Evaluation of grafted tomatoes for California fresh market production

Brenna Aegerter & Scott Stoddard
UC CE University of California Cooperative Extension

Mike Grieneisen & Minghua Zhang
Dept. Land, Air & Water Resources
University of California, Davis
UCDAVIS

Josh Chase
Growers Transplanting, Inc.
Growers Transplanting Inc.

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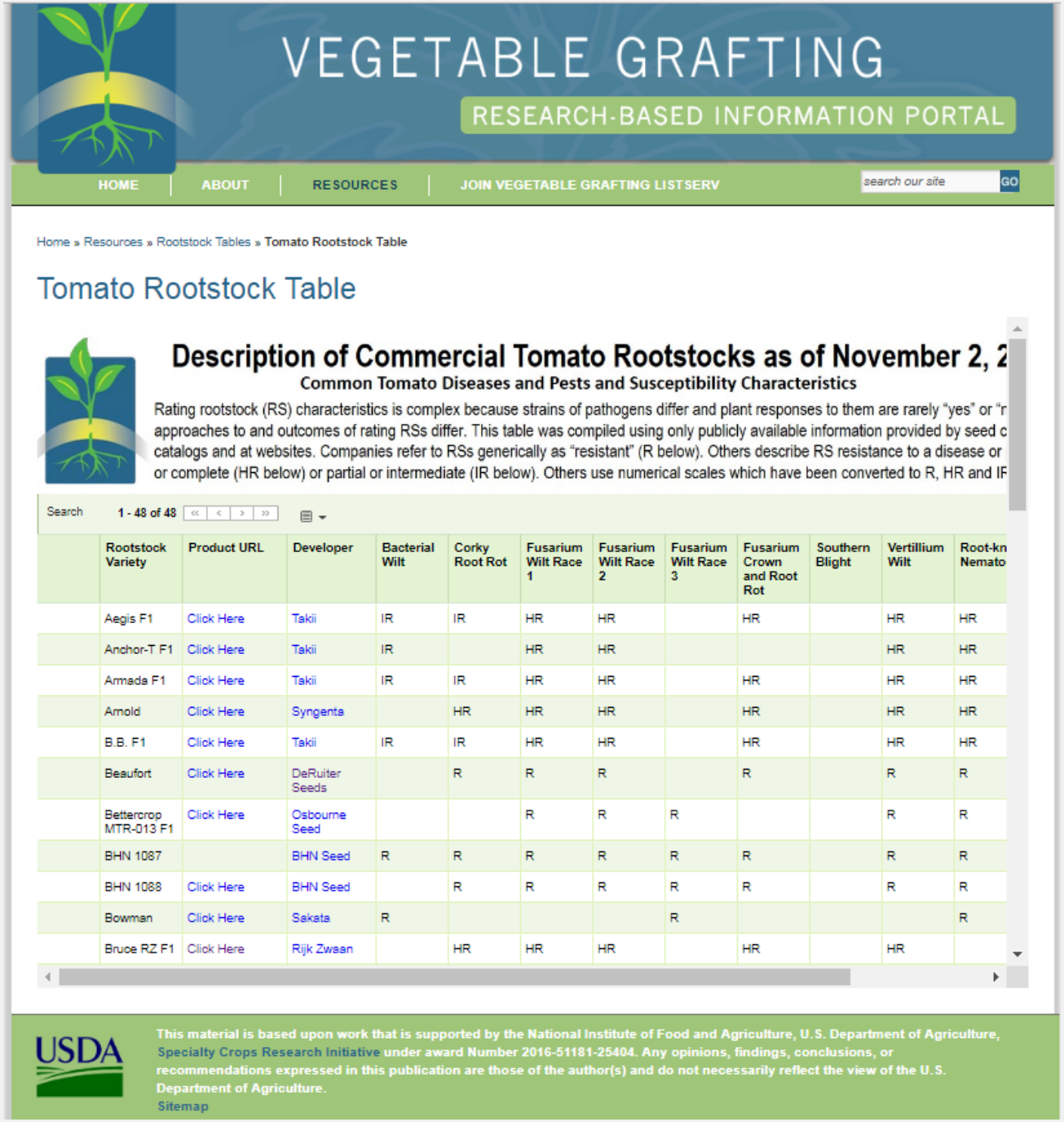
Why graft tomatoes?

