Sweetpotato Research Progress Report 2009

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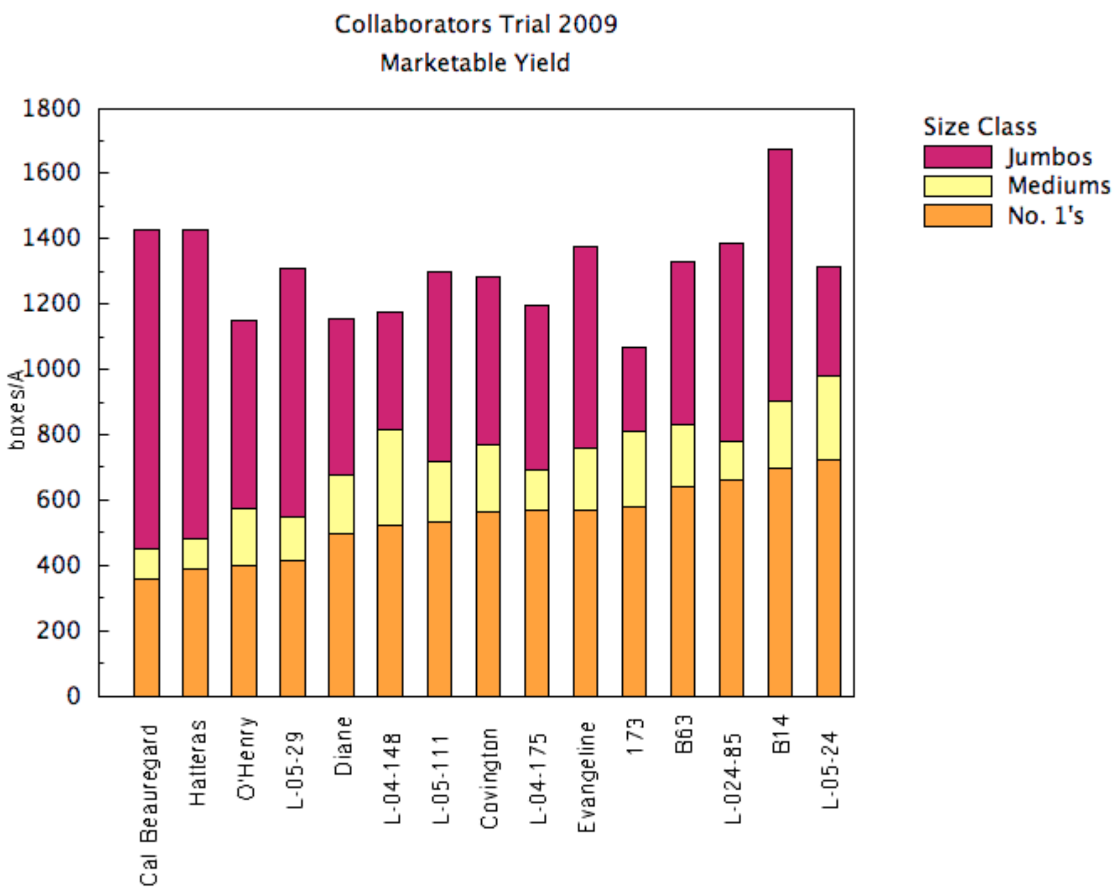
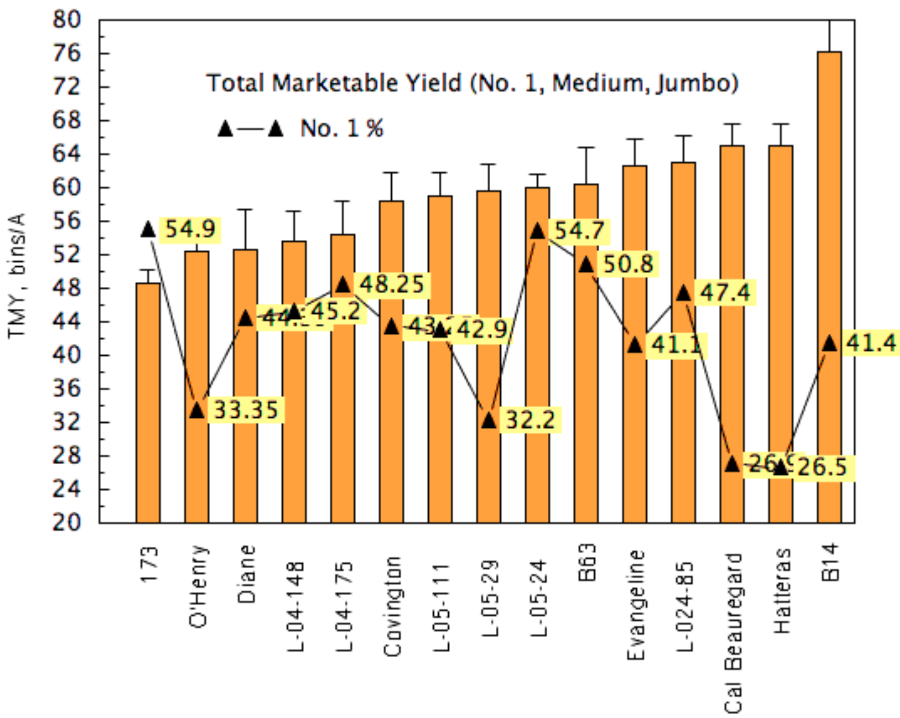
NATIONAL SWEETPOTATO COLLABORATORS SUMMARY OF DATA
2009

STATE AND LOCATION REPORTING: Livingston, CA
DATE TRANSPLANTED: 5/28/09. DATE HARVESTED: 10/28/2008. No. GROWING DAYS: 153
DISTANCE BETEEN ROWS (in): 40. DISTANCE IN ROW (in): 12
PLOT SIZE: NO. OF ROWS: 2 LENGTH (ft): 50 NO. OF REPS: 4
IRRIGATION: pre irrigate + drip irrigation. 1.5 to 2 inches per week during summer, total 30".
FERTILIZER: 3 tons compost, 500 lbs K2SO4 pre plant, CAN17 drip. About 150-60-375 NPK.

