UC CE | UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources | Cooperative Extension

Potassium fertility in processing tomatoes

A research update and current UCCE guidelines

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NSJV Processing Tomato Meeting, February 7, 2024

Role of K in Processing Tomatoes

- plant health
- fruit quality
- yield

Plant Health

vine decline

- Lack of plant vigor, especially late season
- Early senescence
- Root health compromised

Premature vine senescence

66 days before harvest | **18 days before harvest** | **8 days before harvest**

Gene Miyao, CTGA 2016

fruit sizing

fruit ripening

approaching harvest

K deficiency

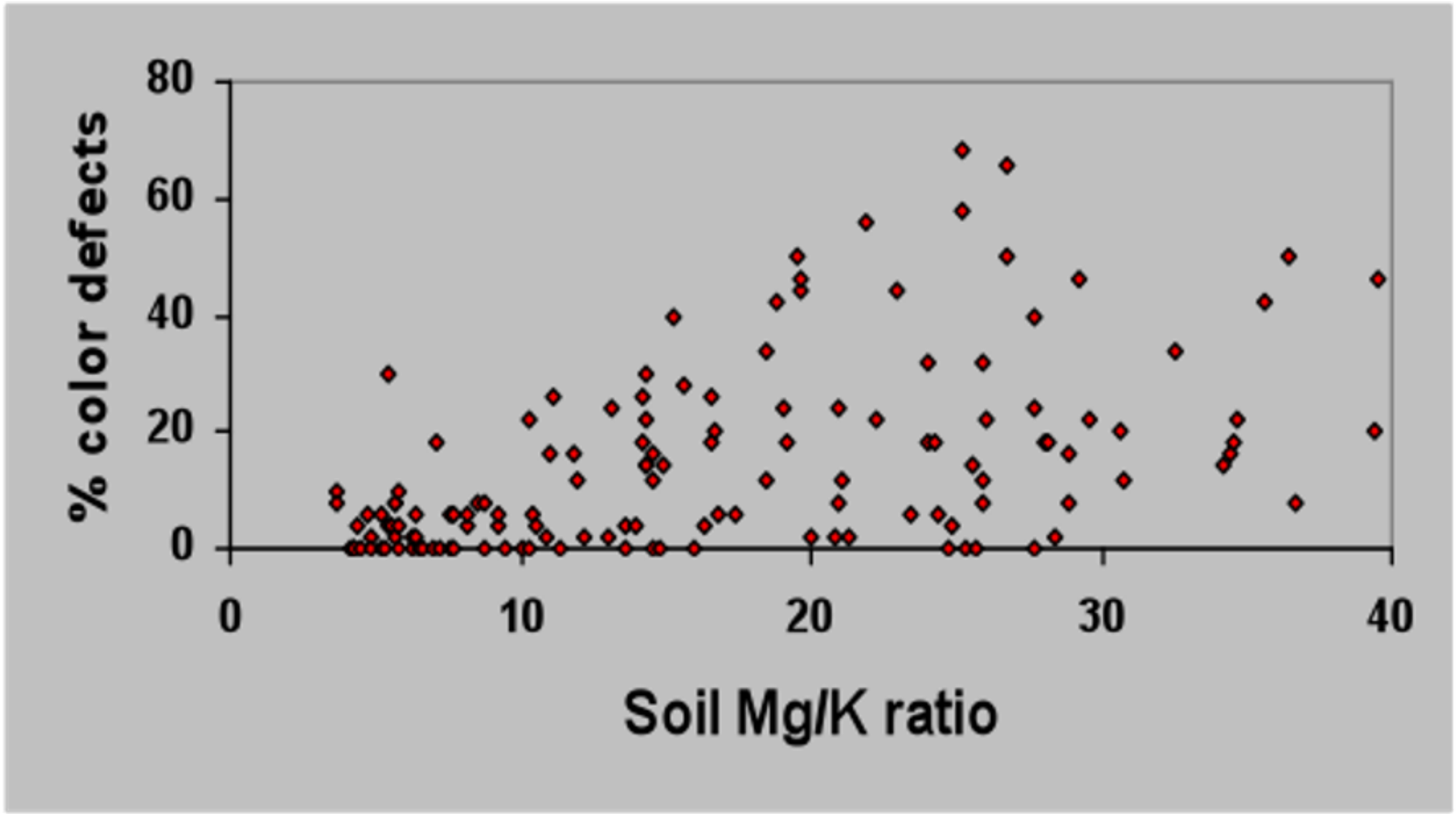
halosulfuron
herbicide

virus infection

Fruit defects

yellow shoulder

- K deficient soils
- high exchangeable Mg
- no effect on SS



Hartz et. al., 2005. HortScience 40(6).