Scion: Desirable fruit traits

Rootstock:

- Increased plant vigor
- Increased abiotic stress tolerance
- Resistance and/or tolerance to soil-borne disease

Source: www.mightymato.com (Plug Connection)



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Tomato Rootstock Table

Description of Commercial Tomato Rootstocks as of November 2, 2

Common Tomato Diseases and Pests and Susceptibility Characteristics

Rating rootstock (RS) characteristics is complex because strains of pathogens differ and plant responses to them are rarely "yes" or "r approaches to and outcomes of rating RSs differ. This table was compiled using only publicly available information provided by seed c catalogs and at websites. Companies refer to RSs generically as "resistant" (R below). Others describe RS resistance to a disease or or complete (HR below) or partial or intermediate (IR below). Others use numerical scales which have been converted to R, HR and IF

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Rootstock Variety	Product URL	Developer	Bacterial Wilt	Corky Root Rot	Fusarium Wilt Race 1	Fusarium Wilt Race 2	Fusarium Wilt Race 3	Fusarium Crown and Root Rot	Southern Blight	Vertillium Wilt	Root-kn Nemato
Aegis F1	Click Here	Takii	IR	IR	HR	HR		HR		HR	HR
Anchor-T F1	Click Here	Takii	IR		HR	HR				HR	HR
Armada F1	Click Here	Takii	IR	IR	HR	HR		HR		HR	HR
Arnold	Click Here	Syngenta		HR	HR	HR		HR		HR	HR
B.B. F1	Click Here	Takii	IR	IR	HR	HR		HR		HR	HR
Beaufort	Click Here	DeRuiter Seeds		R	R	R		R		R	R
Bettercrop MTR-013 F1	Click Here	Osbourne Seed			R	R	R			R	R
BHN 1087		BHN Seed	R	R	R	R	R	R		R	R
BHN 1088	Click Here	BHN Seed		R	R	R	R	R		R	R
Bowman	Click Here	Sakata	R				R				R
Bruce RZ F1	Click Here	Rijk Zwaan		HR	HR	HR		HR		HR	

USDA

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Sitemap

Source: http://www.vegetablegrafting.org/tomato-rootstock-table/

Rootstock Variety	Developer	Corky Root Rot	Fusarium Wilt Race 3	Fusarium Crown & Root Rot	Southern Blight	Root-knot Nematode
Arnold	Syngenta	HR		HR		HR
Beaufort	De Ruiter Seeds	R		R		R
BHN 1087	BHN Seed	R	R	R		R
BHN 1088	BHN Seed	R	R	R		R
Bowman	Sakata		R			R
Bruce RZ	Rijk Zwaan	HR		HR		
DRO141TX	De Ruiter Seeds	HR		HR		
Emperador RZ	Rijk Zwaan	HR		HR		HR
Enpower	Nunhems	IR	HR	HR		IR
Estamino	Enza Zaden			HR		HR
Fortamino	Enza Zaden			HR		IR
Interpro	Vilmorin			IR		IR
Kaiser RZ	Rijk Zwaan			HR		IR
Maxifort	De Ruiter Seeds	HR	?	HR	?	HR
Multifort	De Ruiter Seeds		HR			HR
Shield RZ	Rijk Zwaan		HR	HR		IR
Spirit	Nunhems					R
Stallone RZ	Rijk Zwaan		HR	HR		
Supernatural	Plug Connection					R
Superpro	Vilmorin			HR		IR

