Performance of Refosco and Gewurztraminer on Nine Rootstocks in the Four Corners Region of New Mexico

47th ASEV-Eastern Section Annual Meeting
Austin, TX June 7-9, 2023

Gill Giese, Plant and Soil Science, Arkansas State University

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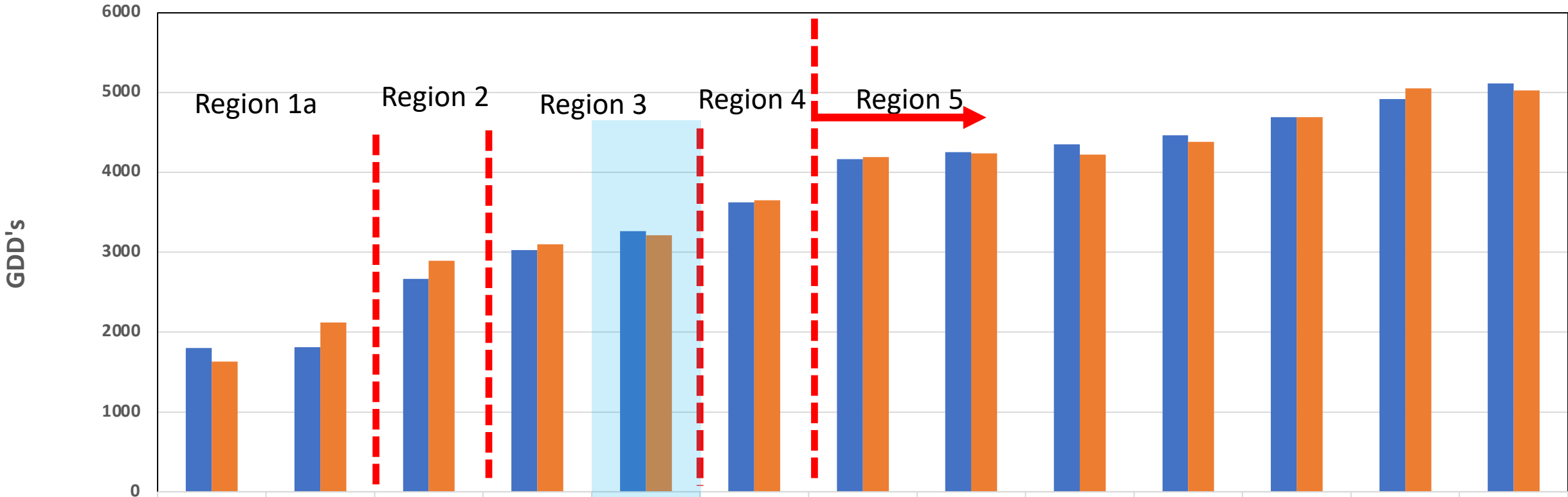
Average Growing Degree Days at 13 New Mexico Sites*, 2011 to 2020, compared to 2021

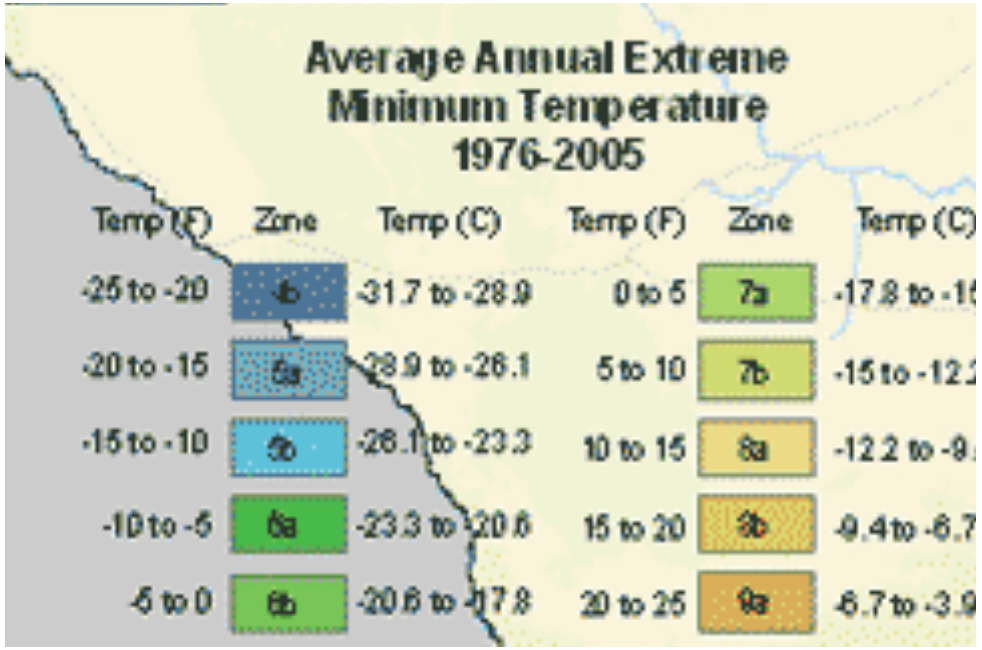


	Silver City	Taos	Alcalde	Santa Fe	Farmington	Los Lunas	ABQ	Tucumcari	Portales	Tularosa	Deming	Hatch	Las Cruces
GDD Averages, 2011-2020	1802	1810	2668	3030	3263	3624	4169	4255	4353	4466	4691	4920	5113
Actual GDD, 2021	1631	2121	2893	3100	3212	3653	4192	4237	4223	4383	4694	5054	5026