			-------	40 lb box/A	-------			%	%
	SELECTION	**CLASS**	**US #1'S**	**CANNERS**	**JUMBOS**	**MKT YIELD**	**BINS/A**	**US #1'S**	**CULLS**
1	Cal Beauregard	yam	359.4	91.0	975.6	1426.0	64.8	25.3	6.5
2	B14	yam	697.0	205.1	772.7	1674.9	76.1	41.6	0.4
3	B63	yam	641.6	187.5	499.5	1328.5	60.4	49.0	4.5
4	Covington	yam	561.9	206.6	516.4	1284.8	58.4	43.7	0.2
5	Hatteras	yam	390.7	90.5	945.7	1426.9	64.9	27.8	7.9
6	L-05-111	yam	532.3	186.5	579.4	1298.2	59.0	41.5	4.4
7	L-05-29	sweet	414.0	132.6	763.0	1309.5	59.5	32.1	7.3
8	L-024-85	sweet	658.7	121.2	606.1	1386.0	63.0	47.5	0.2
9	L-04-175	red	568.2	123.2	505.4	1196.8	54.4	48.6	5.1
10	L-04-148	red	523.2	290.3	362.1	1175.5	53.4	44.4	5.1
11	L-05-24	red	not included in analysis because of lack of reps						
12	173	red	576.7	235.5	255.2	1067.4	48.5	54.1	9.1
13	Evangeline	yam	570.8	189.1	614.4	1374.3	62.5	41.8	4.0
14	Diane	red	494.9	181.4	479.1	1155.4	52.5	42.6	16.4
15	O'Henry	sweet	401.2	171.0	577.0	1149.3	52.2	35.1	7.0
	Average		527.9	172.2	603.7	1303.8	59.3	41.1	5.6
	LSD 0.05 total		113.7	64.9	211.6	211.8	9.6	9.1	5.4
	LSD yam		111.7	47.7	244.3	232.7	10.6	9.7	4.9
	LSD red yam		NS	123.1	NS	NS	NS	NS	7.2
	LSD sweets		130.9	NS	NS	NS	NS	11.0	5.7
	CV, % (total)		15.1	26.3	24.5	11.4	11.4	15.5	67.5
11	L-05-24	red	721.5	261.0	333.7	1316.1	59.8	54.7	9.2

US #1's	Roots 2 to 3.5 inches in diameter, length 3 to 9 inches, well shaped and free of defects.
Canners	Roots 1 to 2 in diameter, 2 to 7 inches in length.
Jumbos	Roots that exceed the size requirements of above grades, but are marketable quality.
Mkt Yield	Total marketable yield is the sum of the above three categories.
bins/A	bins/A are estimated based on market box yield assuming 22 boxes (17.6 Bu) per bin.
% US #1's	Weight of US #1's divided by total marketable yield.
% Culls	Roots greater than 1" in diameter that are so misshapen or unattractive as to be unmarketable.
LSD 0.05	Least significant difference. Means separated by less than this amt are not significantly different (ns).
LSD yam, red, sweets	LSD 0.05 values for respective market class only (e.g. to compare reds excluding other varieties)
CV, %	Coefficient of variation, a measure of variability in the experiment.
L-05-24	Only 2 reps planted


Collaborators Trial 2009
Marketable Yield
boxes/A
1800
1600
1400
1200
1000
800
600
400
200
0
Size Class
Jumbos
Mediums
No. 1's
Cal Beauregard
Hatteras
O'Henry
L-05-29
Diane
L-04-148
L-05-111
Covington
L-04-175
Evangeline
173
B63
L-024-85
B14
L-05-24


Total Marketable Yield (No. 1, Medium, Jumbo)
No. 1 %
TMY, bins/A
80
76
72
68
64
60
56
52
48
44
40
36
32
28
24
20
54.9
33.35
45.2
48.25
42.9
32.2
54.7
50.8
41.1
47.4
26.5
41.4
173
O'Henry
Diane
L-04-148
L-04-175
Covington
L-05-111
L-05-29
L-05-24
B63
Evangeline
L-024-85
Cal Beauregard
Hatteras
B14

Sweetpotato Collaborators Trial -- 2009

Scott Stoddard, UCCE Merced County

This year's sweetpotato evaluation was with Blain Yagi, near Livingston, CA. Soil type was Hilmar sand, slightly saline-alkali. Ground was fumigated with Telone. Field pre-irrigated, and soil moisture was excellent at planting. Warm, dry, and windy spring. Very poor hotber conditions resulted in sourcing plants from LSU and two growers. Emphasis on red yam types this year. No significant pest problems, but harvest slightly delayed which resulted in high proportion of jumbos. Notes made 6 weeks after harvest.

Rep	Var#	Variety Name	Skin Color	Skin Text	Flesh color	Eyes	Lents	Shape	Shape Uniform	Overall App	Comments	notes on culls
1	1	California	Rose-Cu	7	3	9	7	2,8	5	7	Slightly more red in skin than B14	RC
2		Beauregard	Rose-Cu	7	3	5	7	2,3,5	5	6	and B63, some bumps	cuts, shape
1	2	B63	Rose-Cu	7	3	7	5	2,3,8	5	6	Slightly off-color, YCR	
2			Cu	8	3	7	7	2,3,8	5	6	variable shape	
1	3	B14	Rose-Cu	6	3	5	7	2,8	6	6	some rought skin, striations in	cuts
2			Cu	7	3	7	7		7	7	color.	shape
1	4	Covington	Cu	9	2.5	7	7	2,6	7	8	heavy fluting, long, dark lents	dark
2			Rose-Cu	7	3	7	7	2,6,8	5	8	rosy color, good flesh color	lenticles
1	5	NC-99-573	Rose	9	3	7	5	3,6	5	7	Almost a red, some fluting, long	too long
2		(Hatteras)	Rose	9	4	8	3	2,6	5	5	Some pimples, good flesh color	deep eyes
1	6	L-05-111	Cu	7	2.5	7	7	2,3,6	5	6	light orange flesh, YCR.	cuts, shape
2			Cu	6	2.5	7	7		6	7	Shape variable, good skin color	
1	7	L-05-29	buff	9	0	6	5	4,8	7	5	off color, mottling w/some pink	long, veins
2			buff/tan	9	0	7	5		8	5	long, veins	cracks
1	8	L-024-85	cream	9	0	7	7	2	7	8	good shape, skin texture & color	
2			cream	8	0	7	5	2,8	6	7	some dark eyes	
1	9	L-04-175	maroon	9	5	9	9	5,6	9	8	chunky, smooth skin, good flesh	cuts
2			maroon	7	5	9	8	1,5,6	7	9	color, good skin color	
1	10	L-04-148	Rose-Cu	7	4	6	7	3,6	7	7	mostly smooth, consistant color	cuts
2			Rose-Cu	9	5	7	7	3,4	7	8	nice looking	long
			Lvs deeply lobed; would make good ornamental selection.									
1	11	L-05-24	red-Cu	9	5	6	7	2	9	7	good shape, variable color, veins	veins
2			Red	7	5	7	7	2,5	7	6	dark lenticles	cracks
1	12	L-04-173	red-rose	9	5	9	6	3	8	5	skin color variable - mottle rose to	long
2			*Red*	9	4	9	7	3,4	8	7	tan, long	off color
1	13	Evangeline	Rose	7	4	9	5	3,5	7	6	some pimpling	air
2			deep rose	7	4	9	6	3,4,5	5	6	variable shape, color	cracking
1	14	Diane	red	9	4	7	9	3,4	9	8	Long, but good shape and color	cuts
2			red	8	5	8	9		7	7		long
3	15	O'Henry	white/	9	1	7	7	3,5	7	6	little bumpy, rough	cuts, shape
			cream	9	1	5	6	2,5	8	7	sl more skin color than #8	RKN

Skin color:
cream (Hanna)
Tan
copper (Jewel)
Rose (Beau)
Purple (Garnet)

