

Evaluation of Composted Poultry Manure & Potassium as Plant Nutrient Supplements to Improve Tomato Plant Health



BEN LEACOX, AGRICULTURAL TECHNICIAN, UCCE, YOLO, SOLANO, SAC
MIKE DAVIS, PLANT PATHOLOGIST, UC DAVIS
GENE MIYAO, FARM ADVISOR, UCCE, YOLO, SOLANO & SACRAMENTO COUNTIES



Premature vine senescence

66 days before harvest

18 days before harvest

8 days before harvest



fruit sizing

fruit ripening

approaching
harvest

Year 2011

Treatments included:

Treatment

Chemigations

Metham (biocide)

Fungicides

Biologicals

Trichoderma sp.

Bacillus subtilis

Gliocladium virens

Composted manure- surface applied

- 1 Control
- 2 Vapam 15 gpa
- 3 Tenet
- 4 Vapam + Tenet
- 5 Quadris + Ridomil
- 6 Vapam + Quad + Ridomil
- 7 Serenade Soil
- 8 Serenade + Quad + Rid
- 9 Vapam + Serenade
- 10 Chicken manure
- 11 Tenet + Serenade
- 12 SoilGard



chem & biologicals multiple applications	2011 #1	2011 #2	2012 #1	2012 #2
	Yield (tons/A)			

Control	34 b	46	39 b	43
Vapam/Kpam 15 gal	35 b		44 b	40
Tenet	34 b	48		
Vapam + Tenet	34 b			
Quadris + Ridomil	33 b	47	40 b	43
Vapam + Quad + Ridomil	36 b			
Serenade Soil	38 b	45	40 b	41
Serenade + Quad + Rid		46		
Vapam + Serenade	36 b		42 b	38
Chicken manure 10 tons	45 a	52	56 a	55
Chicken manure 20 tons			61 a	40
Tenet + Serenade		46		
SoilGard		44		
Potassium			38 b	41
Actinovate			38 b	

NS

NS

Composted poultry manure, K applications, & chemigations

Muller Ranch, Yolo-Zamora area, 2014 (as supplements)

157 ppm @ 2.5% K

Supplemental Treatment	yield tons/acre	vine health (% green)	Brix
1 Manure 10 tons	69.5	85	4.48
2 Manure 5 tons	68.6	82	4.40
3 Potassium fertigate	67.9	82	4.68
4 Potassium sidedress	66.6	85	4.40
5 Agrinos HYT A	65.5	72	4.30
6 Non treated	63.7	61	4.30
7 CA Soils H2H 15 fb 10 gpa	63.6	65	4.13
8 nutrients (compost mimic)	63.4	85	4.45
9 ProAg Simple Soil Solutions	62.2	65	4.30
LSD@5%	3.3	10	0.27
% CV	3	9	4

Composted manure, NPK and K applications, Muller Ranch, Yolo-Zamora area, 2014

composted
manure
10 T/A

Sidedressed
K
(as KCl)

composted
manure
5 T/A

manufacturer NPK to mimic
compost rates

	lbs/ton	%	avail- able	lbs/A
N	75	3.8	20%	152
P ₂ O ₅	48	2.4	80%	381
K ₂ O	58	2.9	80%	464