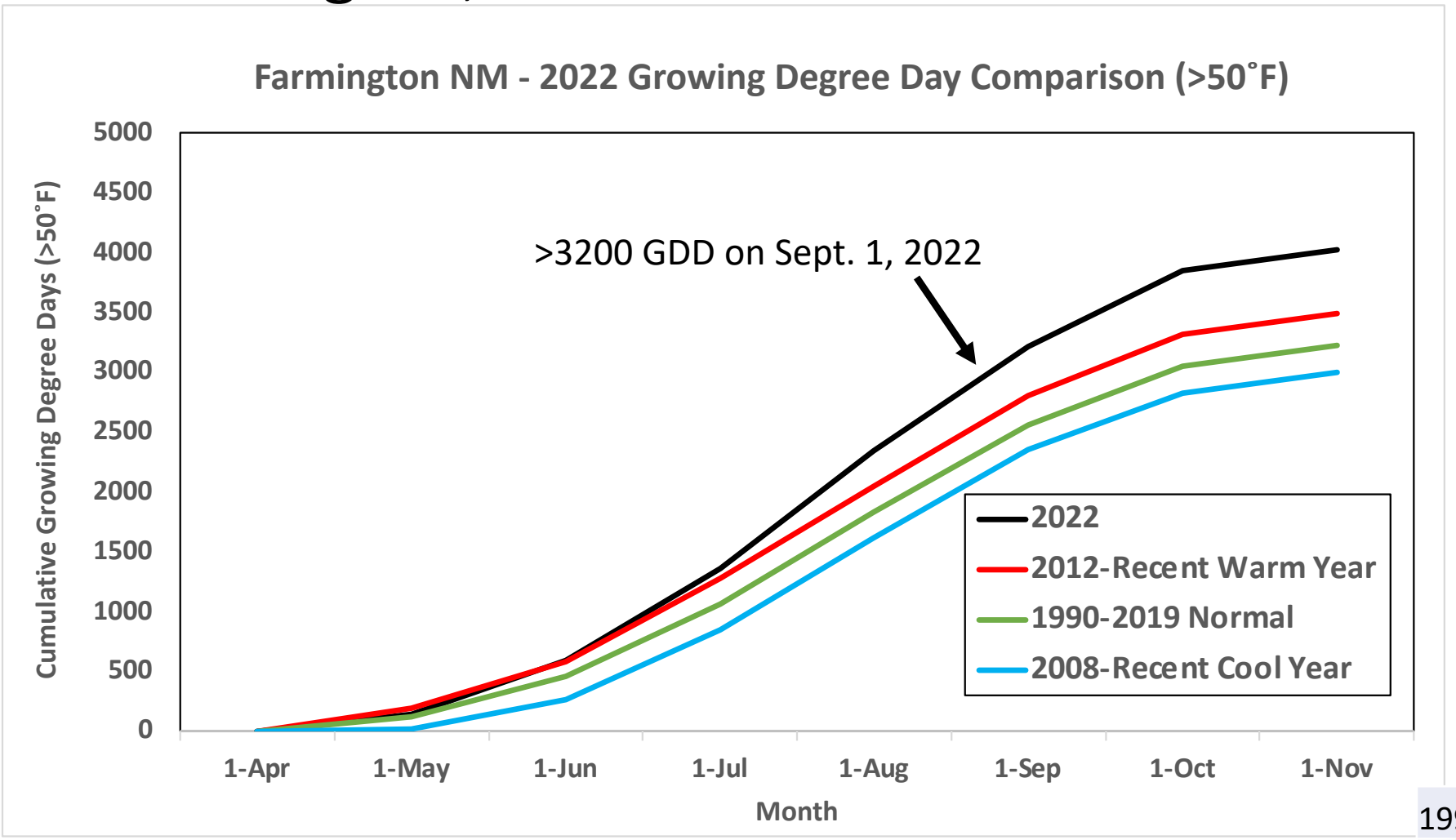
*April to October base 50° F with upper limit of 95 ° F March to October for Deming, Hatch, Tularosa and Las Cruces