Skin Texture:
1 = very rough
3 = moderately rough
5 = moderately smooth
7 = smooth
9 = very smooth

Flesh Color:
0 = white
1 = cream
2 = yellow
3 = orange
4 = deep orange
5 = very deep orange

Eyes:
1 = very deep
3 = deep
5 = moderate
7 = shallow
9 = very shallow

Lenticels:
1 = very prominent
3 = prominent
5 = moderate
7 = few
9 = none

Shape:
1 = round
2 = round-elliptical
3 = elliptic
4 = long elliptic
5 = ovoid
6 = blocky
7 = irregular
8 = asymmetric

Shape Uniformity:
1 = very poor
3 = poor
5 = moderate
7 = good
9 = excellent

Overall Appearance:
1 = very poor
3 = poor
5 = moderate
7 = good
9 = excellent

All ratings made on #1 roots.
YCR = yellow cortical ring
RC = Russet Crack
RKN = root knot nematode
Culls = main reason for culls

NSPCG Trial, Livingston CA, 2009. Field vine evaluation on 12-Aug-2009.

Rep	Var	Var Name	drought rating	vine size	Vine Architecture	leaves (mature) new color	color	shape	size	texture	petiole color	SPFMV	other comments
1	1	Cal Beauregard	3.5	L	trailing	green	green	shoulder, toothed	ML	sl crinkle	lt. pink	no	no twine
1	2	B14	3.0	ML	trailing	sl purple green	green	shoulder, toothed	M	sl crinkle	lt purple	no	some twine
1	3	B63	2.5	M	trailing	sl purple green	green	entire, shoulder	M	mostly smooth	spot of lt purple	yes	twining
1	4	Covington	2.5	M	trailing	lt purple	deep green	shoulder, toothed	ML	crinkle	lt purple	yes	
1	5	Hatteras	3.5	L	Upright	green	green	mostly toothed	M	sl crinkle	pink	no	
1	6	L-05-111	3.1	M	trailing	lt purple	green	shoulder, toothed	L	sl crinkle	lt. pink	yes	
1	7	L-05-29	4.5	L	bunch	green	green	toothed	L	crinkle	light purple	no	
1	8	L-024-85	4.7	L	upright & trailing	green w/ purple fringe	green	shouldered	M	sl crinkle	lt purple	no	very vigorous
1	9	L-04-175	4.0	VL	upright & trailing	sl purple green	dk green	shoulder, toothed	L	crinkle	purple	no	purple veins
1	10	L-04-148	4.0	L	upright & trailing	purple	dk green	shouldered	M	crinkle	purple	no	good ornamental
1	11	L-05-24	4.5	L	bunch	green	deep green	toothed, entire	L	crinkle	purple	no	
1	12	173	2.3	M	bunch	green	green	toothed, entire	L	sl crinkle	purple	no	yellow older leaves
1	13	Evangeline	4.8	M	bunch	purple	dk green	toothed, entire	M	sl crinkle	mostly green	no	
1	14	Diane	4.3	L	upright	green	green	parted	L	mostly smooth	green	no	
1	15	O'Henry	3.8	M	short trailing	lt purple	green	shoulder, toothed	M	sl crinkle	green	yes	

Drought Tolerance, 0 - 5 scale on 30-Jul-2009
0 = dead, 1 = severe wilt, 5 = no wilt

leaf shapes from "Sweetpotato Culture and Diseases", 1971. USDA -ARS Ag Handbook No 388.

SCORE SHEET FOR EVALUATION OF SWEETPOTATO SPROUT PRODUCTION

Date bedded: 2/20/09 Location: Yagi Bros Farms Livingston, CA

Date Evaluated: 4/21/09 Type of bed: hot bed

Evaluated by: S. Stoddard

Selection	Roots presprouted yes/no	Plant Production 1-5 (1)	Uniformity of Emergence 1-5 (2)	Earliness 1-3 (3)	Root Conditions 1-5 (4)	Remarks (5)
1 Beauregard #3	no	2	2	2	2	
2 Beauregard #4	no	2	2	2	2	
3 Covington	no	3	3	2	3	
4 NC -99-573	no	3	3	2	3	
5 L-05-32	no	2	1	2	1	
6 L-05-111	no	2	1	2	2	
7 L-05-29	no	3	2	2	2	
8 L-024-85	no	2	1	1	2	
9 L-04-175	no	0	---	---	1	All rotted
10 L-04-148	no	3	3	3	3	most plants
11 L-05-24	no	1	1	1	2	
12 L-04-173	no	3	3	2	2	
13						
					All varieties heavy losses to rot	

(1) Plant production rated from 1 – 5 based on observation during pulling season. A rating of 1 indicates low plant production, while 5 indicates good plant production.

(2) Uniformity of emergence rated from 1 - 5. One (1) indcates poor uniformity while 5 indicates the highest degree of uniformity of emergence.

(3) Earliness of plant production is rated form 1 – 3. One (1) indicated late emergence while 3 indicates early production.

(4) Root conditions six weeks after first pulling, rated 1 – 5. One (1) indicates complete rotting, while 5 indicates perfectly sound conditions. Mostly not applicable as beds were disced shortly after transplanting.

(5) Notes on size of root, decay in beds, etc.

Louisiana Advanced Line Trial (ALT) 2009

Research Project Summary Report
Scott Stoddard, Farm Advisor

Location: D&S Farms commercial field, Arena and Atwater Jordan, near Livingston.

All varieties from Louisiana, Don LaBonte breeder.
Plot layout. 1 row plots, no replication. Length dependent on number of plants, but generally about 25 feet.

Bedded: not performed. All began as cuttings shipped from LA.
Transplanted: May 29, 2009.
Harvest: Oct 20, 2009. Used 2-row harvester. Field graded.