Yield

Aegerter & Leinfelder-Miles, 2016

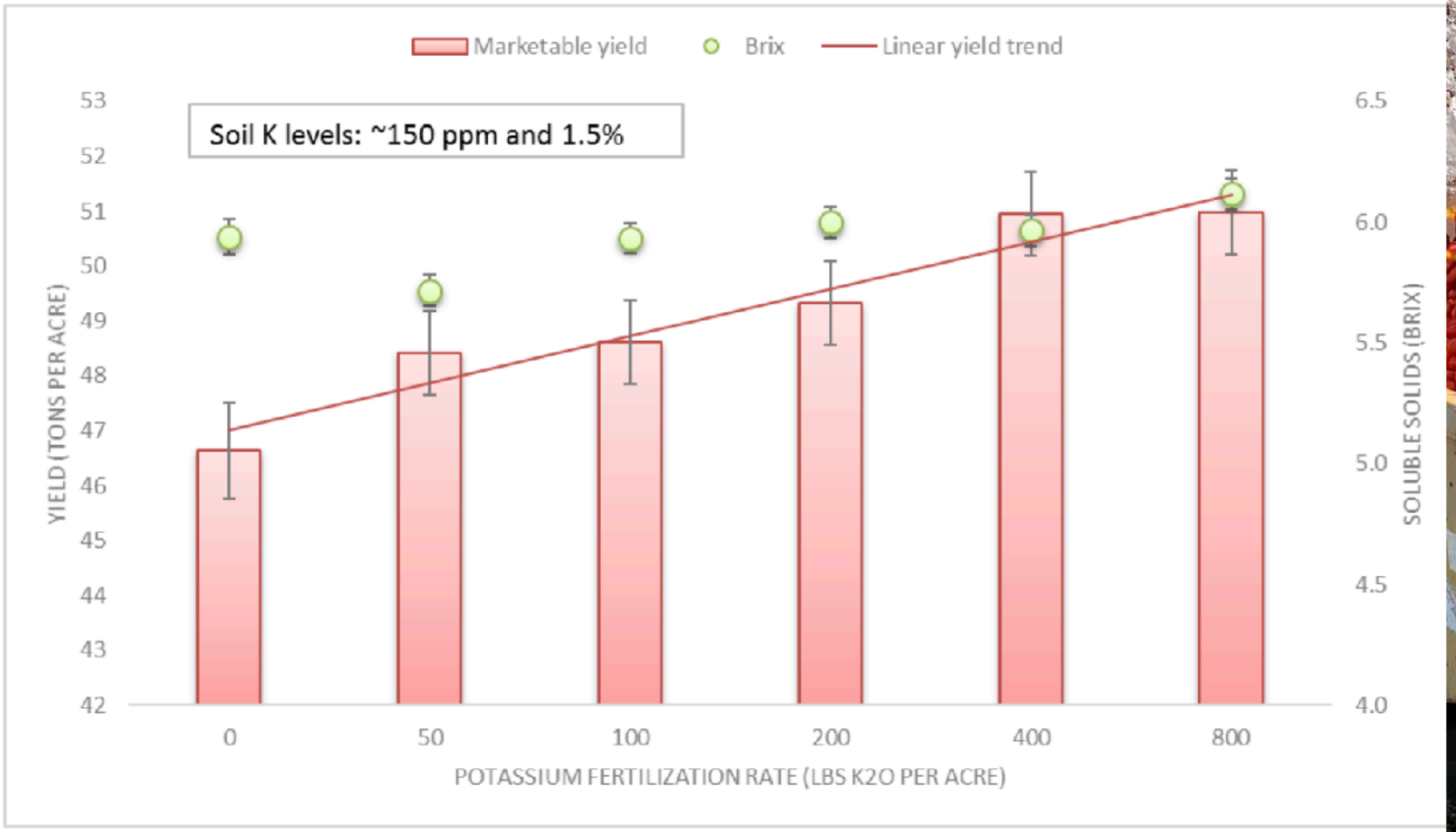


Figure 1. Response of marketable fruit yield and soluble solids (Brix) to potassium fertilization