New Mexico contains about 10 USDA Plant Hardiness Zones

Farmington, Zone 7a with 0-5 F° average annual extreme minimum temperature

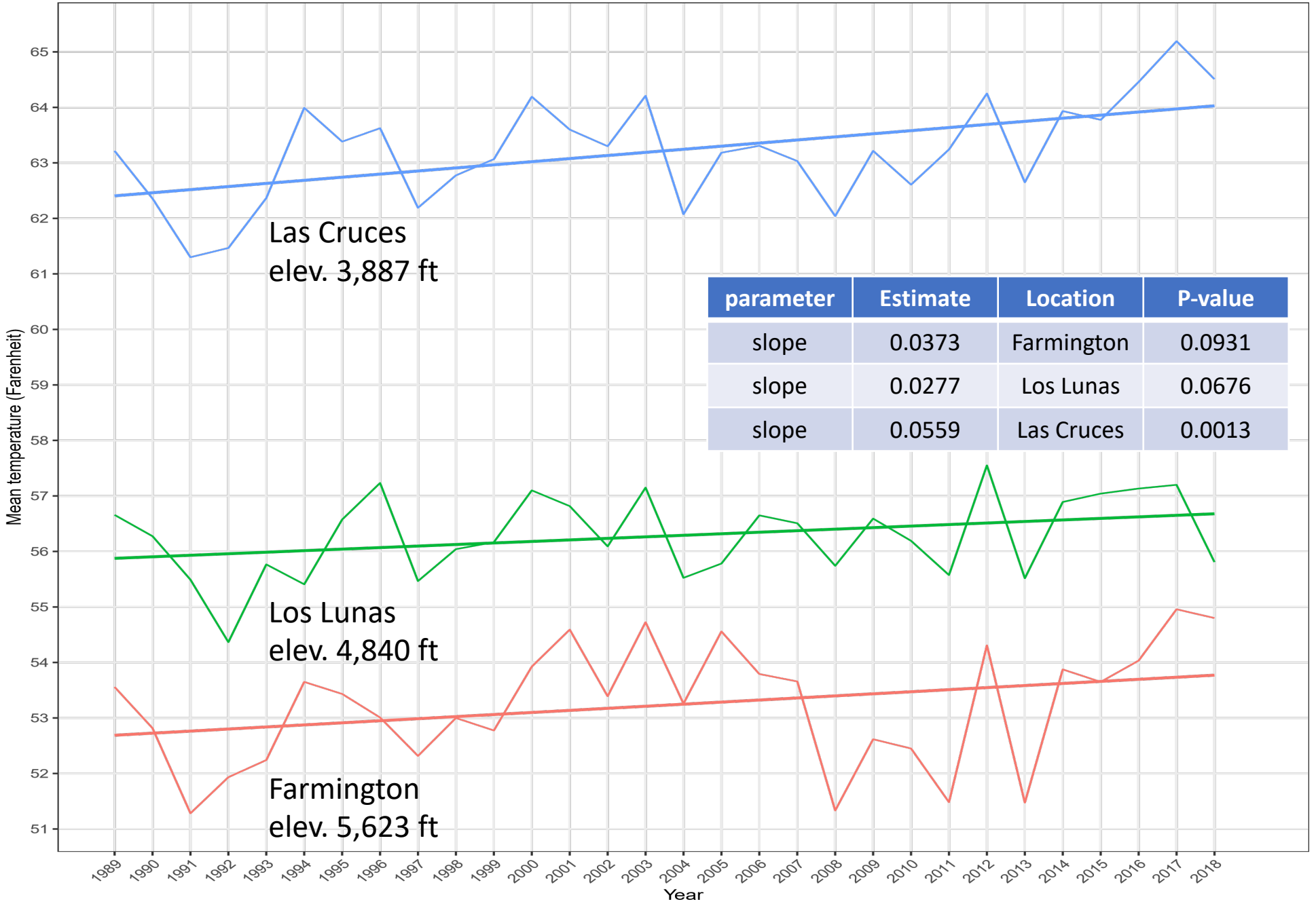


Temperature range, monthly precipitation and GDD comparison @ Farmington, NM

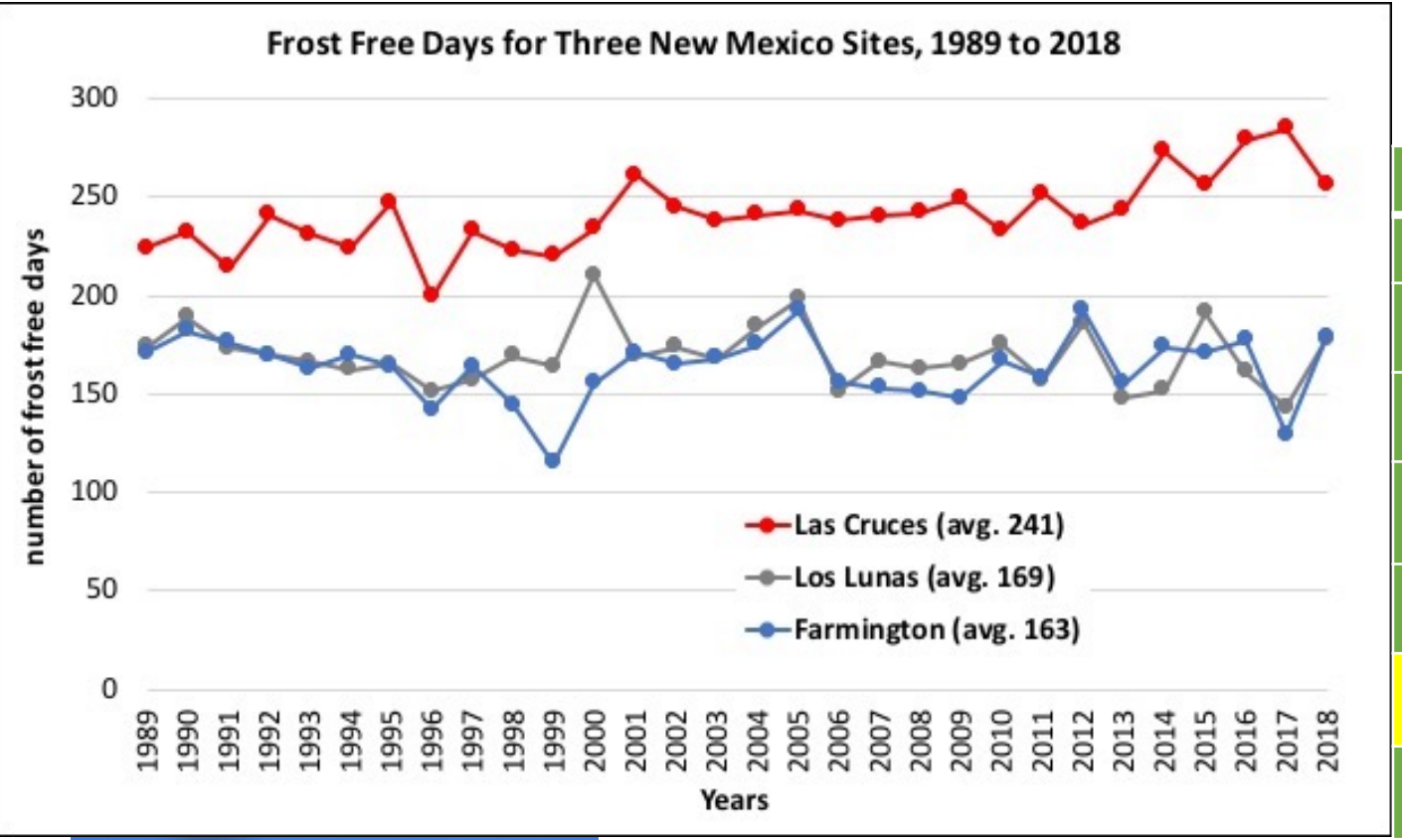


1990-2019 - 30-year average =	3225
Recent Cool Year. - 2008 =	3006
Recent Warm Year - 2012 =	3497
2022 =	4022

Mean temperature at three New Mexico locations, 1989 to 2018



parameter	Estimate	Location	P-value
slope	0.0373	Farmington	0.0931
slope	0.0277	Los Lunas	0.0676
slope	0.0559	Las Cruces	0.0013



Frost-free days

Climatic variable	Time Frame	Alcalde	Farmington	Hatch	Las Cruces	Los Lunas	Portales
Growing Season begins		1-Apr	1-Apr	1-Mar	1-Mar	1-Apr	1-Apr
Average Days: High Temp < 70°F	2011-2021	37	46	16	16	14	14
Average Days: High Temp > 72°F	2011-2021	156	159	218	220	193	194
Average Days: High Temp > 90°F	2011-2021	31	41	100	106	88	87
Average Days: High Temp > 95°F	2011-2021	3	6	63	60	41	44
Average Days: High Temp > 100°F	2011-2021	0.1	0.3	19.5	16.4	7.3	12.8
Avg Count of 4-day heatwaves > 95°F	2011-2021	0.4	0.5	10.0	10.4	6.1	6.2
Average Nights: Low Temp < 32°F	2011-2021	31	13	4	3	14	5
Average Nights: Low Temp < 50°F	2011-2021	130	95	77	72	100	60
Average Night Temps F , Aug 1 - Oct 31	2011-2021	44.3	50.6	62.8	64.3	48.7	55.7