**J.H. Meek and Sons,
Woodland, 2014**



rep A

50 lb K₂O

mimic

compost
10 tons

200 lb K₂O

control

headland area: non-supplemented



50 lb K₂O

mimic

compost
10 tons

200 lb K₂O

control

J.H. Meek and Sons, Woodland, 2014

Composted Manure
Poultry

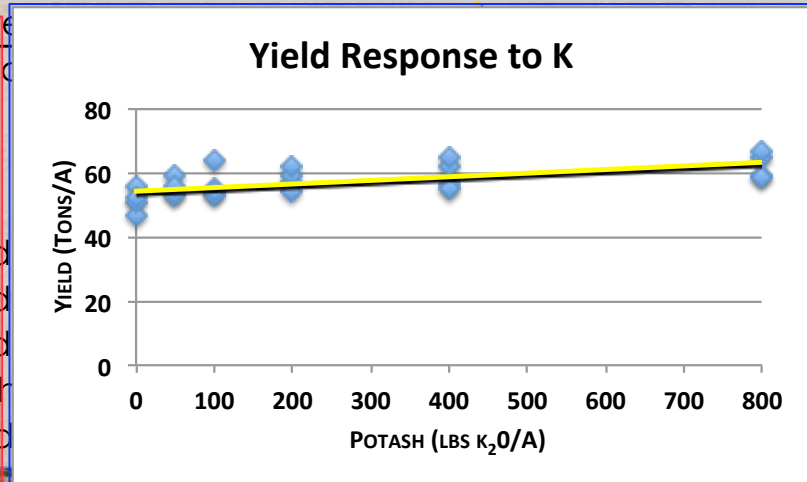
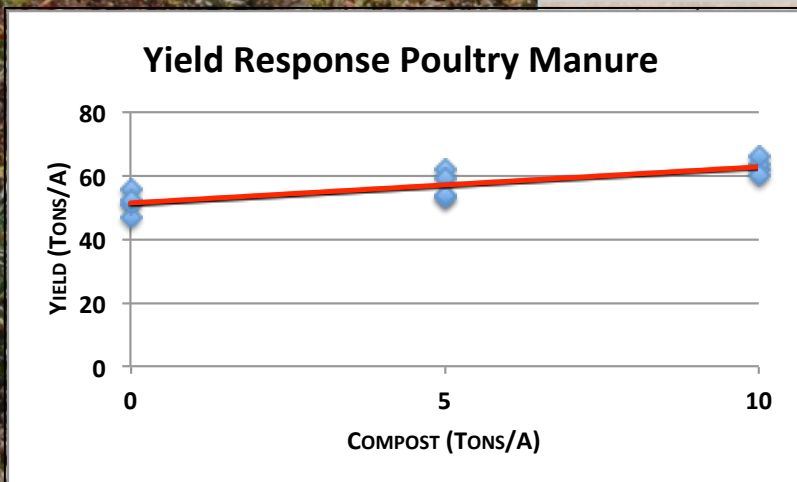
Potassium
Sidedressed KCl

136 ppm K with 1.9% on the cation exchange

treatment	Yield		full bloom			
	tons/A		°Brix	% N	% P	% K
1 control	51.3	e	4.35	4.6	0.38	1.7
2 compost 5 tons	56.8	cd	4.40	4.8	0.40	2.0
3 compost 10 tons	62.6	a	4.63	4.9	0.43	2.3
4 NPK compost mimic	61.7	ab	4.53	4.7	0.49	2.3
5 K20 800 lbs	62.3	a	4.57	4.7	0.36	2.2
6 K20 400 lbs	59.4	abc	4.55	4.7	0.36	2.2
7 K20 200 lbs	57.9	bcd	4.53	4.5	0.37	2.0
8 K20 100 lbs	56.5	cd	4.53	4.5	0.36	1.9
9 K20 50 lbs sidedress	55.1	de	4.35	4.6	0.39	1.9
LSD @ 5%	3.9		0.2	0.19	0.04	0.20
% CV	5		3	3	6	7

Class Comparisons:

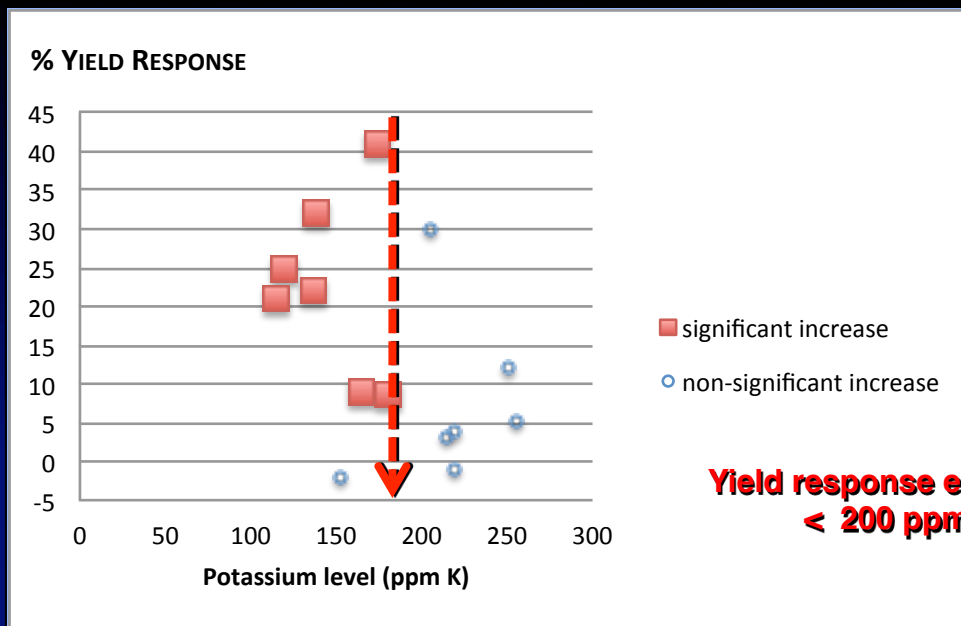
compost rate (probability):	✓	✓			
linear response	0.01	0.01	0.00	0.01	0.00
quadratic	NS	NS	NS	NS	NS



