Influence of Grafting on Yield of Processing Tomato

Brenna Aegerter
Farm Advisor, UCCE San Joaquin County
bjaegerter@ucanr.edu

Gene Miyao
Farm Advisor, UCCE Yolo, Solano & Sacramento counties

UC CE University of California Cooperative Extension

University of California
Agriculture and Natural Resources

Why graft tomatoes?

Combine the features of two cultivars

<u>Scion:</u>
Fruit traits desired by processors, determinant growth habit

<u>Rootstock:</u>

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

Source: www.mightymato.com
(Plug Connection, Vista, CA)

- Increased vigor & fruit size, fruiting over a longer period
- Mostly interspecific hybrids between cultivated tomato (*Solanum lycopersicum*) and wild species (typically *S. habrochaites*, less commonly *S. peruvianum* or *S. cheesmaniae*)

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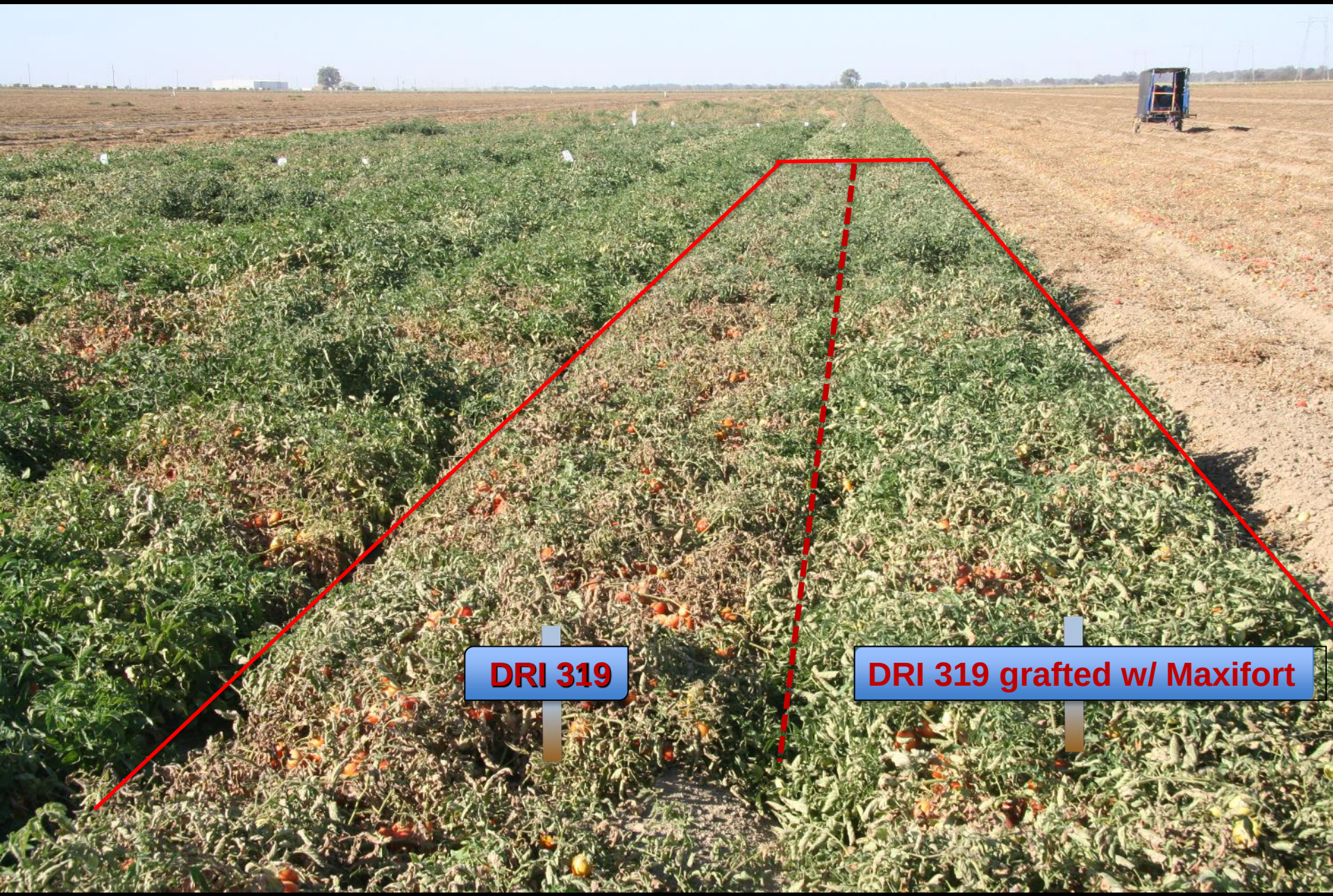
1. Sterile trays & sterile media seeded 4 weeks before grafting

3. Grafting clips positioned half-way on rootstock stems

2. Both rootstock & scion plant stems clipped at ~45º angle

4. Scion stems align to rootstock angle with attention to match stem diameter


1
2
3



Gene Miyao, 2016 trial

N 6428 on rootstock Maxifort

N 6428 (non-grafted)

Gene Miyao, 2017 trial

2018 field trial, north Delta

- Three scion varieties: N 6428, DRI 319 and HM 3887
- Three rootstocks: Maxifort, Multifort and a pre-commercial non-disclosed rootstock
- All combinations of the above, plus non-grafted controls
- Plots single bed by 65 ft, Replicated four times
- Plants produced by California Masterplant
- Transplanted May 30th, delayed harvest October 19th
- drip irrigated, no major disease problems in trial area
- Machine harvested, PTAB fruit quality measurements

