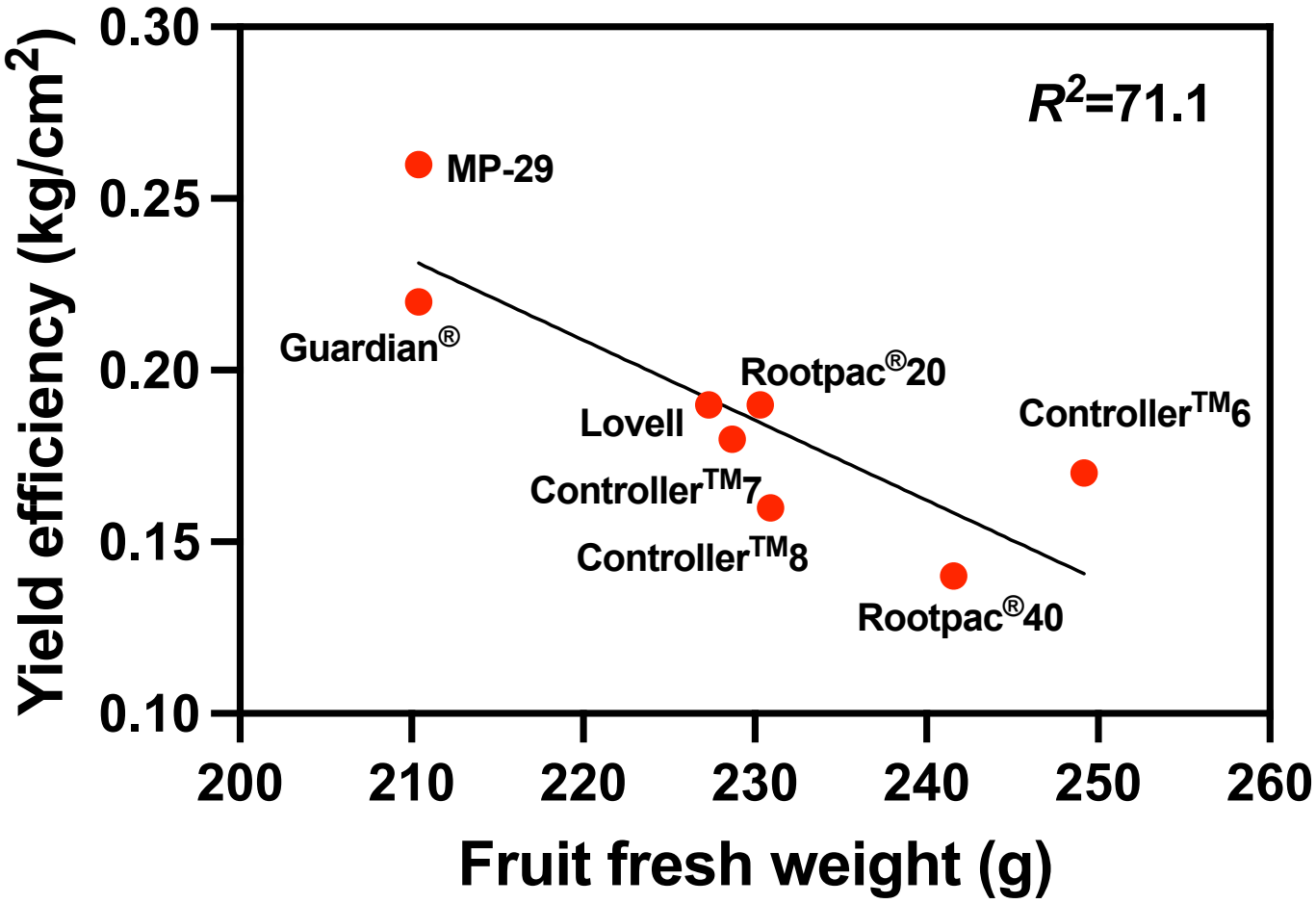
**Mean separation in columns by Tuckey's HSD (P=0.05). HSD was calculated based on the number of observations per mean.*