Yield

frequently inconsistent response

- Response when soil K < 180 ppm.
- Response when %K base saturation < 2%

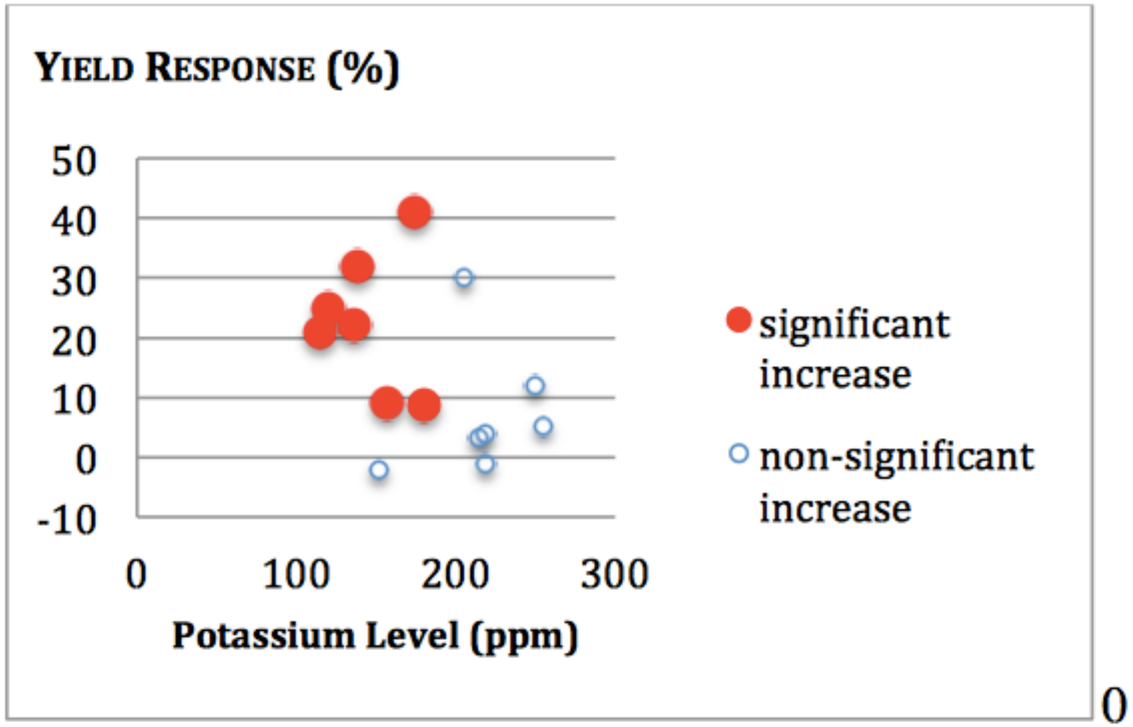
J.H. Meek and Sons, NE Davis, 2015

	K = 219 ppm & 3.0%	
		yield
	treatment (sidedressed KCl)	tons/A
1	control non K20 (KCl)	68.5
2	K @ 50 lbs K20 sidedress	67.5
3	K @ 100 lbs K20 sidedress	70.4
4	K @ 200 lbs K20 sidedress	69.1
5	K @ 400 lbs K20 sidedress	70.1