Avg Annual Max Temp F	2011-2021	79.8	79.2	87.0	87.0	86.4	86.8
Avg Annual Min Temp F	2011-2021	44.4	49.9	56.0	57.3	49.4	55.9
Avg Annual inches precipitation, growing season	2011-2021	**7.14**	**4.46**	**7.31**	**6.63**	**6.14**	**12.91**

Experimental Components

- Gewurztraminer and Refosco
- Nine rootstocks
- Planted in 2008
- Soil: Doak sandy loam
  (fine-loamy, mixed, mesic Typic Haplargid)
  pH > ~8, with < 1% organic matter,
  ~ 65 in. depth with no restrictive layer

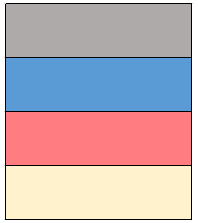
Rootstock	Parentage	Traits, Attributes
110 Richter	berlandieri x rupestris	acid soil, slow development, dry farmed sites, low juice pH
779 Paulsen	berlandieri x rupestris	
SO 4	berlandieri x riparia	well drained + low fertility soils, cool regions, low fruit set
5 BB Kober	berlandieri x riparia	cool climates, tolerate sandy nematode infested soil, sensitive to salinity
3309 Couderc	riparia x rupestris	deep moist soils, tolerant of cold injury, sensitive to salinity
1103 Paulsen	berlandieri x rupestris	drought, acid soil and salinity tolerant, good performer in hot irrigated regions
1145 Paulsen	berlandieri x rupestris	
775 Paulsen	berlandieri x rupestris	
5 C Teleki	berlandieri x riparia	advance grape maturity, wide soil adapted, tolerant to lime