2016 and 2017 field trials

Two trials each year: Le Grand area and Stockton area

Source of grafted plants: Growers Transplanting, Salinas

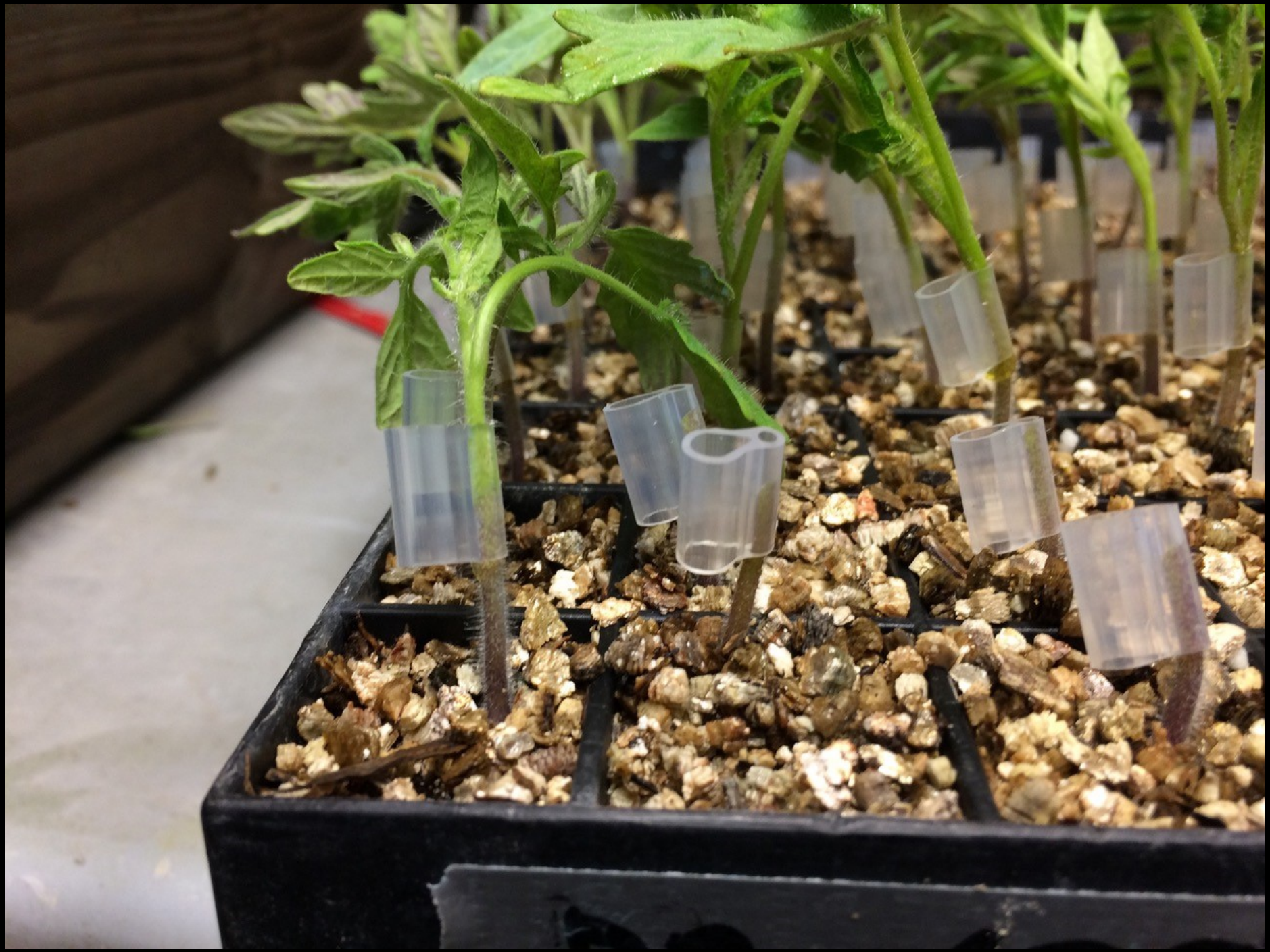
Plot size: 5 feet by 35 to 40 feet, with a minimum of 20 plants per plot (in-row spacing of 16 to 20 inches depending on trial site)

Replicates: four, randomized complete block design

- Scions: Quali T 27, Quali T 47, Quali T 99, HM 1794, Galilea, Bobcat, and Red Dixie
- Rootstocks: Maxifort, DRO138TX (De Ruiter Seeds)
- All combinations of the above, plus non-grafted controls