Yield efficiency correlates with fruit size but MP-29 & Controller™6 represent interesting outliers across rootstocks



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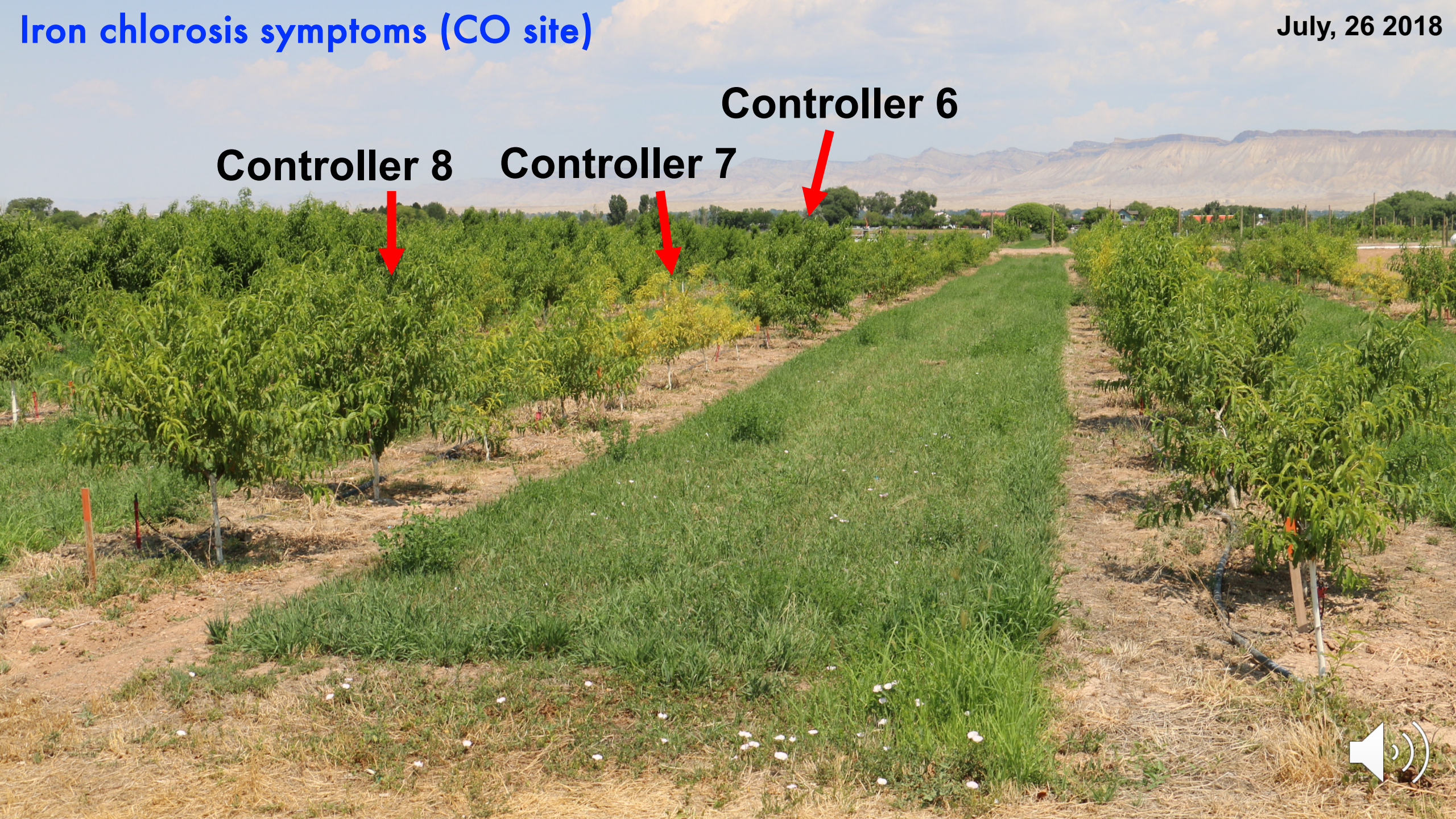