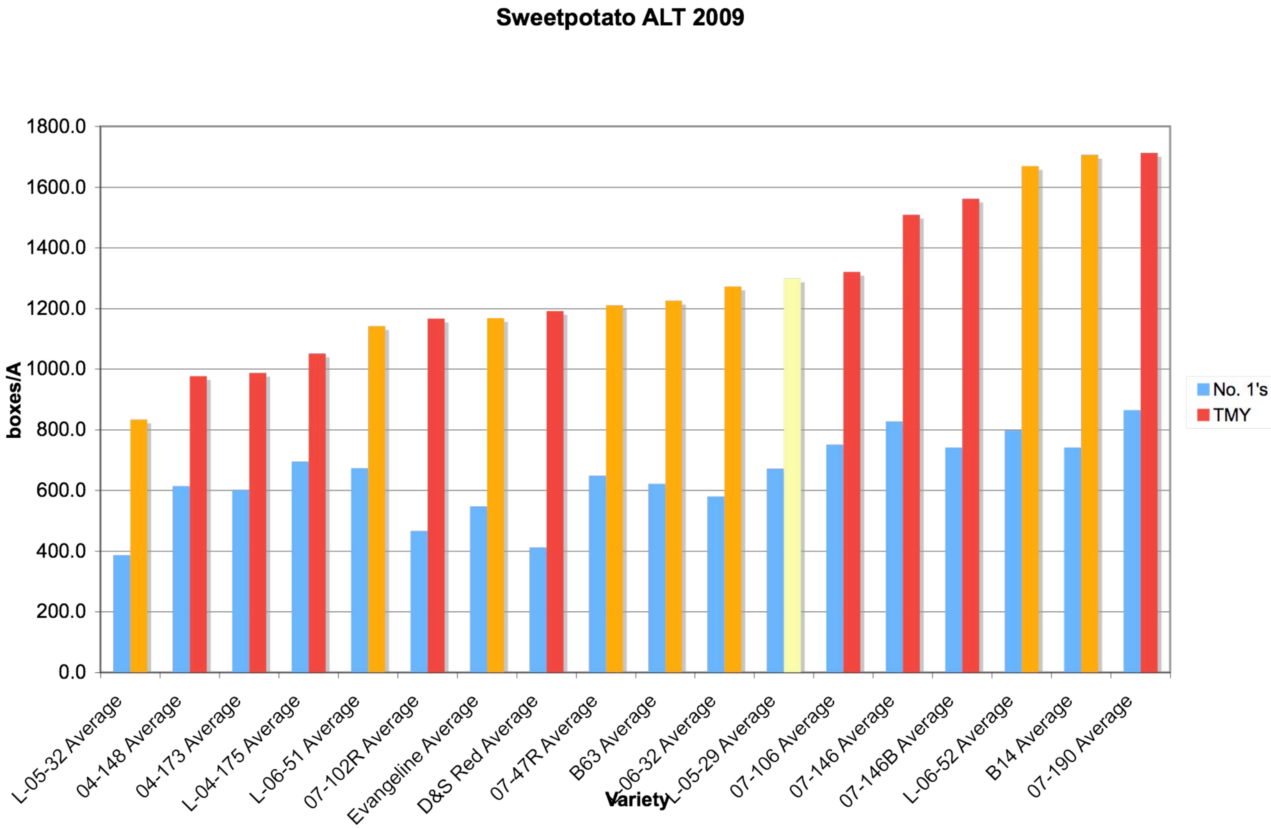
RESULTS

The Advanced Line Trial is a trial to evaluate potential new lines from LA prior to being put into the Collaborators trial. The trial is small, with only 1 or 2 reps, and the potatoes have not been fully evaluated but may fit certain markets in California. This year there were several with deep red/purple skin color and orange flesh (Table 1). Yield results are shown, but they do not give a good indication of the variety's yield potential due to limited size and number of the plots.

Sweetpotato Advanced Line Trial -- 2009
Scott Stoddard, UCCE Merced County

This year's sweetpotato ALT evaluation was with Dave Souza, located on the corner of Atwater Jordan and Arena.
Transplanted May 29, harvested on Oct 20, 2009
Drip irrigation, 12" plant spacing. 1 row plots. Not all plots replicated, and no statistical analysis of yields.

Variety Name	Skin Color	Skin Text	Flesh color	Eyes	Lents	Shape	Shape Uniform	Overall App	Comments	yield	keep for 2010
L-05-29	buff	9	0	6	5	4,8	7	5	off color, mottling w/some pink, veins	good	NSPCG
L-06-32	Cu	5	3	7	5	2,5	5	6	lents, slight fluting, too long	okay	?
L-06-52	Cu	9	4	9	9	2	7	8	Nice, good color, smooth	good	yes
L-07-47R	Cu	7	4	5	5	3,4	7	3	long, eyes, lents, veins, RC	okay	no
Evangeline	Rose Cu	7	4	9	5	3,5	7	6	some pimpling, air cracks	okay	NSPCG
L-05-32	Rose Cu	6	3	5	5	1,4	5	6	YCR, off shape, long	low	no
L-06-51	Rose Cu	9	3	9	7	2	7	8	nice shape, smooth, YCR, color?	okay	yes
L-07-146B	Lt red	8	4	5	3	3,6,8	5	4	off-red, lents, crooked, long	good	no
L-07-146	red	9	4	5	7	3,4	7	6	long, little crooked	good	? Same as 146B?
L-07-102	red	7	4	7	7	5,1	7	7	chunky, round	okay	yes
L-07-106	red	5	4	5	5	4	7	5	long, eyes, lents prominent	good	?
L-04-173	red	7	4	5	7	3,4	7	7	long	okay	no, inferior to 175
L-07-190	red	9	4	5	9	2,8	7	8	Nice color and shape	good	yes
L-04-148	Lt red	6	3	9	9	3,6	5	7	slightly rough skin	okay	probably not. Flesh color and skin color too pale.
L-04-175	red	9	5	9	9	5,6	9	8	chunky, smooth skin, good flesh	okay	multi-site testing with G0 plants



Sweetpotato ALT 2009
boxes/A
1800.0
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
L-05-32 Average
04-148 Average
04-173 Average
L-04-175 Average
L-06-51 Average
07-102R Average
Evangeline Average
D&S Red Average
07-47R Average
B63 Average
L-06-32 Average
L-05-29 Average
07-106 Average
07-146 Average
07-146B Average
L-06-52 Average
B14 Average
07-190 Average
Variety
No. 1's
TMY

L-04-175 Red Skinned Sweetpotato Multi-site Evaluation Trial 2009

Research Project Summary Report

Scott Stoddard, Farm Advisor

L-04-175 sweetpotato. This cultivar is characterized by chunky, smooth roots and burgundy skin color with deep orange flesh.

L-04-175 is a red-skinned, orange-fleshed sweetpotato first evaluated in the Advanced Line Trial in 2006. It is chunky, with smooth reddish purple skin, very few lenticles or eyes, and has good yield potential. 175 has been evaluated in the NSCG variety trial in replicated plots from 2007 – 2009. Initial results indicated yields similar to Diane (Table 1). Flesh color has been consistant very deep orange, with no yellow cortical ring or spotting. Flavor is mild, similar to Beauregard.

In 2009, it was also grown in strip trials (not replicated) in 6 other locations to evaluate its performance under various soils and management techniques. Averaged across locations, it produced almost 51 bins per acre, with a 46% #1 pack-out (Table 2). This compared favorably with the other reds evaluated. However, root quality was variable, with some sites having bally roots, pale skin color, and even veins. Flesh color was deep orange at all locations.

Other negatives for this cultivar include weak plant production, tendency to fade in storage, and high incidence of rotting in storage. Its relative resistance to stem rot (*Fusarium*), Pox (*Streptomyces),* and root knot nematodes (*Meloidogyne incognita*) is not known at this time. Additional testing is planned with virus-tested plants in 2010, but this line probably is not a viable alternative to Diane. Additional red-skinned cultivars are being evaluated in the Advanced Line Trial.