6	K @ 800 lbs K20 sidedress	68.7
	LSD 5%	NS
	F value	0.97
	% CV	4

Yield response x soil

Gene Miyao, 2011 - 14

Table A. Influence of soil K level (in ppm) on processing tomato yield response to composted poultry manure, Yolo-Solano, 2011-2014.



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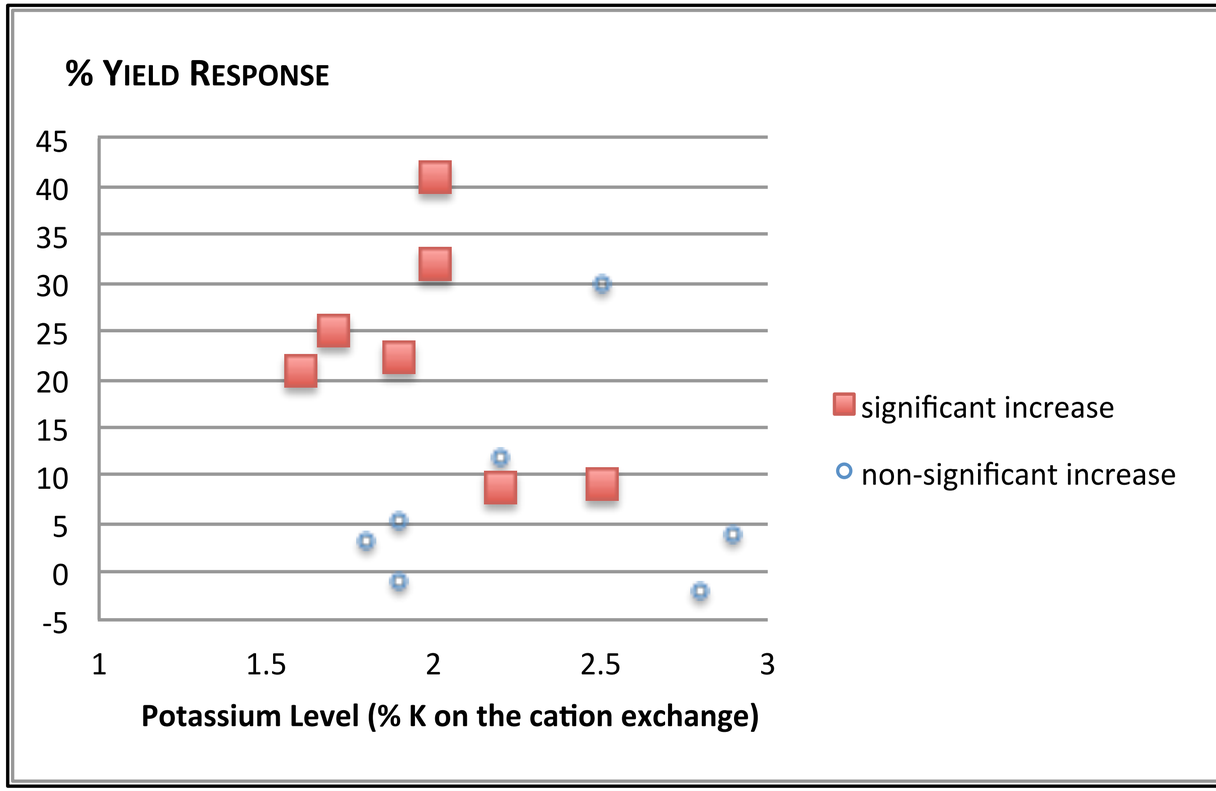
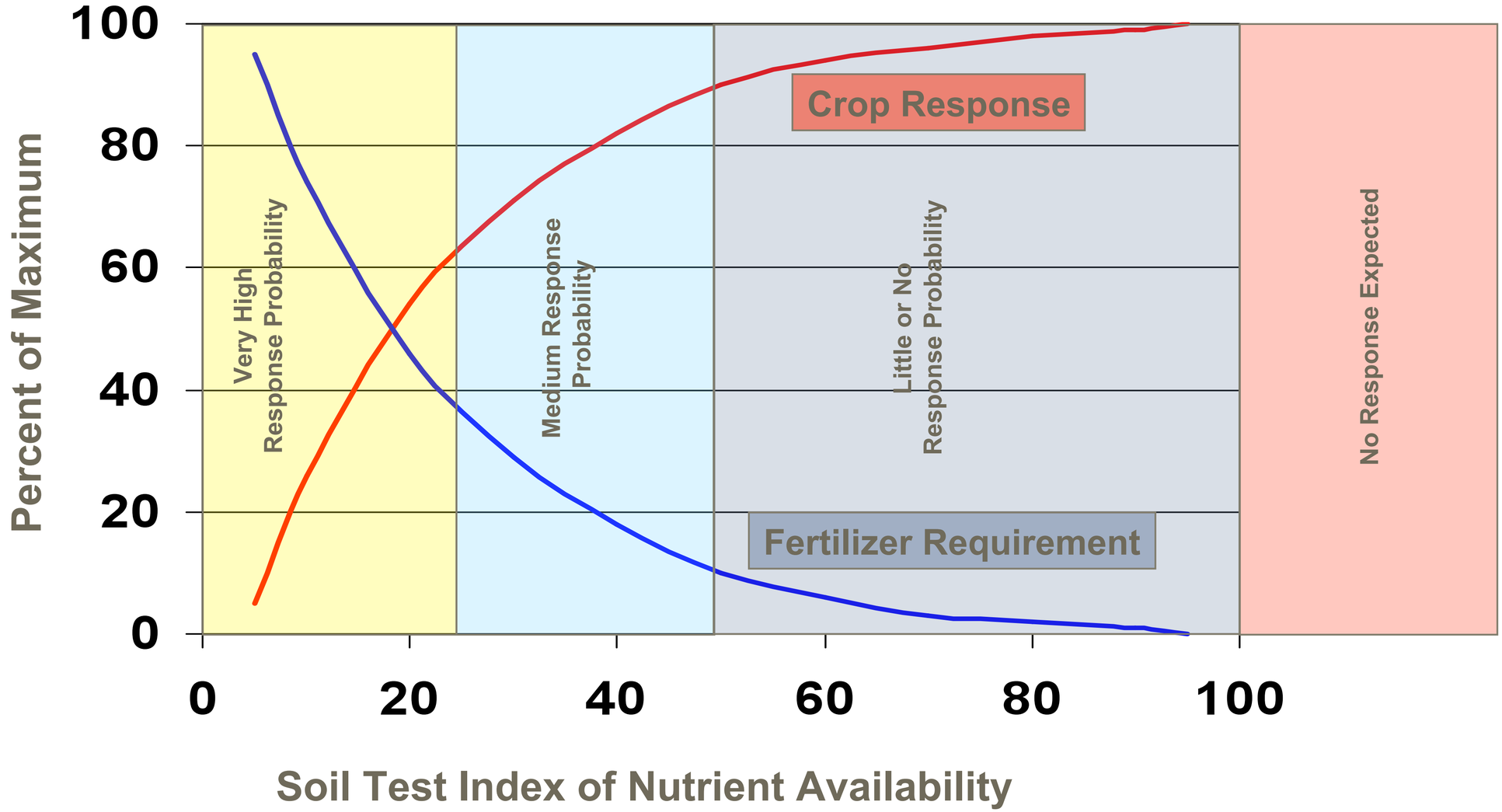