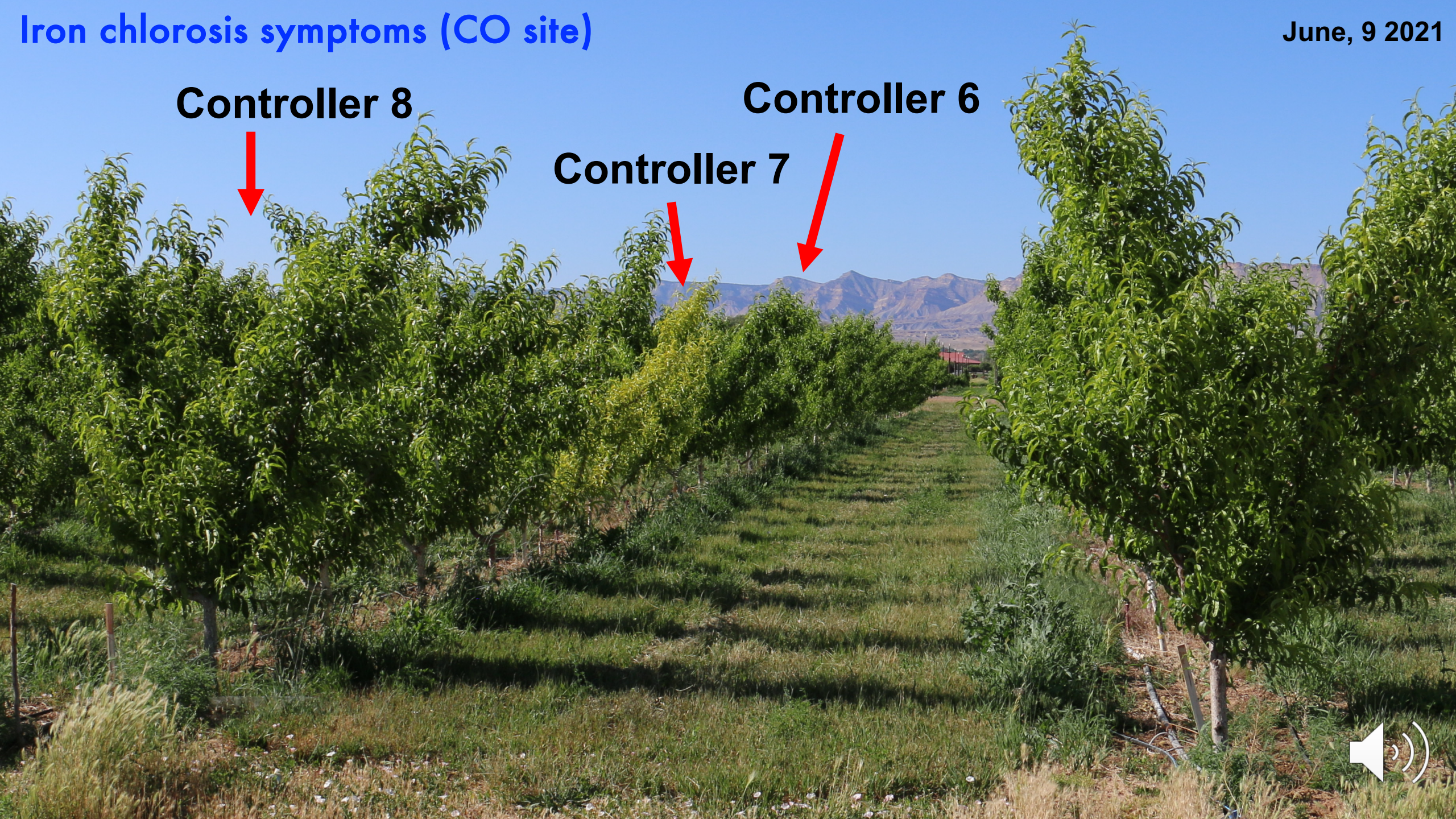
Iron chlorosis symptoms (CO site)

July, 26 2018




Iron chlorosis symptoms (CO site)
June, 9 2021
Controller 8
Controller 7
Controller 6

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Rootpac®20?