All trials transplanted in early May


3887
HM 3887
GENE MIYAO
9/27 → 5/7 UCCE

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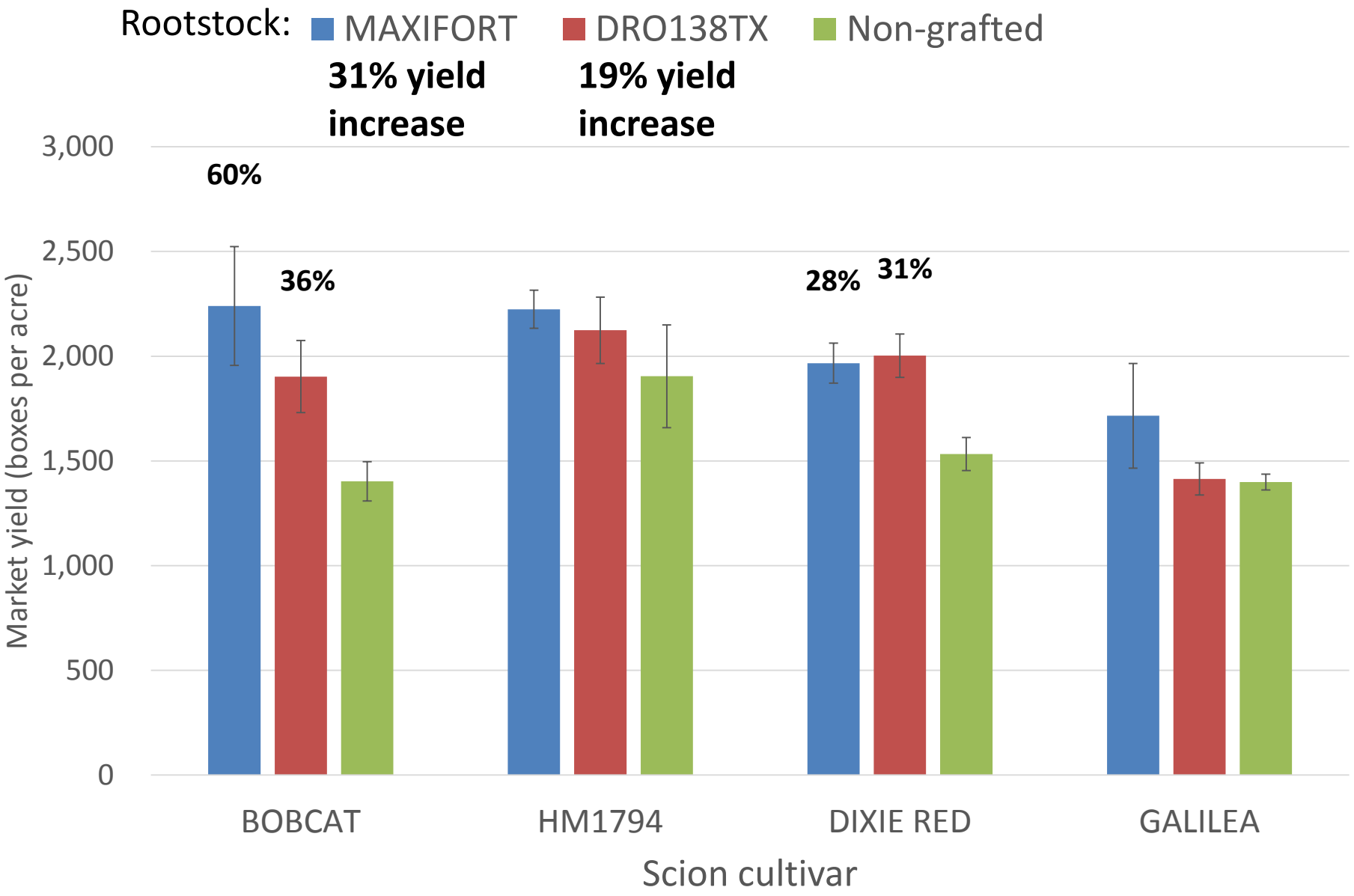
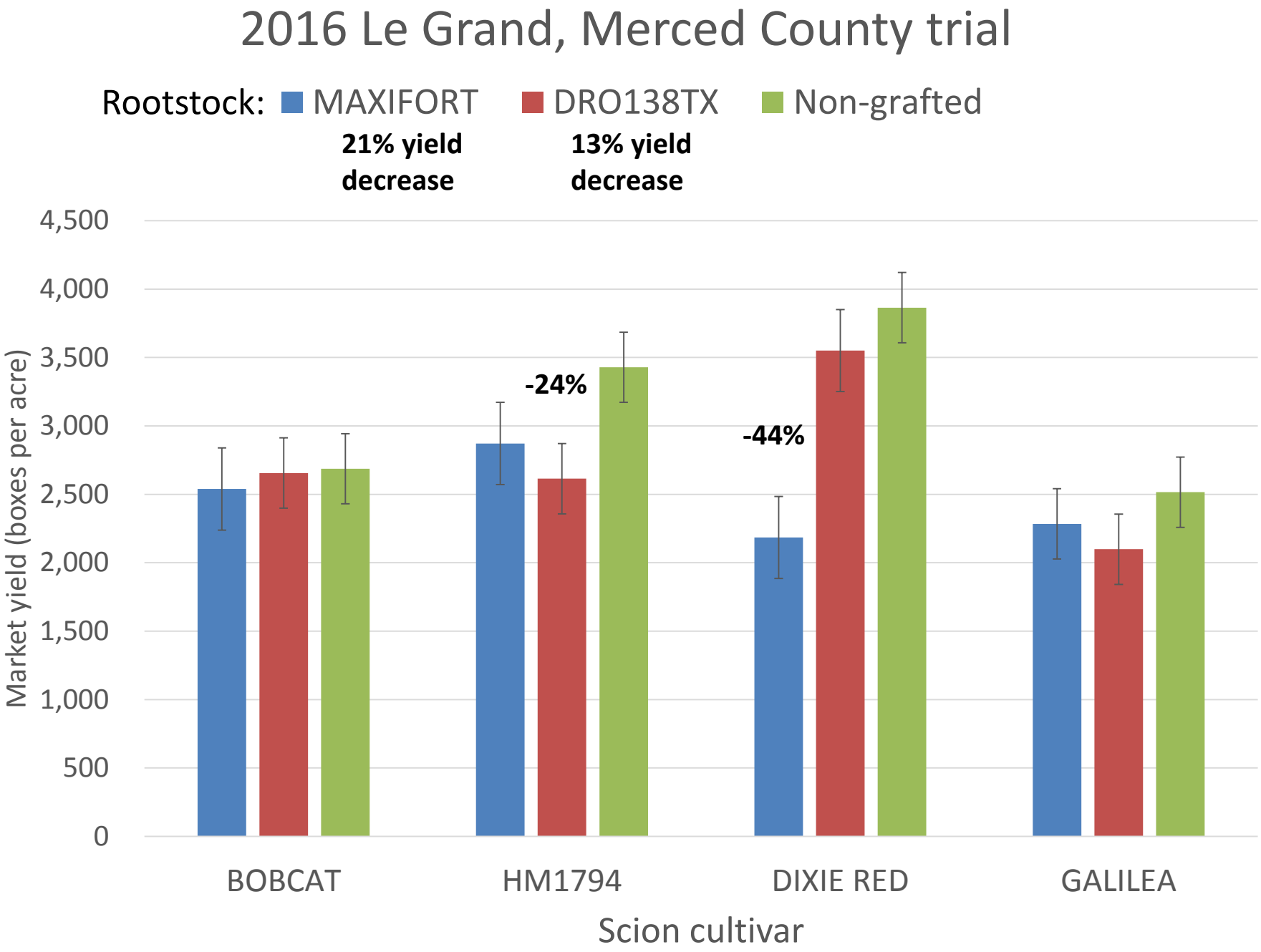