Table 1. L-04-175 yield summary (2007 - 09)

	SELECTION	CLASS	------- US #1'S	40 lb box/A CANNERS	JUMBOS	------- MKT YIELD	BINS/A	% US #1'S	% CULLS
2009									
	L-04-175	red	568.2	123.2	505.4	1196.8	54.4	48.6	5.1
	L-04-148	red	523.2	290.3	362.1	1175.5	53.4	44.4	5.1
	173	red	576.7	235.5	255.2	1067.4	48.5	54.1	9.1
	Diane	red	494.9	181.4	479.1	1155.4	52.5	42.6	16.4
	LSD red yam		NS	123.1	NS	NS	NS	NS	7.2
2008									
	L-04-175 (Red)		349.6	118.2	469.5	937.3	42.6	37.7	2.5
	L-04-148 (Red)		472.6	295.4	147.3	915.3	41.6	52.0	18.1
	L-04-178 (Red)		335.3	198.8	314.5	848.5	38.6	39.0	28.0
	Diane (Red)		422.1	260.2	361.2	1043.5	47.4	40.6	13.3
	LSD red yam		ns	62.0	134.0	ns	ns	ns	8.3
2007									
*	L-04-175		392.8	143.7	374.6	911.0	41.4	43.1	1.0
*	L-04-148		546.2	89.1	160.0	795.4	36.2	68.7	0.0
*	L-04-178		398.8	124.6	265.0	788.4	35.8	50.6	4.5

* not replicated

Table 2. L-04-175 red-skin sweetpotato multi-site evaluation 2009
Scott Stoddard, UCCE Merced and Madera Counties

Cooperator	location	plant date	harvest date	growing days	rows	ft	total lbs/A	22 boxes per bin #1 bins	TMY - bins	% No.1's	% Jumbo	% culls	Comments
A.V. Thomas	Rosa & 3rd Aves, in Stevinson	29-May	30-Oct	154	2	50	38,551	19.7	43.8	45.1%	46.9%	12.8%	Veins, cuts, bally. Good color
Classic Yam	by shed, off Longview	29-May	30-Oct	154	1	100	36,185	16.2	41.1	39.5%	42.5%	9.7%	Good shape. Cuts only
Jason Tucker	Weir and 140	30-May	30-Oct	153	1	135	51,846	27.5	58.9	46.8%	33.5%	10.7%	Cuts and rot. Color dull
Weimer Farms	lower Livingston field	29-May	30-Oct	154	1	100	37,479	19.3	42.6	45.3%	39.8%	8.8%	Cuts, slightly rough, but good color
Ben Alvernaz	Sunset and Howard	30-May	2-Nov	156	2	38	50,904	22.3	57.8	38.6%	43.0%	6.3%	Cuts, rot. Nice shape, but not red enough
Dave Souza	Atwater Jordan & Arena	29-May	20-Oct	144	2	100	43,062	32.3	48.9	66.0%	21.8%	3.3%	Cuts, shape. Good color.
Blaine Yagi	NSPCG trial, Joe Gallo Bear Creek Ranch	28-May	28-Oct	153	2	109	55,383	23.7	62.9	37.7%	53.9%	4.2%	Cuts; good color
AVERAGE							**44,773**	**23.0**	**50.9**	**45.6%**	**40.2%**	**8.0%**	
Comparison lines:													
Dave Souza	D&S Red				1	190	47,609	19.0	54.1	35.2%	45.9%	5.4%	teardrop shape; bally
	L-04-148				1	177	38,872	27.8	44.2	62.9%	10.2%	2.6%	
Blaine Yagi	Diane				2	103	45,129	22.9	51.3	44.6%	34.7%	17.0%	long
	L-04-148				2	100	48,031	26.1	54.6	47.8%	30.9%	7.8%	

Most locations 1 or 2 rows on 12" spacing. Total 100 plants.
Only Dave Souza and Blaine Yagi had other reds for comparison.

In general, 175 exhibited some negative characteristics in 3 locations (balliness, veins, rotting, and dull color) not seen in previous years.
Good interior flesh color in all locations. Good yields, but tendency to jumbo.
Additional testing needed with G0 plants. Disease and RKN, fry test evaluations needed.

Feb 16, 2010. Extensive rotting in two locations. Color fade.

Feb 17. Good baked color, skin and flesh, moist and smooth but not sweet. Similar to Beauregard.

Murasaki-29 Sweetpotato Plant Spacing Trial 2009

Research Project Summary Report

Scott Stoddard, Farm Advisor

Objective: Evaluate impact of different plant spacings on yield of No. 1, Medium, and Jumbo-sized roots of the sweetpotato variety Murasaki-29.

Methods:
Cooperator: Dave Souza, D&S Farms
Location: Central & Rose
Transplant: May 8, 2009, using 6-row transplanter
Variety: Murasaki-29 G1
Plot Size: 2 rows x 50 ft
Harvest: Oct 1, 2009

Plots were transplanted into commercial field and managed accordingly. Drip irrigated. Stand counts taken one month after transplanting and were very close to target plant population. Harvest was performed with a 2-row digger and sorted by the grower's harvest crew.

Results:
No. 1 yield peaked at the 12" spacing, however, there was no significant differences in No. 1 yield or No.1 + medium yield between any of the plant spacings (Table 1). Significant differences were seen in size category, with very few Jumbos (15%) but increased mediums in the 6" and 9" spacings (Figure 1). There are about 250 plants per 4 sq ft in the bed, or 500 plants per linear ft of bed. Therefore, to increase plant population by 4000 (planting at 9" rather than 12"), requires an additional 8 ft x 18.00 = $144. Based on this limited data set, it appears that 9", 12", or 15" plant spacings offer similar yield potential; increased plant costs at 9" are offset by the higher potential income from the increased medium size class, resulting in net returns that are very similar between 9" to 15". If the medium size class value per box is reduced to $12, however, best returns occur at 12" and 15".

Table 1. Murasaki-29 plant spacing trial 2009

spacing inches	actual plants/A	target plants/A	% No.1's	% Med	% Jumbo	adj TMY boxes/A	adj TMY bins/A	No. 1's bins/A	No.1 + Med bins/A	Potential return, $/A	plant cost $/A	net $/A
6	24562	26123	55.5%	29.5%	14.9%	894.8	40.7	22.6	34.6	$ 11,441	$ 884	$ 10,557
9	17575	17415	52.9%	32.7%	14.5%	1004.1	45.6	24.1	39.0	$ 12,776	$ 633	$ 12,144
12	13114	13061	55.8%	18.2%	26.0%	1007.9	45.8	25.5	33.9	$ 11,831	$ 472	$ 11,358
15	11982	10449	48.0%	24.3%	27.7%	1118.3	50.8	24.3	36.8	$ 12,592	$ 431	$ 12,161
18	9686	8708	48.3%	20.2%	31.6%	1023.3	46.5	22.4	31.9	$ 11,156	$ 349	$ 10,807
LSD 0.05			NS	4.4	5.4	124	5.6	NS	NS			
CV, %			9.8	11.4	15.2	8	8	12.2	9.5			