K fertilizer recommendations

based on soil index



Processing Tomato

K fertilizer projects 2021, 2023

- Commercial field, near Merced
- Severe late season vine decline
- Very low in season leaf K, <2%
- 125 ppm K, 1.5% base saturation, high Mg

OBJECTIVE: improve yield and fruit quality with supplemental fertilizer K

K fertilizer trials in processing tomatoes

treatments

- Grower standard: 60 gpa 4-10-10 PPI + KTS drip = 110 lbs K_2O/A
- 2021: 0-0-60 shanked at 100, 125, 150, 225, 250 lbs K_2O/A
- 2023: 0-0-60 blends at 120, 150, and 190 lbs K_2O/A
- RCBD with 4 reps, plots 1 bed x 300 to 1100 ft
- Nov applications.

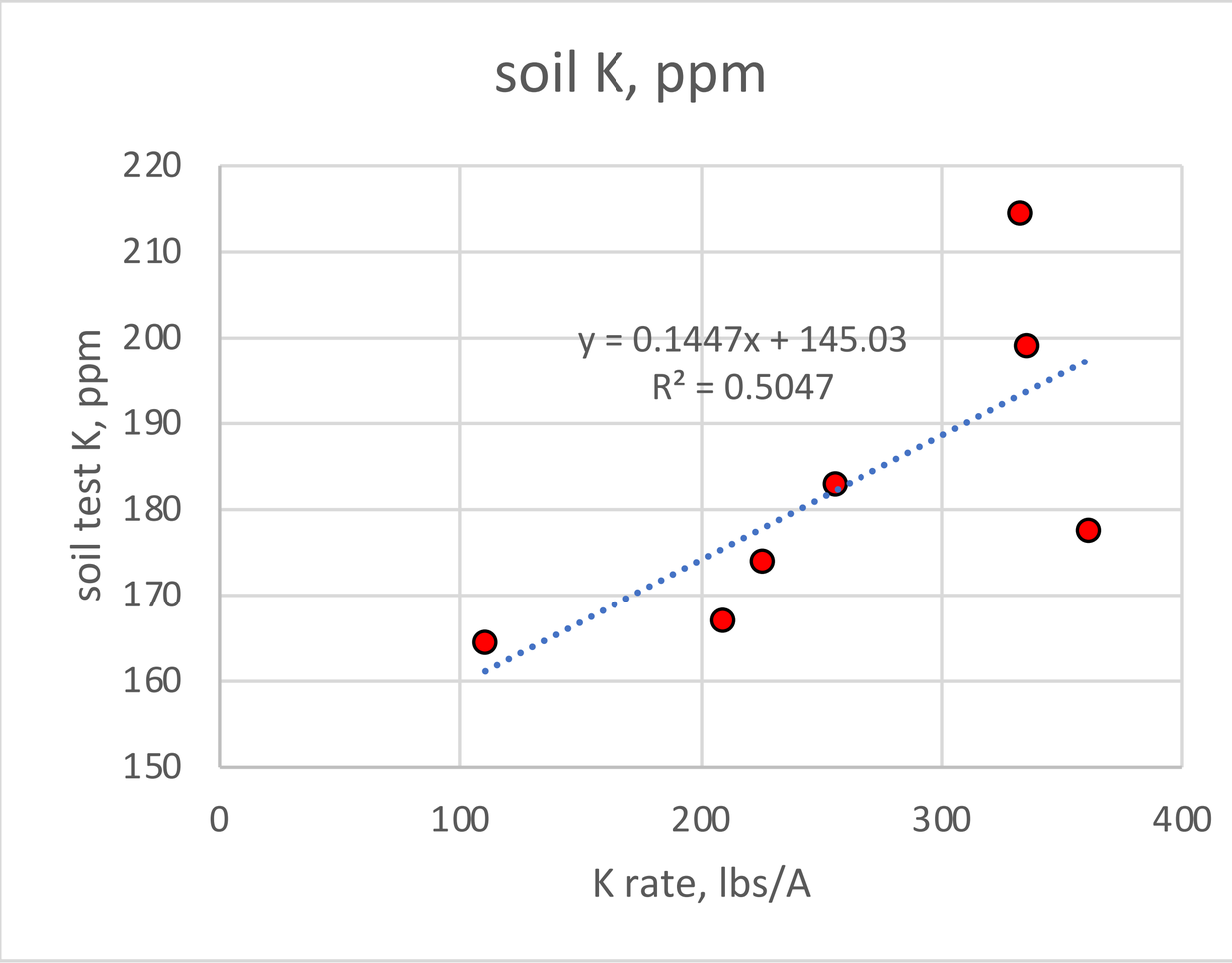

1015


Simplot
Simplot

Results

2021

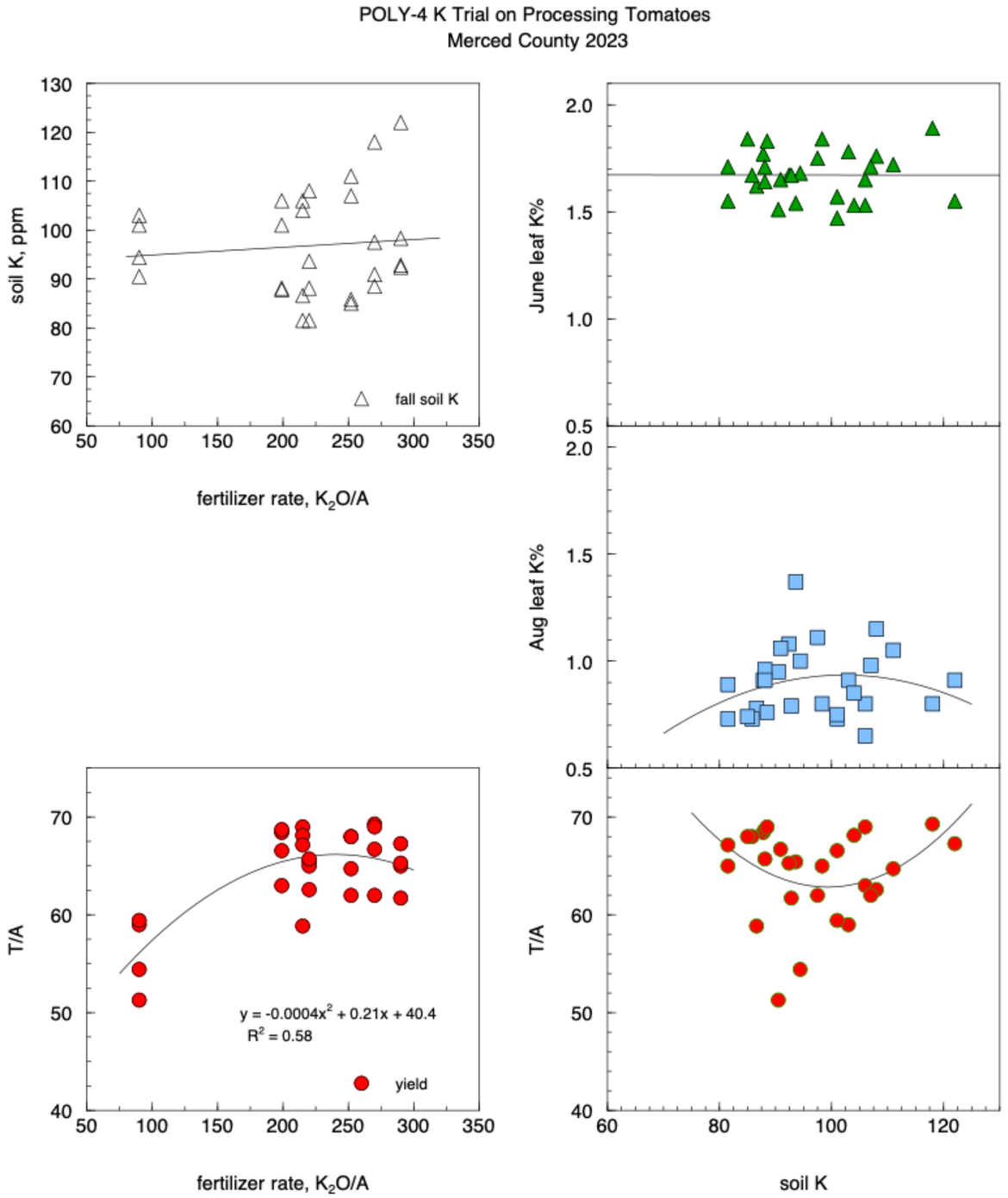
- No leaf tissue response to fertilizer treatments.
- Significant response in soil K in upper 12” soil.
- No yield response. Avg yield 53 tons/A.
- No SS, color, or pH changes in fruit.