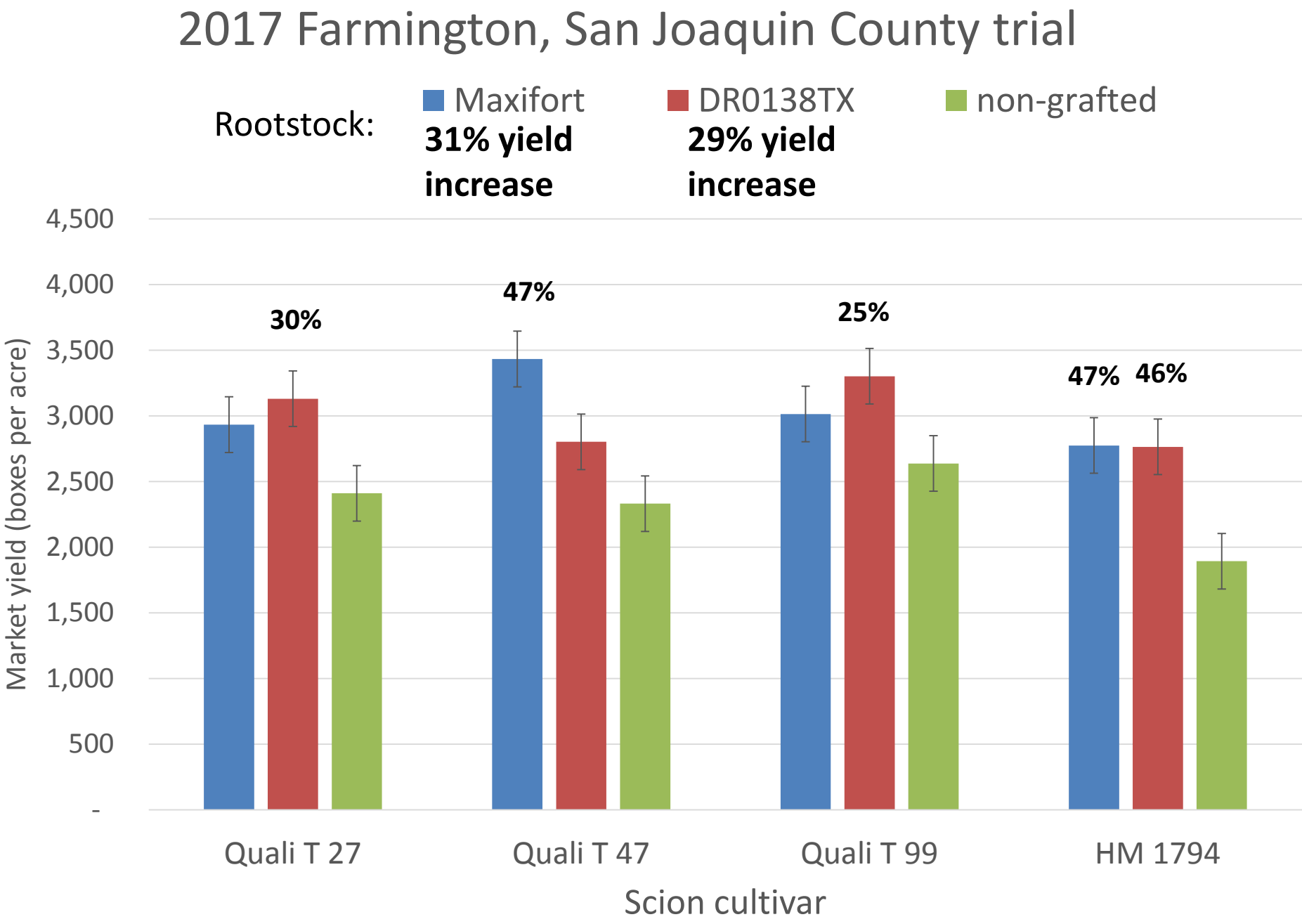
Mysterious vine decline in some grafted plots in tractor drive row