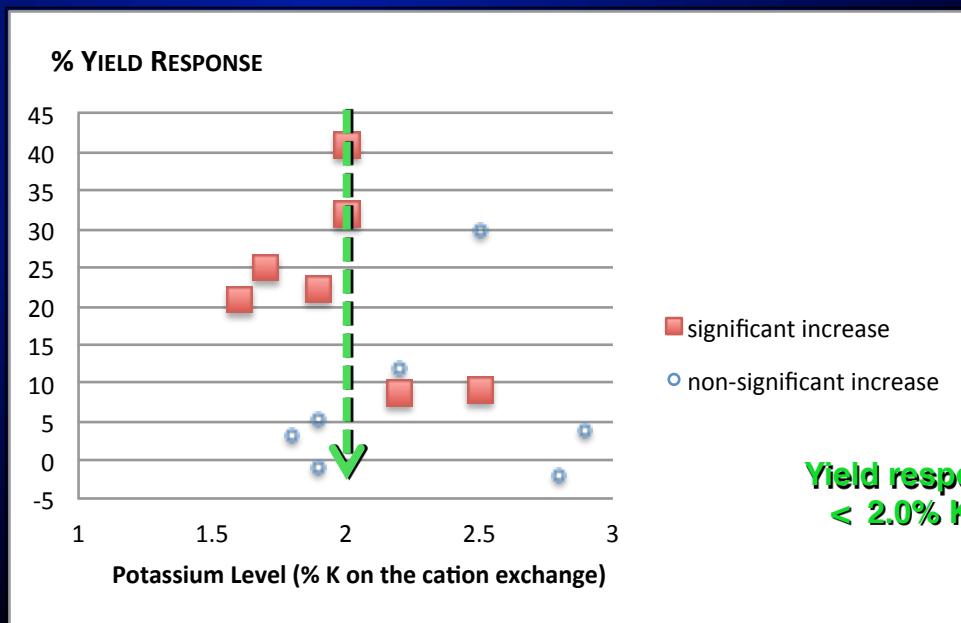
Composted poultry manure applications (supplemental) 2011-2014

soil lab determinations as:

ppm K



% K of cations





From small-scale, test plot results ...

... to grower adoption



Challenges:

High Costs (w/ short supply)

Slow operation (high volume)

Specialized equipment

◆ Compost superior beyond NPK value

◆ KCl alone similar results to NPK compost 'mimic'

◆ Tissue K levels raised

Processing tomato yield (tons/acre)

Treatment	# sites	only		remove 1	LSD	LSD
	all	significant				
	7 sites	4 sites	3 sites	1%	5%	
1 Compost	56.9	a	67.9	a	67.3	a
2 compost 'mimic'	54.1	b	64.3	b	64.6	ab
3 Potassium KCl	53.8	b	63.5	b	62.0	b
4 Control	50.2	c	58.6	c	57.0	c
LSD 1%	1.99		2.75		3.46	
CV	5		5		5	
interaction prob	0.000		0.001		0.017	

Tissue K levels from whole leaves (% K) @ full bloom

Treatment	# sites	only		remove 1	LSD
	all	significant			
	7 sites	4 sites	3 sites	1%	
1 Compost	2.470	a	2.547	a	2.575
2 compost 'mimic'	2.349	a	2.513	a	2.487
3 Potassium KCl	2.366	a	2.406	a	2.337
4 Control	2.234	b	2.226	b	2.191
LSD 1%	0.128		0.176		0.222
CV	8		8		8

Processing tomato yield (tons/acre)

Treatment	# sites all 7 sites		added material cost	gross marginal income/acre
1 Compost	56.9	a	\$500	\$36.00
2 compost 'mimic'	54.1	b	\$790	(\$478.00)
3 Potassium KCl	53.8	b	\$100	\$188.00
4 Control	50.2	c	0	\$0.00
LSD 1%	1.99			
CV	5			
interaction prob	0.000			

Materials			\$/unit	\$/acre
compost	10 tons		\$50	\$500
mimic	varies		\$790	\$790
KCl	200 lbs		\$0.50	\$100

◆ Compost superior beyond NPK value

◆ KCl alone similar results to NPK compost 'mimic'