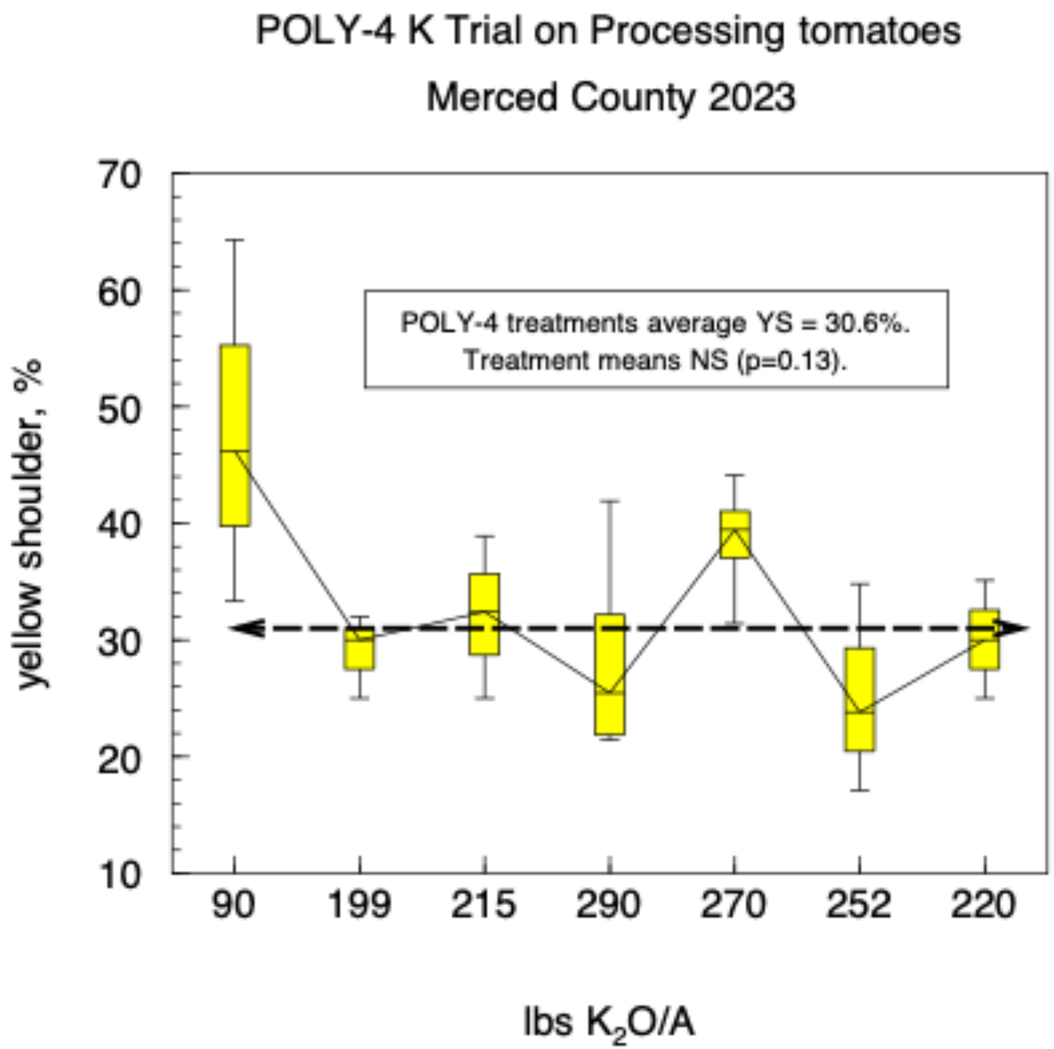
Results

2023

- no soil response to fertilizer K
- no leaf K response
- Yields significant increased over lowest rate, 53 to 63 tons/A.



Results


POLY-4 K Trial on Processing tomatoes
Merced County 2023
POLY-4 treatments average YS = 30.6%.
Treatment means NS (p=0.13).
yellow shoulder, %
70
60
50
40
30
20
10
90
199
215
290
270
252
220
lbs K_2O/A

Guidelines

1. Soil test K.

Table 1. Predicted minimum soil exchangeable K required for optimum tomato fruit color uniformity.