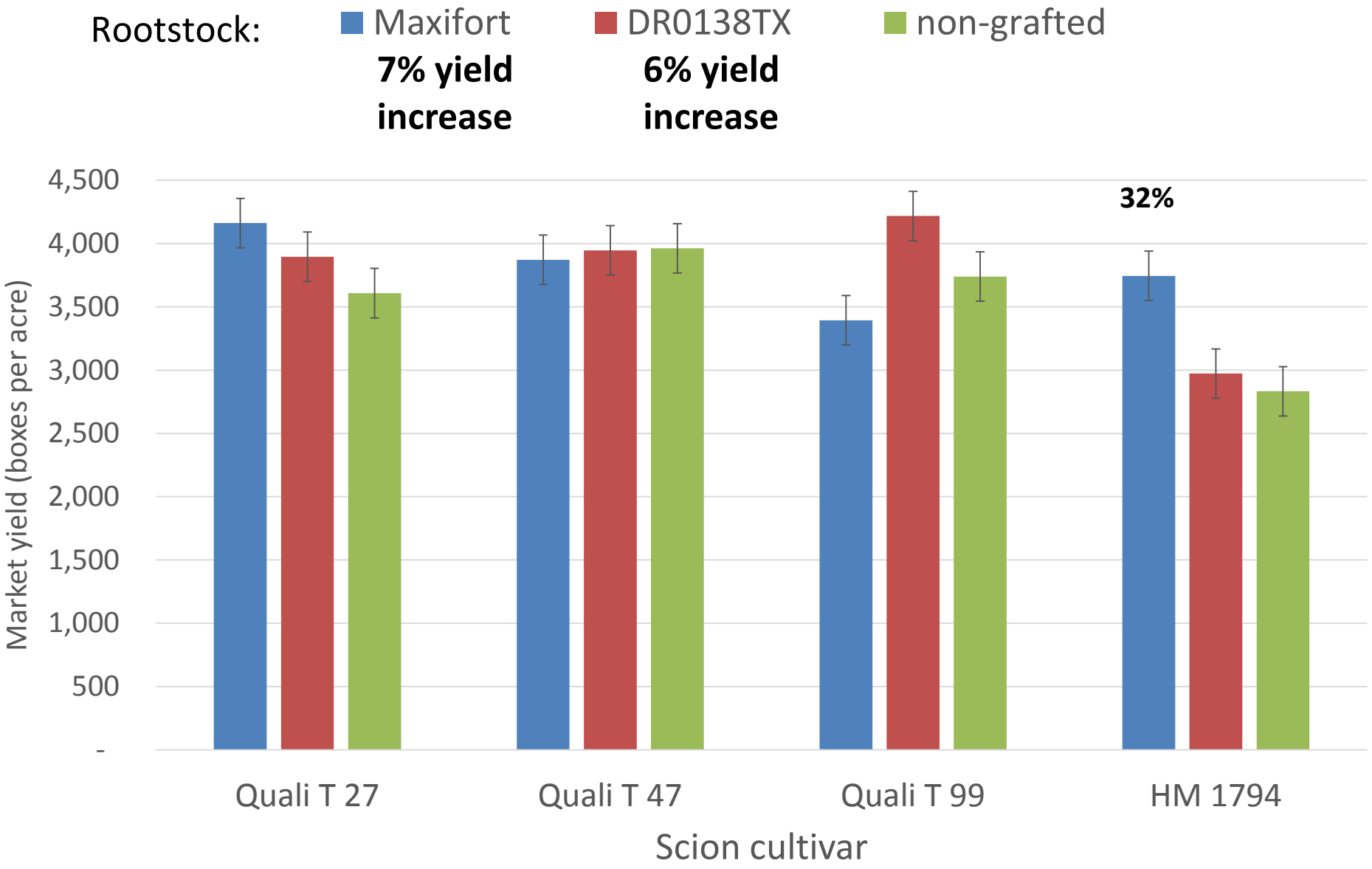
2016 Vernalis, San Joaquin County trial

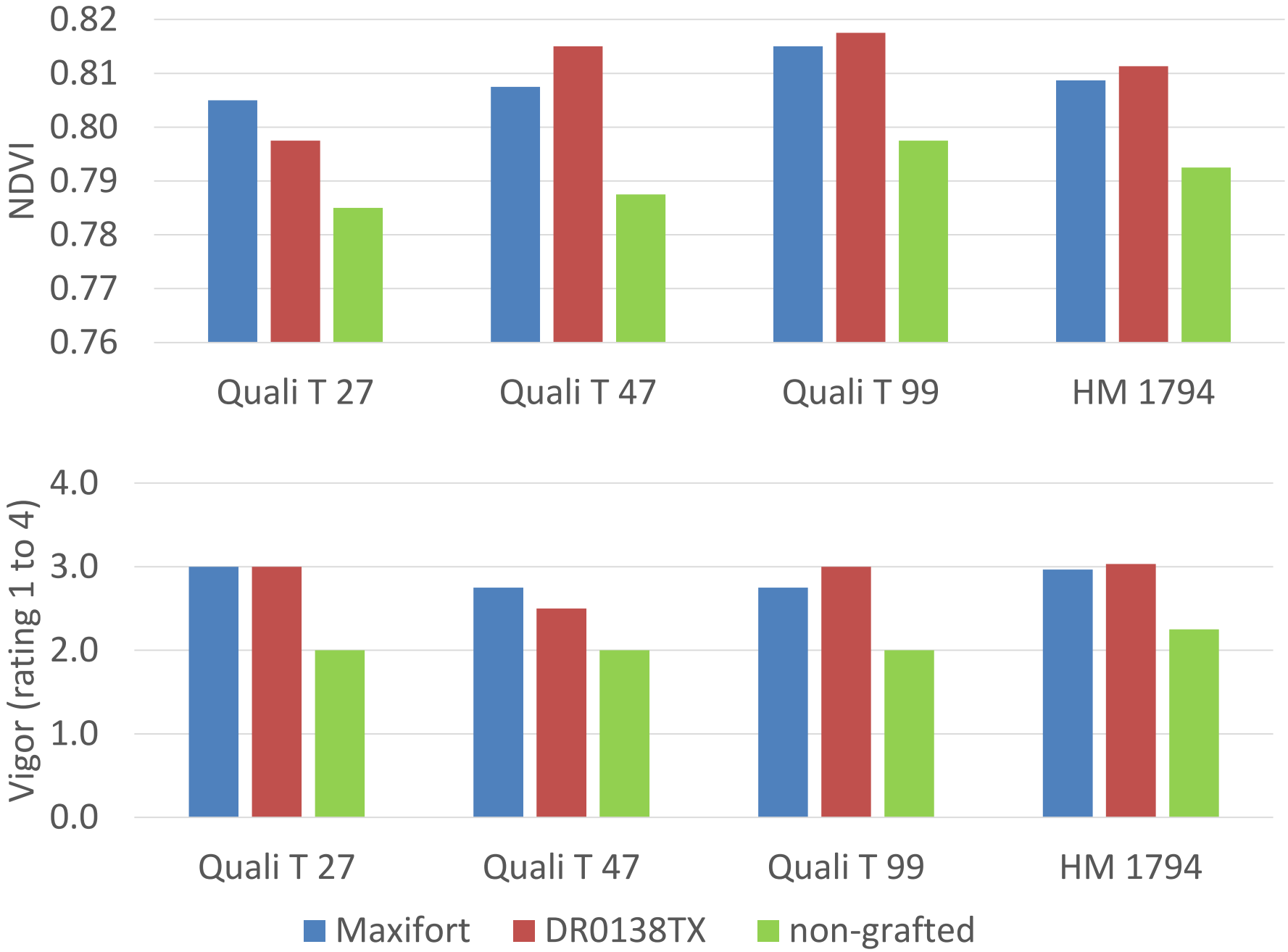



2016 Le Grand, Merced County trial
Rootstock: MAXIFORT DRO138TX Non-grafted
21% yield decrease
13% yield decrease
-24%
-44%
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Market yield (boxes per acre)
BOBCAT
HM1794
DIXIE RED
GALILEA
Scion cultivar


2017 Farmington, San Joaquin County trial
Rootstock:
Maxifort
DR0138TX
non-grafted
31% yield increase
29% yield increase
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
-
Market yield (boxes per acre)
30%
47%
25%
47%
46%
Quali T 27
Quali T 47
Quali T 99
HM 1794
Scion cultivar

2017 Le Grand, Merced County trial




NDVI
0.82
0.81
0.80
0.79
0.78
0.77
0.76
Quali T 27
Quali T 47
Quali T 99
HM 1794
Vigor (rating 1 to 4)
4.0
3.0
2.0
1.0
0.0
Quali T 27
Quali T 47
Quali T 99
HM 1794
Maxifort
DR0138TX
non-grafted

Fruit size distribution, 2017

(% fruit by weight)

Farmington, San Joaquin Co.

	Medium	Large	X-large
Maxifort	16	25	58
DRO138TX	16	27	57
non-grafted	22	24	54

Le Grand, Merced Co.

	Medium	Large	X-large
Maxifort	12	32	56
DRO138TX	11	32	57
non-grafted	14	38	48

Disease resistance/tolerance in UC field trials

- Maxifort has shown some southern blight resistance; Field trial data as well as greenhouse tests show that it does help control disease (processing tomato trials in Yolo and Kern counties, UC colleagues Miyao, Nunez, Putman)
- Verticillium wilt race 2?
- Fusarium wilt race 3?

Joe Nunez, UCCE Kern County
Alex Putman, UC Riverside

Challenges

- Vine decline in some grafted plots at Le Grand
- Commercially available rootstocks were not bred for use with determinant scion cultivars
- Huge increase in field establishment costs

2018

Adding new rootstocks to the trials:

- Arnold (Syngenta)
- Estamino (Enza Zaden)
- Guardior (HM.Clause/Vilmorin)

Thanks!

Live Oak Farms, Le Grand
Pacific Triple E, Tracy
Growers Transplanting Inc., Salinas

Gowan Seed Company
Seminis Vegetable Seeds/De Ruiter Seeds
Syngenta Vegetable Seeds
HM.Clause

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