LSD 0.05 = Least significant difference at the 95% confidence level.
Means within each column separated by less than this amount are not significantly different.
NS = not significant
CV = coefficient of variation
bins/A estimated using 22 boxes per bin
Potential return: $25 No.1, $20 medium, $8 jumbo, $5 packing charge, 80% pack-out
Plant cost: 500 plants per linear ft, $18 per linear ft

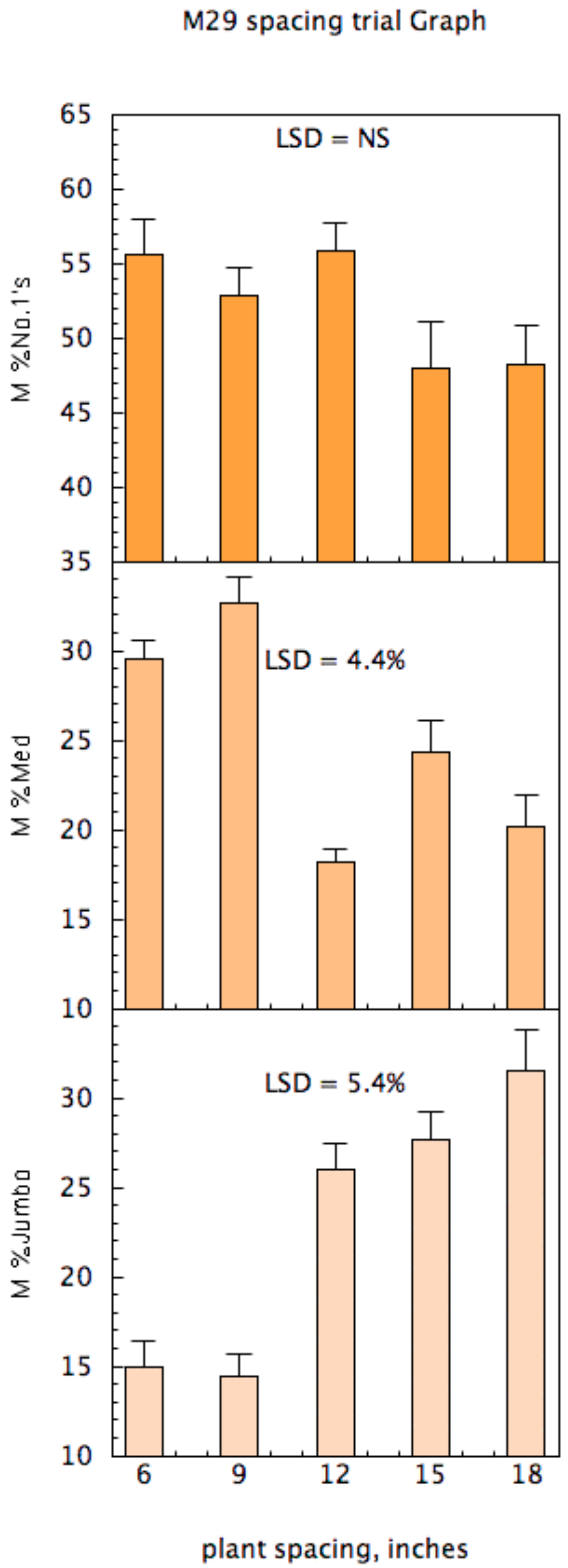


Figure 1. Murasaki-29 size classification as affected by in-row plant spacing.

Sweetpotato Field Fumigation Trial 2009

Research Project Summary Report
Scott Stoddard, Farm Advisor

Objective: Evaluate effect of reduced Telone (1,3-D) rates when combined with K-pam (metam potassium) on root knot nematodes (RKN – *Moloidogyne incognita*) and yield of sweetpotatoes.

Cooperators: Randy Jantz, Jantz Farming; Larry Beckstead, CPS; Brian Hegland, Dow AgroScience; Jerry Krebs, TKI

Location: Location: NW corner of Griffith and Bell Roads, near Stevinson CA. Field had previously been in organic sweetpotato production for at least 7 years.

Variety: O'Henry (white skin and flesh, nematode susceptible), Transplanted May 19, 2009. Harvest on Oct 14 – 16, 2009.

Treatments:

1	UTC
2	K-Pam 35 gpa only
3	K-Pam 50 gpa only
4	Telone 6 gpa only
5	K-pam 35 gpa + Telone 6 gpa
6	K-Pam 50 gpa + Telone 6 gpa
7	Telone 9 gpa only
8	K-Pam 35 gpa + Telone 9 gpa
9	K-Pam 50 gpa + Telone 9 gpa
10	Telone 12 gpa + 45 Vapam
11	Telone 12 gpa only

Methods:

Fumigation on 4/17/2009. Fumigation strips 21 ft wide by 350 ft long (total plot size 5.1 A) by Crop Production Services (CPS, Inc.). 15 gpa water added to Metam-K to bring volume applied to 50 and 70 gpa. Concurrent application of both products.
Telone 20" centers @ 18 - 20" deep, K-Pam on 10" centers @ 4" and 8" deep.
Untreated control (UTC) plots 100 ft long by 21 ft wide.
Standard Telone application (12 gpa) around test plot area.
Pre-fume nematode samples on 4/6/2009; Post: 6/9; pre-harvest 9/14. 20 cores from the center of each plot.
Harvest: Oct 14 – 16, 100 ft of one or two rows from the center of each plot, harvest crew sorted into #1, Med, and Jumbo size categories.

Results:

This field was chosen based on its history of organic sweetpotato production and because it was outside of the impacted cap townships of R11 and R12. Initial nematode counts indicated a potentially large number of root knot nematodes of more than 500 per pint of soil (Table 1).

Application of fumigants was done with the commercial CPS rig that could apply both products at the same time and vary their rate through the use of an in-cab control unit. Due to the number of outlets for the metam, a minimum volume of at least 50 gpa was required. Thus, the equivalent of 15 gpa of water was added to the stock tanks before fumigating. The soil was sealed with a ring-roller mounted to the application toolbar (Figure 1). Soil moisture as determined by the gravimetric method was 6.4% at the time of field fumigation. This would be approximately 75% of field capacity for this texture of soil (fine sand).

Table 1. Telone field fumigation trial on sweetpotatoes 2009

Sample ID	#/500 cc Root-Knot	Ring	Spiral
16-Apr			
East 0 - 12"	720	144	ND
West 0 - 12"	504	972	ND

Post-fumigate nematode samples were taken in each test plot to evaluate initial efficacy of the fumigation treatments on June 9, shortly after transplanting. No significant difference was seen between any of the treatments for root knot nematode, but differences were seen for spiral nematode (*Helicotylenchus* sp.) (Table 2). At the fall sampling, however, both species were significantly higher in the untreated, 6 gpa Telone, and 9 gpa Telone treatments. When Telone and metam were combined, it resulted in overall less RKN than either alone (Figure 2). Nematode counts were extremely variable and required the square root transformation for statistical analysis. Indeed, some RKN were present in spring samples but not found in the fall and vice-versa.