Scion	Rootstock	Yield (tons/ac)		Increase	Soluble solids (°Brix)		PTAB Hue		PTAB pH
DRI 319	Maxifort	62.60	b	26%	5.10	d	21.1	ab	4.54
DRI 319	Multifort	56.93	bc		5.43	cd	20.9	bc	4.51
DRI 319	Non-disclosed rootstock	50.36	c		5.75	bc	20.9	bc	4.51
DRI 319	non-grafted control	49.83	c		5.70	bc	21.0	ab	4.49
HM 3887	Maxifort	79.55	a	55%	5.13	d	21.0	ab	4.51
HM 3887	Multifort	77.74	a	51%	5.08	d	21.1	ab	4.48
HM 3887	Non-disclosed rootstock	52.57	bc		6.30	a	20.4	c	4.49
HM 3887	non-grafted control	51.33	c		6.00	ab	20.9	bc	4.45
N 6428	Maxifort	86.38	a	50%	4.30	e	21.5	a	4.52
N 6428	Multifort	80.75	a	40%	4.60	e	20.9	bc	4.49
N 6428	Non-disclosed rootstock	60.85	bc		5.33	cd	20.4	c	4.47
N 6428	non-grafted control	57.73	bc		5.15	d	20.6	bc	4.50
	Mean	63.89			5.32		20.9		4.50
	LSD	11.20			0.45		0.6		ns
	Probability	*<0.0001*			*<0.0001*		*0.040*		*0.508*
	CV (%)	*12.182*			*5.85*		*2.05*		*1.00*
	GROUP CONTRASTS								
	Grafted	67.53	a	27%	5.22	b	20.9		4.50
	Non-grafted	52.96	b		5.62	a	20.8		4.48
	Contrast Probability	*<0.0001*			*0.0006*		*ns*		*ns*

Scion	Rootstock	8-Aug NDVI	5-Oct NDVI	5-Oct vigor (1 to 4)	5-Oct cover (%)	est. harvest date (day in October)
DRI 319	**Maxifort**	0.81	0.59	2.4	56	10.3
DRI 319	**Multifort**	0.80	0.57	2.0	51	10.5
DRI 319	**Non-disclosed rootstock**	0.79	0.50	1.4	40	5.5
DRI 319	**non-grafted control**	0.78	0.50	1.3	39	5.0
HM 3887	**Maxifort**	0.81	0.63	3.5	74	16.8
HM 3887	**Multifort**	0.80	0.63	3.6	75	17.3
HM 3887	**Non-disclosed rootstock**	0.74	0.52	1.8	45	10.8
HM 3887	**non-grafted control**	0.73	0.55	1.8	51	12.0
N 6428	**Maxifort**	0.85	0.66	3.9	85	17.3
N 6428	**Multifort**	0.84	0.64	4.0	80	15.5
N 6428	**Non-disclosed rootstock**	0.82	0.56	2.9	65	10.8
N 6428	**non-grafted control**	0.79	0.55	2.9	59	12.5
	Mean	0.8	0.6	2.6	60	12
	LSD	0.036	0.037	0.67	12.1	3.8
	Probability	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*
	CV (%)	*3.093*	*4.502*	*17.770*	*14.027*	*22.238*
	GROUP CONTRASTS					
	Grafted	0.81	0.59	2.8	63.5	12.7
	Non-grafted	0.77	0.53	2.0	49.6	9.8
	Contrast Probability	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*0.0027*

Grafting Evaluations: 2016-2018, Yolo-Solano area

	Y 2016 harvested yield Tons/A	% of non-grafted yield	Y 2017 harvested yield Tons/A	% of non-grafted yield	Y 2018 harvested Yield Tons/A	% of non-grafted yield
CLASS COMPARISONS:						
Grafted vs	60.4	110	49.9	119	83.5	108%
non grafted	55.2	100	41.9	100	77.1	100%
Probability	0.001		0.00		0.000	
FACTORS						
A. *Variety (scion)*						
Probability	0.000		0.00		0.000	
B. *Rootstock*						
Probability	NS		NS		0.000	
LSD 5%						
C. *Interaction (probability)*						
Variety x Rootstock	NS		NS		NS	
% CV	7		11		5	
Maximum scion x rootstock increase		115%		132%		120%

- ✓ Yield increase averaged 8 to 19%
- ✓ Increased 'vigor' and plant canopy, but delayed maturity
- ✓ No statistical <u>Interaction</u> between rootstock x scion combinations tested
- ✓ Limited wild shoots emerging from rootstocks

UC Farm Advisor testing in commercial fields

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POTENTIAL ADVANTAGES	CHALLENGES
	High cost of establishment (rootstock seed, grafted plants)
	Greenhouse logistics: • Rootstock seed germination and uniformity challenges • doubling greenhouse space for first month, plus special healing facility
Higher yield	• Potentially lower soluble solids? • Potentially slightly higher input costs? • Delayed harvest
Improved resistance to soilborne diseases	• Planting with union belowground may compromise disease resistance • Few/no rootstocks with F3, Vert race 2
Abiotic stress tolerance	Yield advantage may be greater at some sites than others
High vigor, better fruit cover, less sunburn	Perhaps greater need to manage vines with training or trimming?

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California Masterplant

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Vilmorin/H.M.Clause

Seminis Vegetable Seeds/Bayer