Experimental Design and Analysis

wine row 13	wine row 14	wine row 15	wine row 16	wine row 17	wine row 18	wine row 19	wine row 20	wine row 21	table row 22
T-01 vines	T-01 vines	T-06 vines	T-06 3 DEAD	T-14 3 vines	T-14 3 vines	T-11 3 vines	T-11 vines	T-08 vines	T-08 3 vines
G-09 4 vines	R-07 4 vines	G-04 4 vines	R-02 III 2 /4	R-01 IV 2/4	G-09 IV 3/4	G-05 V 3/4	G-04 VI 2/2	G-07 VI 1/3	T-03
G-01 4 vines	G-01 4 vines	G-03 4 vines	G-02 III 3/4	G-08 IV 3/4	G-07 IV 4/4	R-08 V 3/4	G-09 V 3/4	R-03 VI 0/4	T-01
G-02 4 vines	G-07 4 vines	R-09 4 vines	R-06 III 0/4 roostock sprouting	G-01 IV 4/4	R-06 IV 2/4	G-08 V 3/4	R-09 V 3/4	R-01 VI 3/4	T-02
R-08 4 vines	R-06 4 vines	R-03 4 vines	G-09 III 2/4	R-04 IV 2/4	R-08 IV 2/4	R-04 V 2/4	R-06 VI 1/3	R-08 VI 4/4	T-05
R-06 4 vines	G-05 4 vines	R-06 4 vines	R-04 III 0/4	G-06 IV 2/4	G-02 IV 3/4	G-07 V 3/4	G-06 V 4/4	R-07 VI 2/2	T-15
R-07 4 vines	R-03 4 vines	R-07 4 vines	R-03 III 3/4	R-03 IV 1/4	R-09 IV 1/4	G-04 V 4/4	G-05 VI 2/4	G-08 VI 3/4	T-16
R-09 4 vines	R-08 4 vines	R-09 4 vines	G-08 III 1/4	R-01 III 0/4	G-05 IV 3/4	R-03 V 2/4	R-02 V 1/4	G-02 VI 1/3	T-13
RG-01 4 vines	G-03 4 vines	RG-01 4 vines	G-03 III 4/4	R-07 III 2/2	G-03 IV 4/4	G-02 V 3/4	R-01 V 3/4	R-05 VI 1/3	T-10
R-04 4 vines	G-05 4 vines	R-04 4 vines	R-08 III 3/4	G-04 III 2/2	R-02 IV 4/4	G-03 V 3/4	G-09 VI 2/4	R-02 VI 1/3	T-12
G-04 4 vines	G-06 4 vines	G-04 4 vines	G-01 III 3/4	R-09 III 3/4	G-04 IV 3/4	G-06 V 2/4	R-07 V 2/4	G-01 VI 3/4	T-04
G-07 4 vines	R-05 4 vines	R-02 4 vines	G-07 III 2/4	G-06 III 3/4	R-07 IV 4/4	R-06 V 2/4	R-09 V 3/4	G-03 VI 3/4	T-07
G-08 4 vines	R-02 4 vines	R-01 4 vines	G-05 III 2/4	R-05 III 3/4	R-05 IV 3/4	G-01 V 2/4	R-05 V 4/4	R-04 VI 2/4	T-06
table 1 vine	table 1 vine	table 1 vine	DEAD	T-20 1 vine	T-20 1 vine	T-20 1 vine	DEAD	DEAD	T-05 1 vine

NORTH

- CRD, 4 replications
- 4 vine plots
- 10’ x 4’ spacing (~1,089 vines/acre)
- Rows oriented north-south
- bilateral cordon, single high-wire
- Spur pruned, 40 to 60 buds
- SAS = data analysis
- R = selected graphics



Cherry trees
Table grape (border)
Refosco
Gewurztraminer

Yield, pruning weight, and Ravaz index* within varieties: Gewurztraminer and Refosco on nine rootstocks (2017 – 2022)

Rootstock	Yield (kg/vine)		Pruning weight (kg/vine)		Ravaz index*	
	GEW	REF	GEW	REF	GEW	REF
110 Richter	4.87 a	10.23 a	0.74 b	0.85 a	8.39 a	13.07 a
779 Paulsen	4.96 a	9.98 ab	1.65 a	1.22 a	4.74 a	11.37 a
SO4	5.74 a	8.50 ab	0.86 b	0.75 a	7.76 a	16.04 a
5 BB Kober	5.09 a	5.12 b	1.01 b	0.65 a	5.79 a	9.32 a
3309 Couderc	5.21 a	8.07 ab	0.75 b	0.83 a	7.55 a	14.81 a
1103 Paulsen	5.52 a	8.46 ab	0.85 b	1.02 a	7.48 a	13.84 a
1045 Paulsen	4.72 a	8.43 ab	1.04 ab	0.90 a	6.11 a	13.11 a
775 Paulsen	5.17 a	7.68 ab	1.35 ab	1.09 a	5.19 a	9.75 a
5C Teleki	4.38 a	8.52 ab	0.85 b	0.92 a	6.11 a	9.92 a