Yield results are shown in Table 3 and Figure 2. There was a significant reduction in yield in the untreated control, though this occurred mainly as a result of very few plants setting roots rather than a high cull count. Indeed, the cull % was only slightly higher in the control plots than the fumigated plots in spite having high nematode counts. In general, yields were improved when Telone and metam were combined (Figure 4). Telone only at 6 gpa was too low for optimal production, but when combined with either rate of metam significantly increased yields.

Regression analysis of the square-root adjusted fall RKN counts and yield for each plot suggested a significant negative relationship between the two: counts > $\sqrt{(RKN)} = 20$ may result in significant yield declines (Figure 5). It is not known whether such counts in the fall will carry-over to the next year's crop.

Based on the results of this study at one location with high indigenous populations of RKN and Spiral nematodes, the combination of reduced rates of Telone + metam looks very promising. The factorial analysis indicated that metam was as effective as Telone. Nematodes were effectively controlled, and yields were significantly improved as compared to the untreated control areas that had very high nematode counts in the fall. Further evaluation of this system is needed.

Figure 1. Spring fumigation injections. All treatments were shank applied, and then the soil was sealed with the ring roller.

Table 2. Spring and fall nematode counts, 2009

	treatment name	Spring Root-Knot	Spring Ring		Fall Root-Knot		Fall Ring	
		# per 500 cc soil						
1	UTC	5.0	364.5	a	3381.5	a	1293.8	a
2	K-Pam 35 gpa only	6.0	0.0	d	48.0	cd	0.0	b
3	K-Pam 50 gpa only	0.0	0.0	d	513.0	bcd	0.0	b
4	Telone 6 gpa only	0.0	110.7	b	558.0	b	1170.0	a
5	K-pam 35 gpa + Telone 6 gpa	4.5	0.0	d	0.0	d	1.0	b
6	K-Pam 50 gpa + Telone 6 gpa	22.5	0.0	d	0.0	d	0.0	b
7	Telone 9 gpa only	0.0	13.5	cd	360.0	bc	684.0	a
8	K-Pam 35 gpa + Telone 9 gpa	4.0	0.0	d	0.0	d	0.0	b
9	K-Pam 50 gpa + Telone 9 gpa	15.5	9.0	d	0.0	d	0.0	b
10	Telone 12 gpa + 45 Vapam	5.5	0.0	d	117.0	cd	0.0	b
11	Telone 12 gpa only	9.0	36.0	c	92.5	cd	765.0	a
	Average	6.5	48.5		460.9		355.8	
	LSD 0.05	ns	use letters		use letters		use letters	
	CV, %	101	43		77.5		51.5	
Factorial Analysis (p-values):								
	Telone	ns	0.001		0.001		ns	
	Metam	ns	0.001		0.001		0.001	
	Telone x Metam	ns	0.001		0.001		ns	

Note: Statistical analysis performed on corrected data (square root); actual values shown here.
ns = not significant.

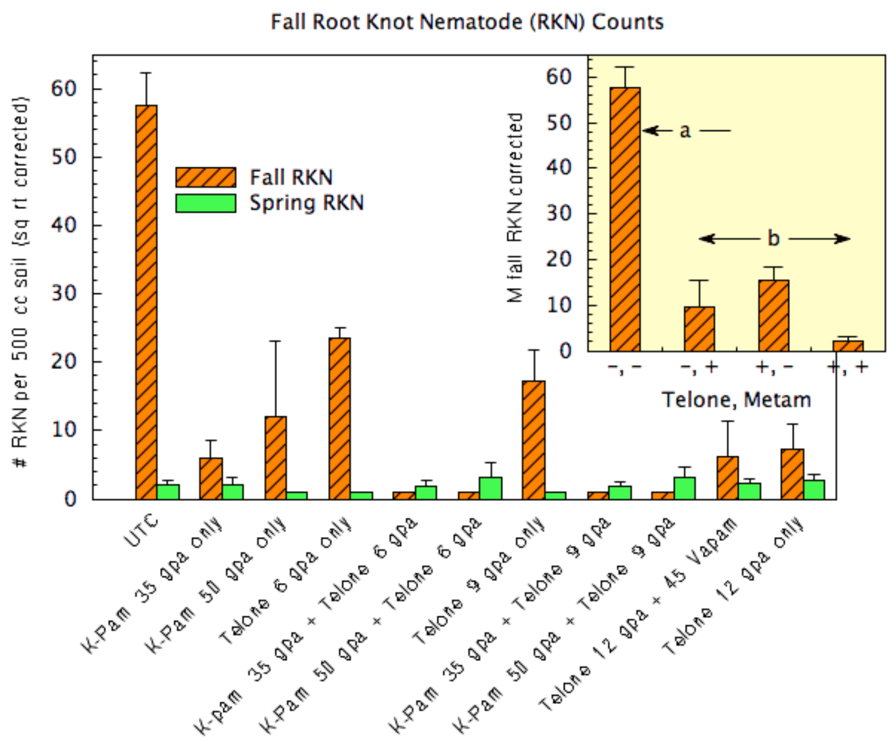
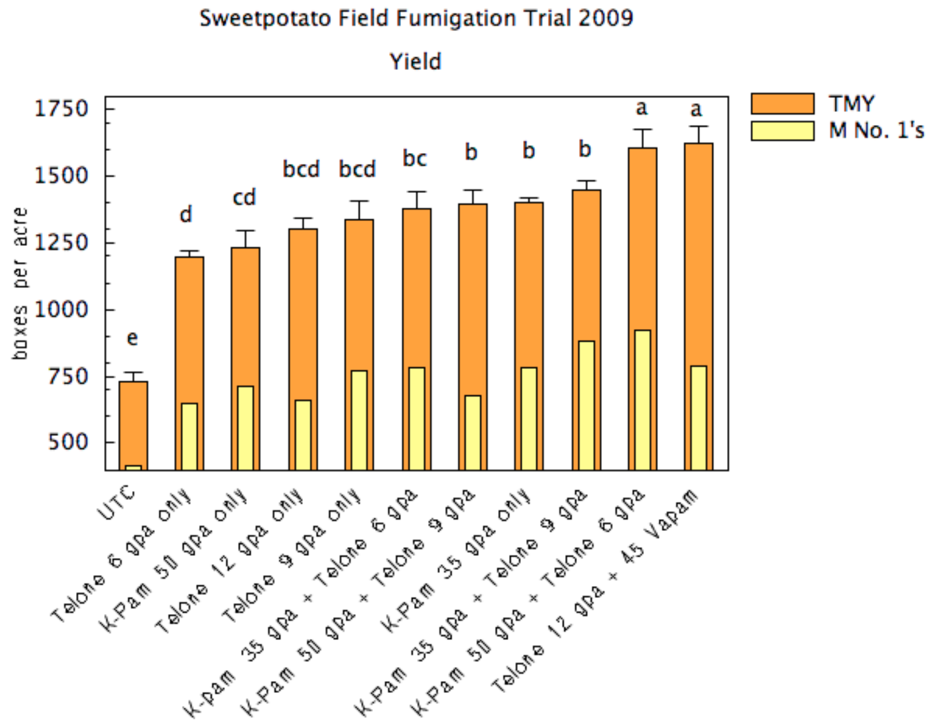