Soil texture	Minimum exchangeable K (PPM)*
Sandy loam	130
Loam	180
Clay loam	230

* top 12 inches of soil

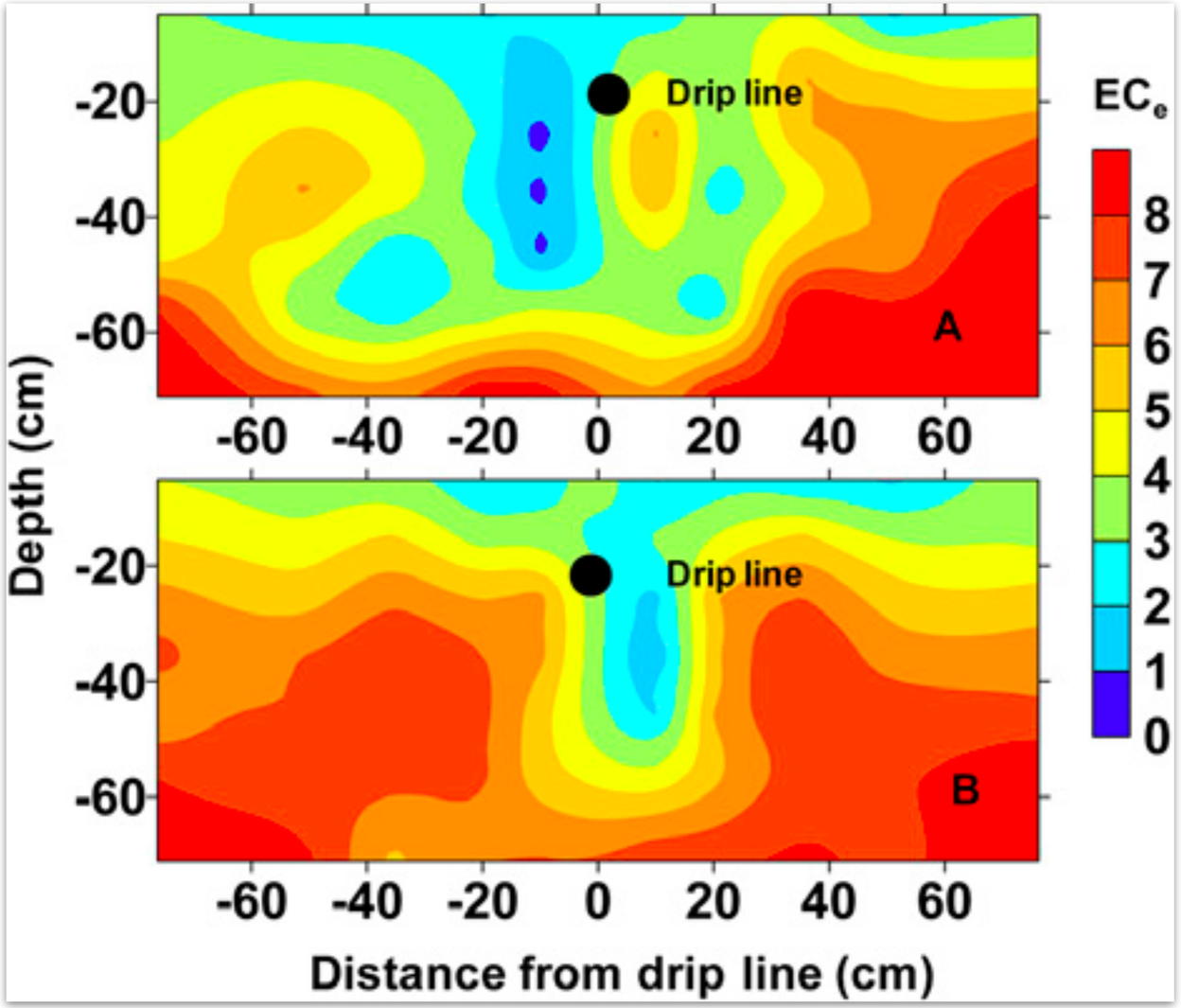
T.K. Hartz. http://cemerced.ucdavis.edu/newsletters/April_200223111.pdf

Guidelines

2. Sample location and depth

In buried drip irrigation systems that have been in place for multiple years, potassium availability in the zone around the drip tape can drop considerably, and it is important to soil test this zone to get an accurate assessment of soil fertility.

Soil electrical conductivity around a buried drip line under high and low irrigation amounts.