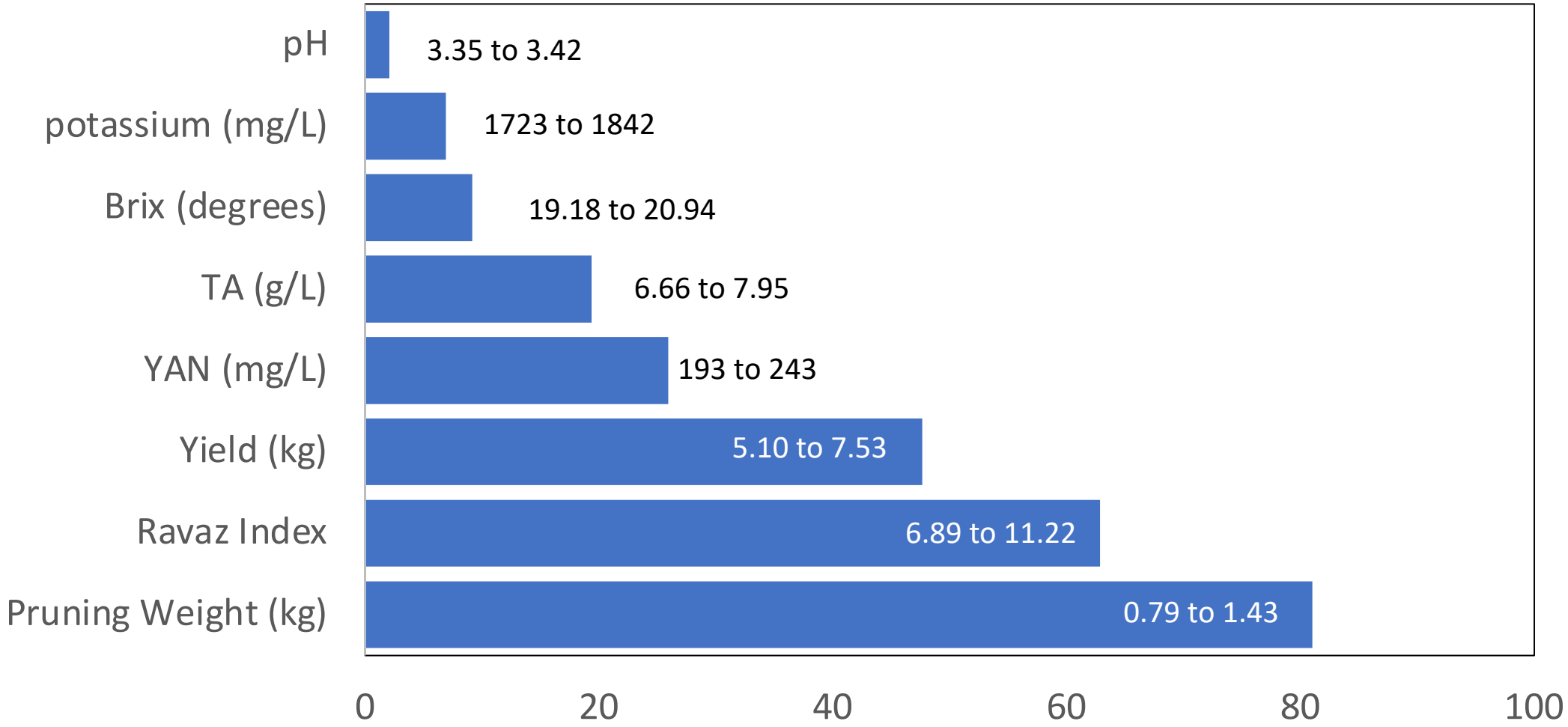
* = Ravaz index is a measurement of crop load calculated by dividing yield by pruning weight from the following dormant season

Berry chemistry at harvest from 2017, 2018 and 2022

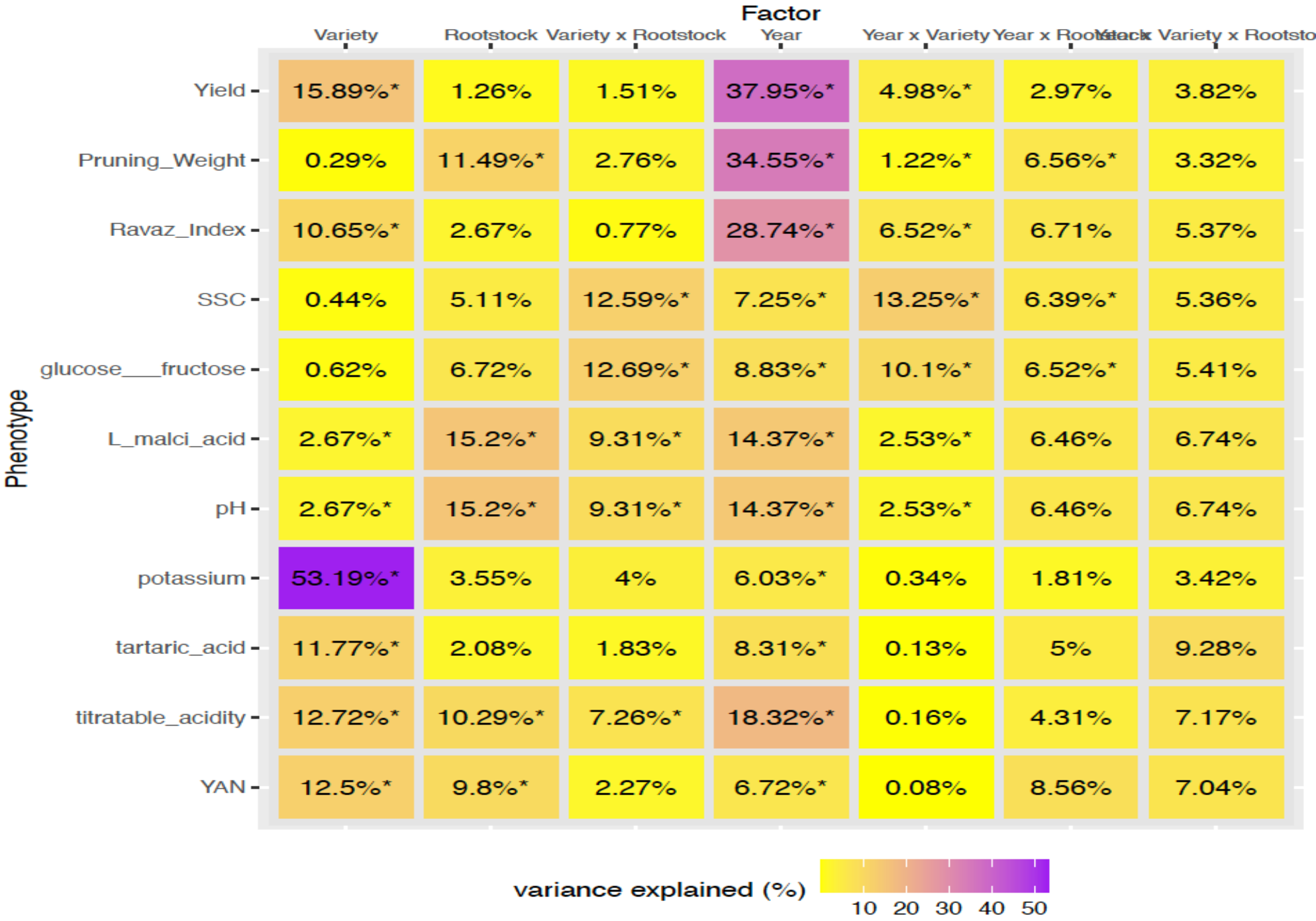
Rootstock	°Brix		Tritratable acidity		pH		potassium		YAN	
	GEW	REF	GEW	REF	GEW	REF	GEW	REF	GEW	REF
110 Richter	21.8 a	19.5	5.62 c	8.34	3.50 ab	3.21	1878 b	1541	209	183
779 Paulsen	21.3 ab	19.0	6.87 abc	7.98	3.59 a	3.26	2381 a	1566	278	206
SO4	19.8 ab	20.2	6.40 bc	7.11	3.49 ab	3.29	2001 ab	1540	208	166
5 BB Kober	18.5 b	20.5	7.13 ab	9.58	3.47 ab	3.19	2131 ab	1670	237	191
3309 Couderc	20.8 ab	20.4	6.58 abc	7.43	3.53 ab	3.27	2141 ab	1516	233	176
1103 Paulsen	22.2 a	19.2	6.51 bc	7.74	3.53 ab	3.24	2179 ab	1393	258	223
1045 Paulsen	19.0 ab	20.0	6.64 abc	7.78	3.49 ab	3.27	2050 ab	1496	265	206
775 Paulsen	19.6 ab	20.1	7.13 ab	7.77	3.49 ab	3.30	2215 ab	1594	248	237
5C Teleki	18.3 b	20.3	7.78 a	7.42	3.45 b	3.25	2230 ab	1479	269	196