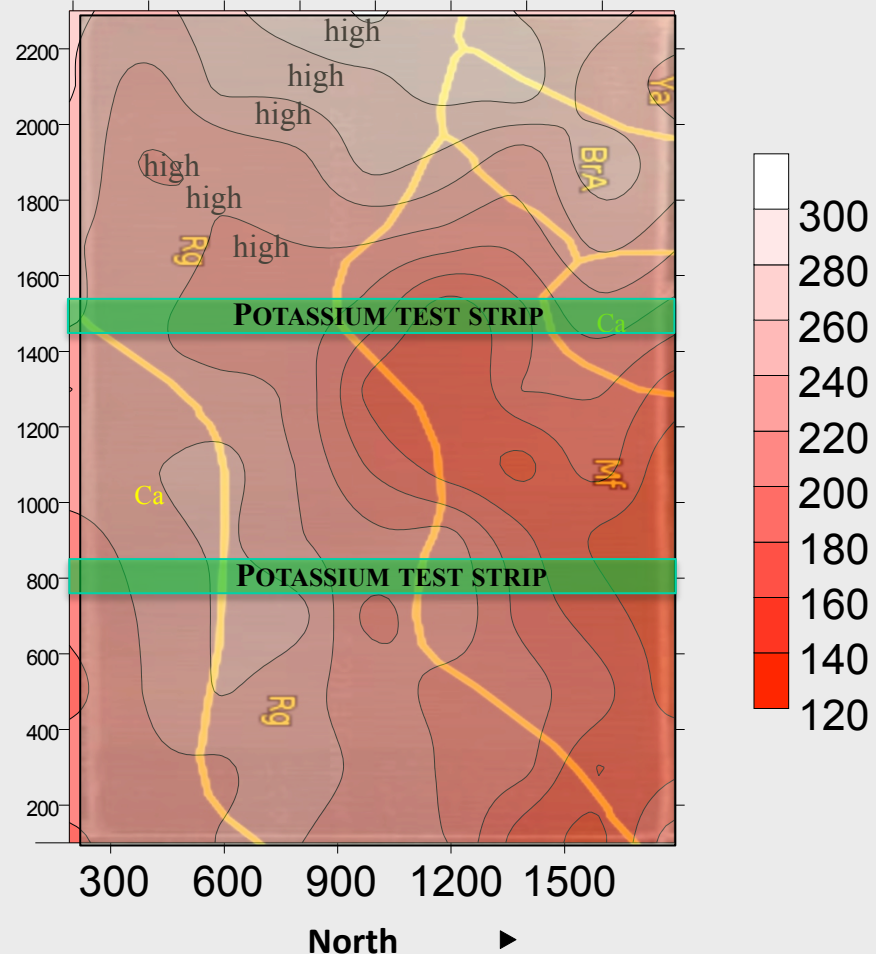
Potassium variability (in a Yolo field)

Soil Series Map @
SoilWeb



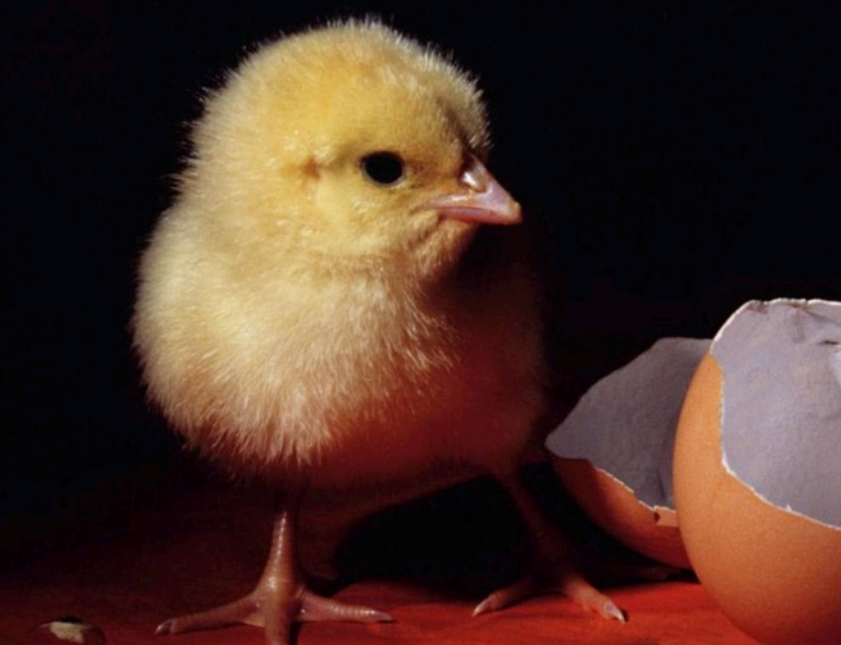
derived from 200 x 200 ft
grid samples

Soil test K (ppm)
in 108 acre tomato field





~6 lbs. K2O per ton: tomato fruit removal



Research collaborators:

Johan Leveau
Nilesh Maharaj
Mark Kochi
Karina Perez
Hung Doan & many others



Year 2014 Cooperators:

Steve & Sam Meek & John Pon
Colin, Frank & Louie Muller
Bob & Bill Payne
Dustin Timothy & Dave Viguie

KCI fertilizer donated by
Agriform & Tremont Group

Compost: UCD Russell Ranch