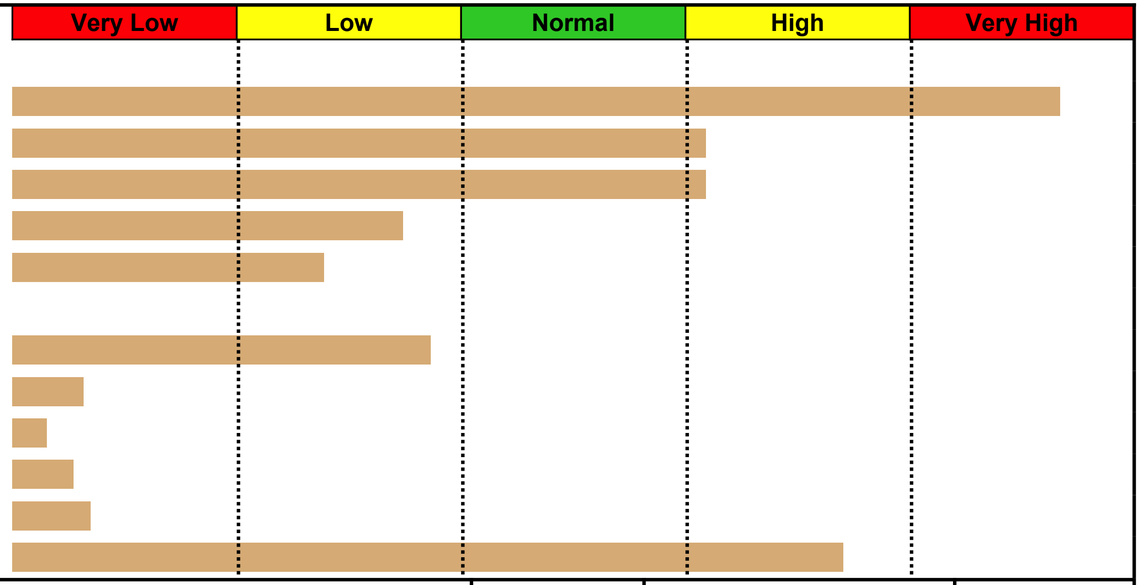


Hanson and May, 2011. UC ANR pub 8447

Guidelines

3. Look at base saturation and Mg

Analyte	Result	Units	Optimal
pH (Water)	7.6	Units	6.45
pH (Soil)	7.6	Units	6.45
Electrical Conductivity	1.70	mmhos/cm	1.05
Soluble Salts	1090	mg/L	672
Nitrate Nitrogen	18.7	ppm	35
Phosphorus (Olsen Method)	10.0	ppm	26
MicroNutrients			
Boron	0.357	ppm	0.6
Zinc	0.850	ppm	12.5
Iron	1.90	ppm	[illegible]
Copper	0.402	ppm	[illegible]
Manganese	1.65	ppm	[illegible]22
Sulfate	110	ppm	38.5



	Exchangeable Cations	Base Saturation Acetate Extraction				
	Result	Your %	Optimal %	Low	Normal	High
Potassium	256 ppm	3.6 %	3 - 7			
Calcium	3010 ppm	80.6 %	64 - 78			
Magnesium	298 ppm	13.4 %	12 - 20			
Sodium	104 ppm	2.5 %	< 3			

	Water Extraction		Extraction Ratio
	Result	% Total	
Potassium	0.717 meq	4.9 %	10.97 %
Calcium	6.96 meq	47.7 %	4.71 %
Magnesium	2.71 meq	18.6 %	11.03 %
Sodium	4.19 meq	28.8 %	92.3 %

Plant Nutrient Recommendations

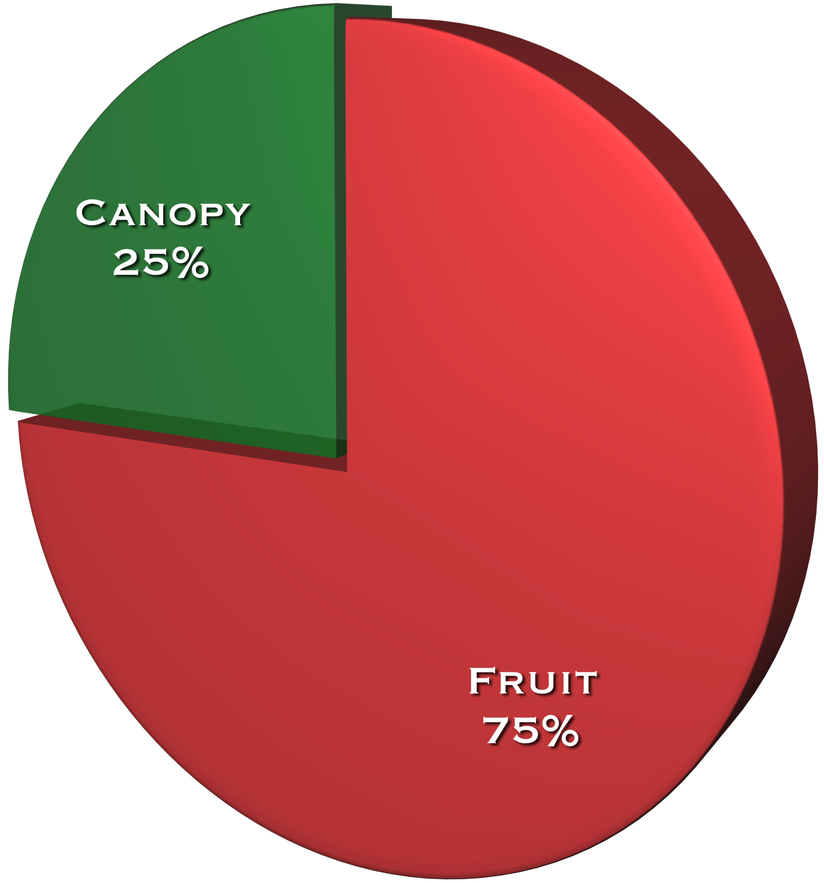
Nitrogen	0 Lbs/Acre	Sulfur *	
Phosphorus	0 Lbs/Acre	Boron	0 Lbs/Acre
Potassium	0 Lbs/Acre	Zinc	10.6 Lbs/Acre

Total Nitrogen	ESP	SAR	C:N	Ca:Mg
Bray Phosphorus	2.5	1.9		10.1
Ammonia Nitrogen		CEC	18.3 meq/100g	

Guidelines

4. K removal in fruit

- 4 - 6 lbs of K per ton fruit.
- Removing > 220 lbs K_2O/A with harvest.
- In low K soils, fertilizer K should replace what's taken off the field.
- Data show ~ 100 lbs K_2O/A from fertilizer give highest economic return



K partitioning at harvest

Conclusion

Thank you,
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