Rootpac®40?

Genetics: fundamental pillar

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AGROMILLORA
It's in our nature

From our own breeding program we obtained recognized high quality products, such as:

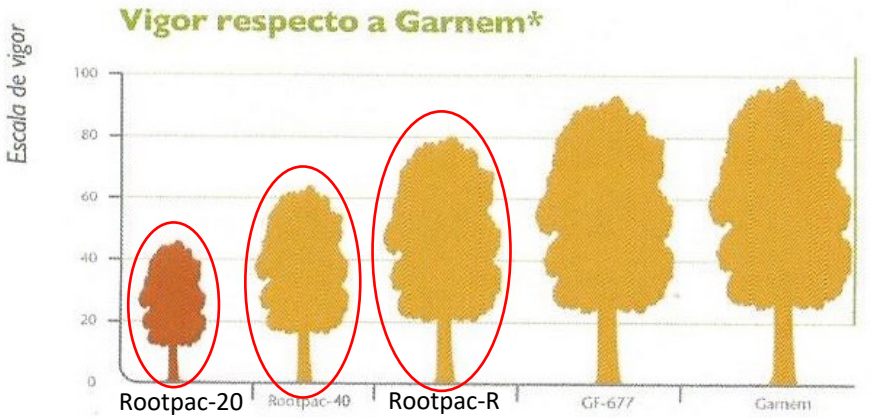
PRUNUS ROOTSTOCKS

ROOTPAC®

ROOTPAC 20

ROOTPAC 40

ROOTPAC R



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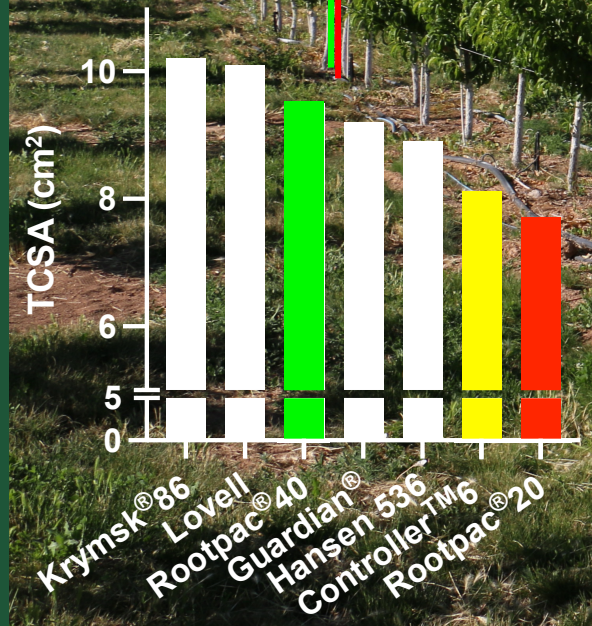
2nd leaf 2019 Next Generation 2D Peach Orchard Trial, Grand Junction, CO

Rootpac®40

Rootpac®20

Controller™6



Anthony et al., unpublished

SUSTAINABLE PEACH ORCHARD SOIL MICROBIOME MANAGEMENT TO CONTROL REPLANT DISEASE

Western SARE Research and Education

A research-extension-producer team approach to identify peach RD etiology, evaluate alternative sustainable strategies of management and impact farmer decision.