Values within columns differ by P= $\leq$ 0.05 when followed by different letters

% difference of measured averages per rootstock

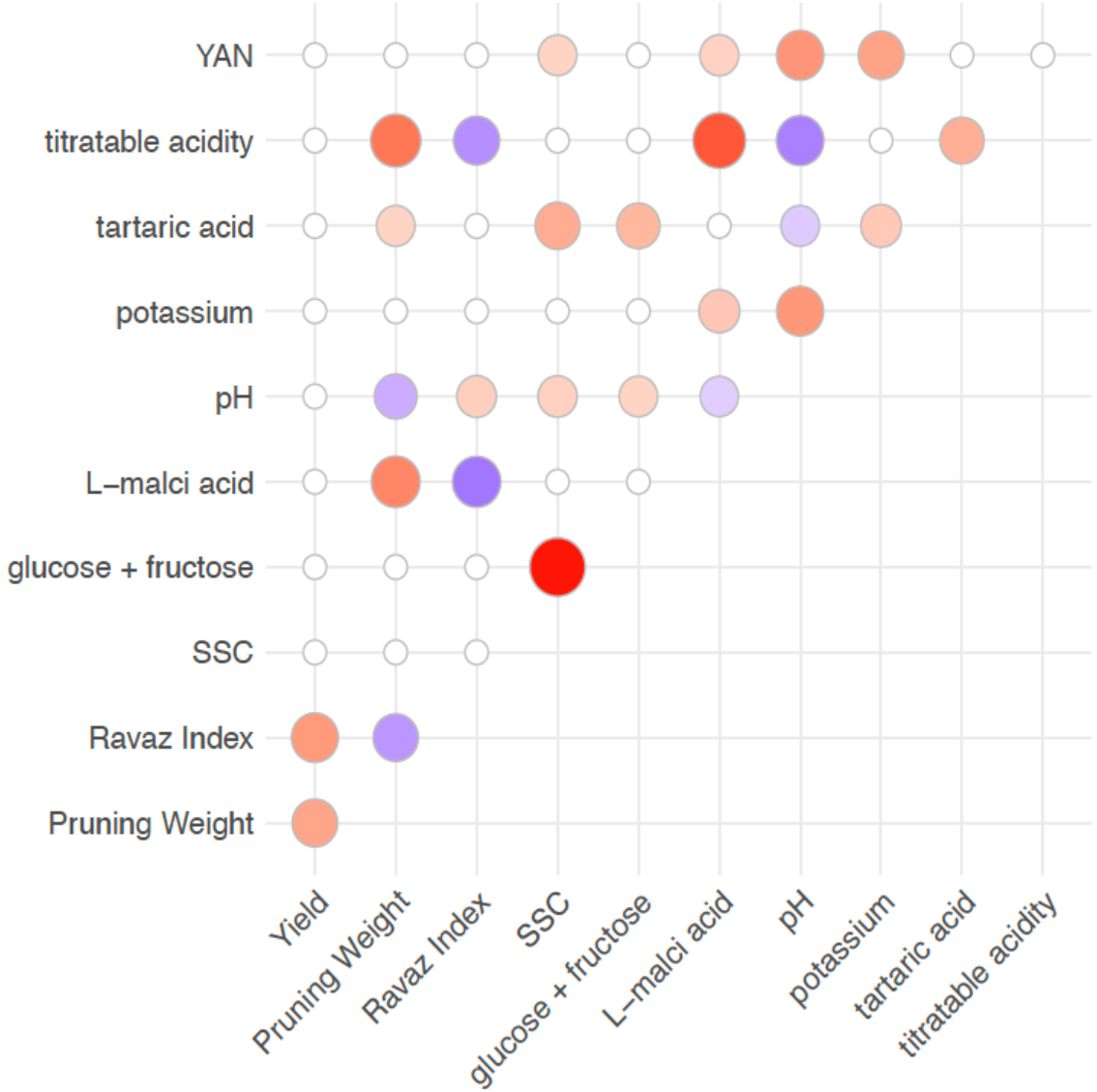


Variance presented as percentages

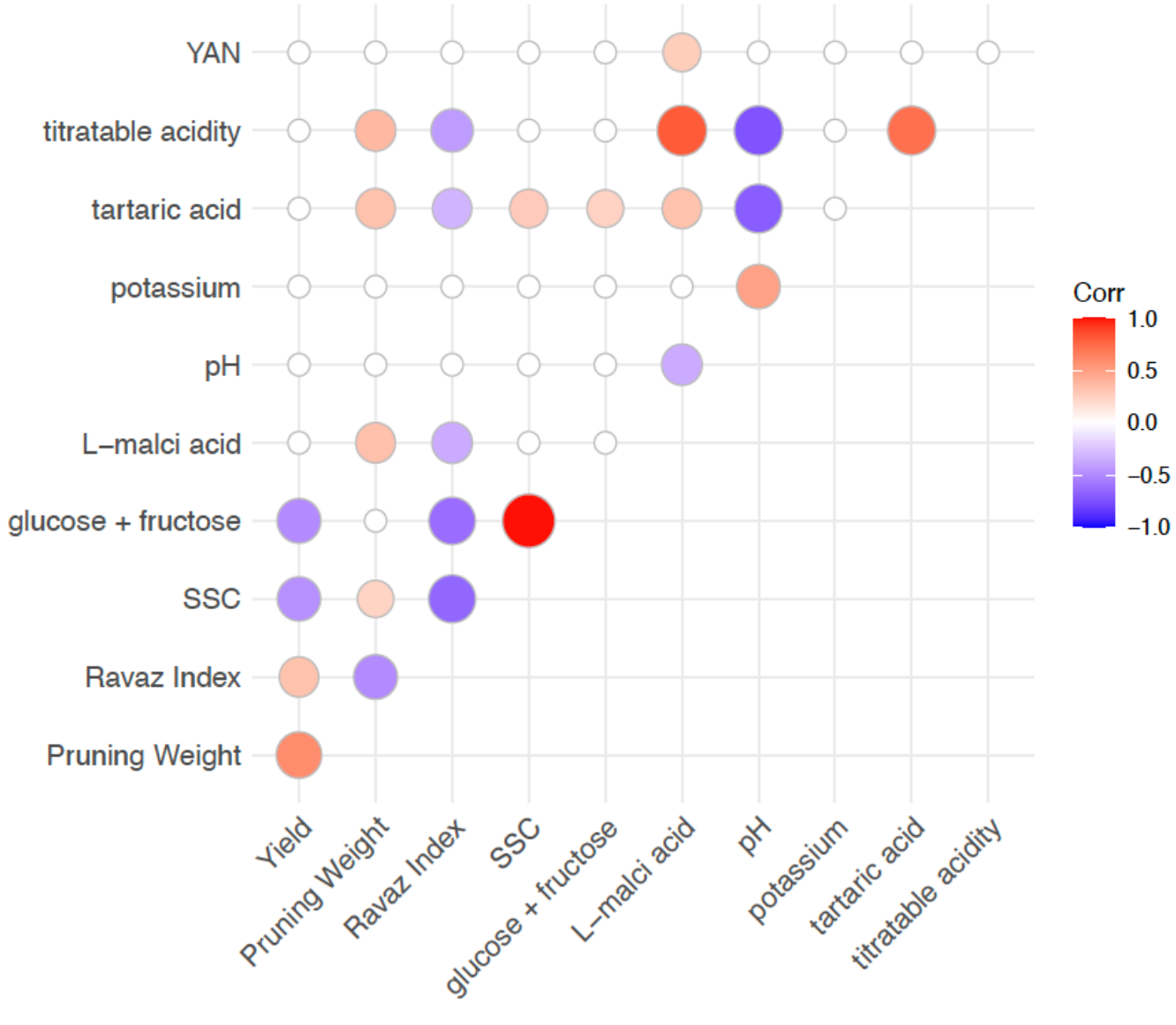


Correlation of factors per variety

Gewurztraminer



Refosco



Vine mortality @ 10 years post planting

Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
VARIETY	1	40.03	4.67	0.0366
ROOT	8	40.05	1.34	0.2519
VARIETY*ROOT	8	40.05	0.99	0.4607
YEAR	1	38.29	1.41	0.2417
VARIETY*YEAR	1	38.29	1.88	0.1789
ROOT*YEAR	8	38.28	1.00	0.4499
VARIETY*ROOT*YEAR	8	38.28	0.42	0.8994

Rootstock	% mortality
110 Richter	40%
779 Paulsen	44%
SO4	31%
5 BB Kober	58%
3309 Couderc	38%
1103 Paulsen	50%
1045 Paulsen	34%
775 Paulsen	33%
5C Teleki	40%
Gewurztraminer	33%
Refosco	50%

Conclusions

- Variety affected measured berry potassium at harvest (Gewurztraminer > Refosco)
- Gewurztraminer had less vine mortality after 14 years post-planting
- Kober 5BB had greatest mortality of tested rootstocks
- Rootstock had minimal impact on berry chemistries measured over 3 years
- Rootstock had some impact on crop yield (Refosco) measured over 5 years

Outcomes and impact

Acknowledgements

- Dr. Ciro Velasco-Cruz, Research Scientist and Statistician, NMSU
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- Daniel Goodrich, Los Alamos National Laboratory
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Thank you for your attention!

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