OBJ 3 EDUCATION & OUTREACH

Materials: scientific articles, factsheets, videos & website

Dissemination: locally, regionally, nationally & globally

Activities: grower meetings, seasonal workshops, field days, webinars & on-farm trial tours

OBJ 2 ROOTSTOCKS

TREATMENTS:

Peach rootstocks: 7 *Prunus* hybrids

Soil types: replant & sterilized

DATA COLLECTION:

- ✓ Peach rootstocks growth
- ✓ Rhizosphere soil microbiome profiling

OBJ 1 PGPRs & COVER/ROTATION CROPS

TREATMENTS:

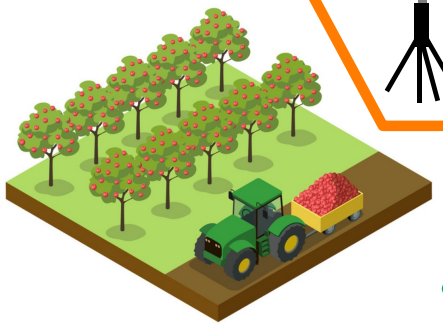
Cover crops: alfalfa & fescue

Rotation crops: corn & tomato

Soil types: replant & sterilized

DATA COLLECTION:

- ✓ Susceptible peach seedlings growth
- ✓ Rhizosphere soil microbiome profiling



ON-FARM
(CO)

GREENHOUSE

XII ORCHARD SYSTEMS 2021

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SARE Sustainable Agriculture Research & Education

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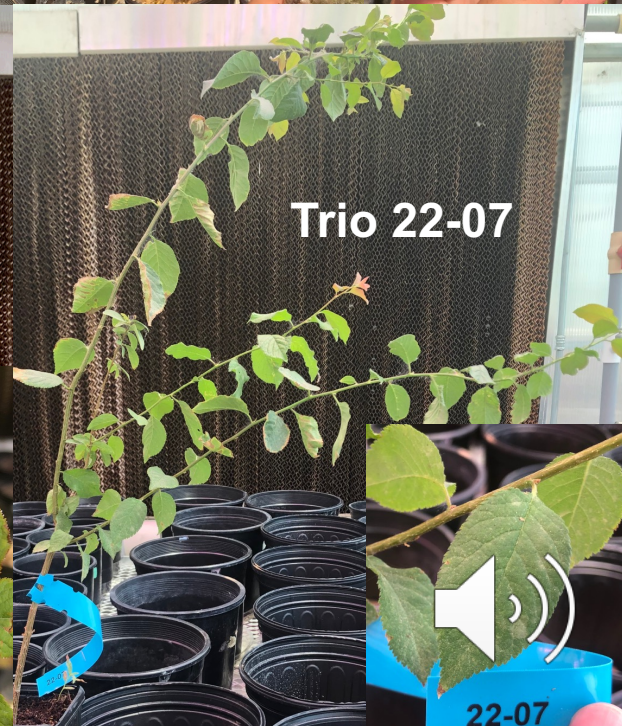

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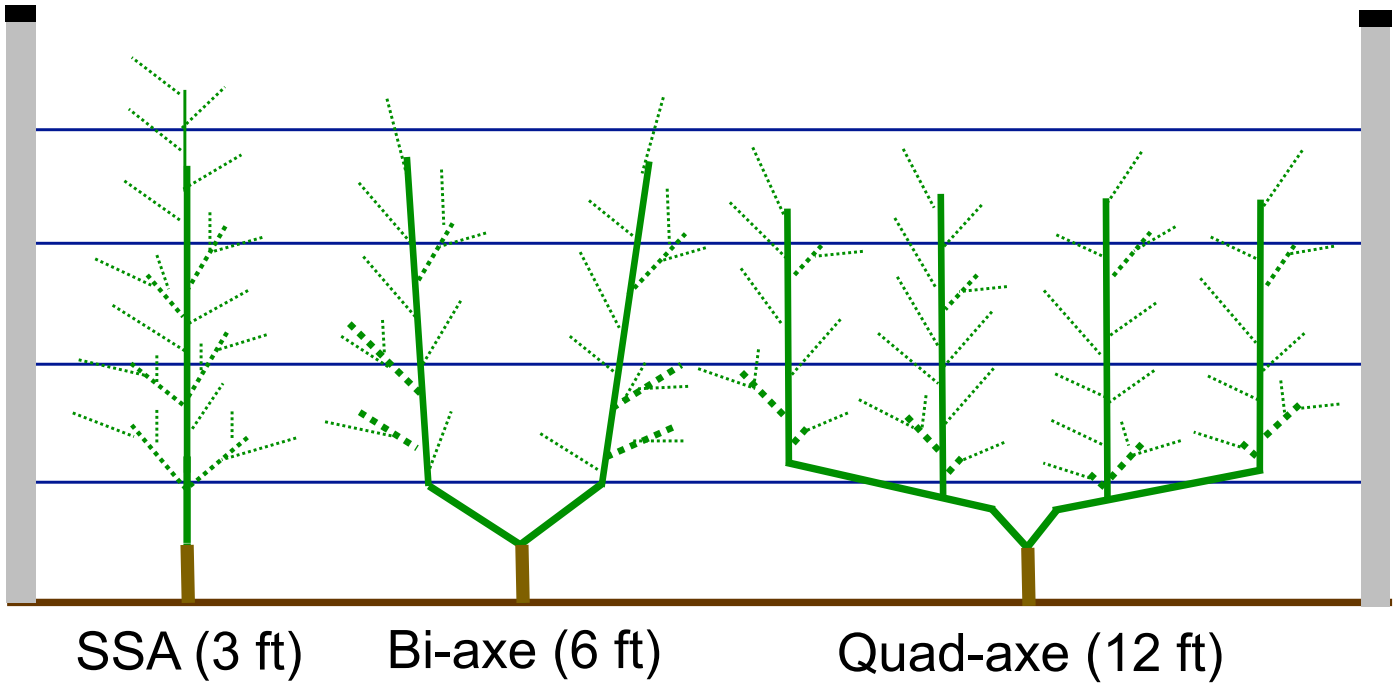
SARE
Sustainable Agriculture
Research & Education

2022 Peach Replant Rootstock x Training Plan

3 training systems:

- SSA - 1 leader (3 ft)
- Bi-axe - 2 leaders (6 ft)
- Quad-axe - 4 leaders (12 ft)



3 rootstocks

- Trio 2507 (1 leader or 2 leaders)
- Trio 2207 (1 leader or 2 leaders)
- Krymsk® 86 (2 or 4 leaders)

Scion: ‘Cresthaven’

WESTERN SARE Sustainable Agriculture Research & Education

CSU_Pomology Minas Lab

Conclusions

- Results from this study are preliminary and only focusing on establishment of the trial across 10 sites in North America
- Past NC-140 peach rootstock trials have shown rootstock productivity and performance can be safely judged after at least three bearing years
- So far 'Controller™6' seems to be a promising semi-dwarfing rootstock, and 'MP-29' has the potential to make an interesting dwarfing rootstock
- More confident conclusions on the performance of the rootstocks under evaluation in this trial can only be made with the collection of additional data in subsequent growing seasons.

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Questions?

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Acknowledgements

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- Jim Schupp, PSU (PA)
- Elina Coneva, UA (AL)
- Dario Chavez, UG (GA)

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Jeff Pieper

Emily Dowdy

Questions?

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NC-140

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Talbott Farms

CropWorx

SG Sierra Gold Nurseries

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The Burchell Nursery Inc.

Since 1907 ELA Family Farms

Cherry Hill Farms

Tree Connection
representing leading nurseries since 1990

Fowler Nurseries, Inc.
Foothill Grown Since 1912

Western Colorado Horticultural Society

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