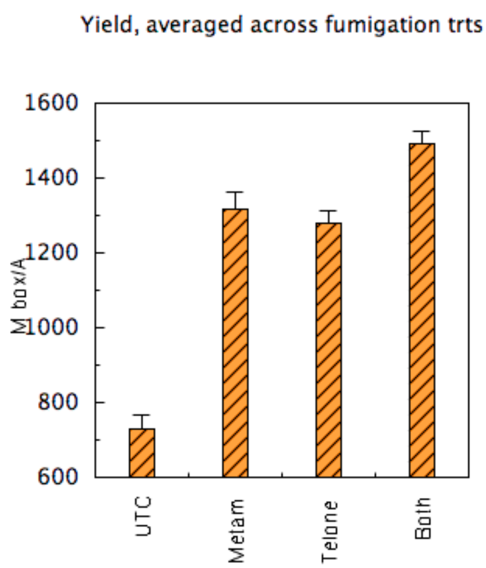
Figure 2. Fall and spring Root Knot Nematode counts as affected by fumigation treatment. Averaged across rates, Telone, metam, or the combination all significant reduced fall RKN compared to the untreated control (inset).

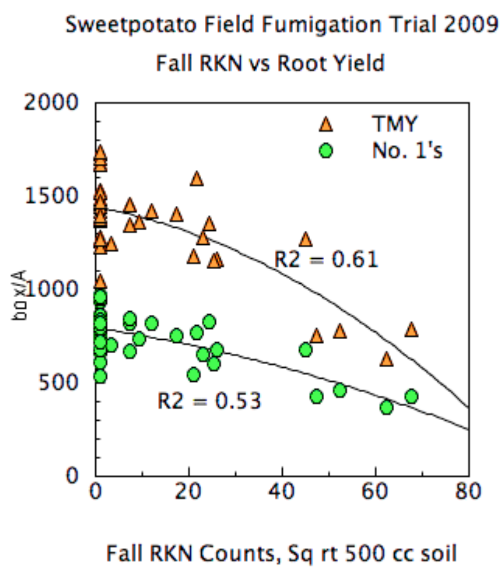
Table 3. Sweetpotato yield and grade by fumigation treatment, 2009.

treatment name	TMY lbs/A	40 lb box/A No. 1's	40 lb box/A Meds	Jumbos	TMY box/A	Market bins/A	No. 1's 1%	Culls cull%
1 UTC	29,126	416	177	135	728	33.1	57.2	7.7
2 K-Pam 35 gpa only	55,929	783	170	445	1398	63.6	56.0	4.2
3 K-Pam 50 gpa only	49,163	714	158	357	1229	55.9	58.5	4.9
4 Telone 6 gpa only	47,872	646	177	374	1197	54.4	54.0	7.3
5 K-pam 35 gpa + Telone 6 gpa	55,078	781	202	394	1377	62.6	57.1	4.7
6 K-Pam 50 gpa + Telone 6 gpa	64,215	920	272	414	1605	73.0	57.4	3.2
7 Telone 9 gpa only	53,567	769	209	361	1339	60.9	57.2	3.5
8 K-Pam 35 gpa + Telone 9 gpa	57,932	884	226	339	1448	65.8	61.0	5.0
9 K-Pam 50 gpa + Telone 9 gpa	55,853	680	152	564	1396	63.5	48.7	5.9
10 Telone 12 gpa + 45 Vapam	65,003	789	185	651	1625	73.9	48.8	1.1
11 Telone 12 gpa only	51,997	659	180	460	1300	59.1	50.6	5.7
Average	53,249	731	192	409	1,331	60.5	55.1	4.8
LSD 0.05	---	101.7	55.5	116.7	149.2	6.8	6.3	3.6
CV, %	---	9.6	20.1	19.8	7.8	7.8	7.9	51.2
Factorial Analysis (p-values):								
Telone		0.001	ns	0.001	0.001	0.001	ns	ns
Metam		0.001	ns	0.001	0.001	0.001	ns	0.02
Telone x Metam		0.01	ns	0.03	0.003	0.003	ns	ns

US #1's	Roots 2 to 3.5 inches in diameter, length 3 to 9 inches, well shaped and free of defects.
Canners	Roots 1 to 2 in diameter, 2 to 7 inches in length.
Jumbos	Roots that exceed the size requirements of above grades, but are marketable quality.
Mkt Yield	Total marketable yield is the sum of the above three categories.
bins/A	bins/A are estimated based on market box yield assuming 22 boxes (17.6 Bu) per bin.
% US #1's	Weight of US #1's divided by total marketable yield.
% Culls	Roots greater than 1" in diameter that are so misshapen or unattractive as to be unmarketable.
LSD 0.05	Least significant difference. Means separated by less than this amt are not significantly different (r
CV, %	Coefficient of variation, a measure of variability in the experiment.







Figures 3, 4, and 5. Yield for all treatments (top), yield when fumigation rates were combined (bottom left), and relationship between fall soil RKN counts and yield (bottom right).

Methyl bromide fumigation alternatives for sweetpotato hotbeds in California

Research Project Summary Report (year 2)

Scott Stoddard, Farm Advisor

Cooperators: Mike Davis, UCCE Plant Pathology, UC Davis
Antoon Ploeg, UCCE Nematology Specialist, UC Riverside
Jim Stapleton, UCCE IPM Plant Pathologist, Kearney Agriculture Center

While sweetpotatoes are commonly considered to be a southern crop, California has a history of sweetpotato production dating back more than 100 years. Production has increased markedly in the last 10 years, and now the state ranks number two in production, with 2008 estimated at 4.366 million Cwt from about 14,500 acres and a value exceeding $130 million, according to USDA-NASS estimates.

Similar to many other vegetable crops, sweetpotatoes are entirely propagated from transplants. Unlike most other crops, however, transplants are reared by growers for their own production, using roots saved from the previous year's crop. The nursery area where this occurs is called a hotbed, and it is a distinct and separate operation for any grower. Because of the importance and expense related to growing sweetpotato transplants, the hotbed area is typically fumigated to ensure the area will be free of nematodes, disease, and weeds. Hotbeds are most commonly fumigated in the late fall with a MeBr + Pic combination, tarped with standard plastic. Currently, MeBr is allowed under a Critical Use Exemption (CUE) with the U.S. EPA. This is likely to end soon, and effective alternatives are needed. The purpose of the project is to evaluate alternatives to MeBr for sweetpotato hotbeds that are agronomically acceptable and meet regulatory approval.

Alternative fumigants were evaluated in a commercial hotbed operation near Atwater, CA, using a randomized block split-plot design with three replications. Main plots consisted of six fumigation treatments: 1) untreated control; 2) MeBr + Pic 53/47% at 350 lbs/A; 3) Pic-Chlor 60 (1,3-D + Pic) at 45 gallons/A; 4) metam sodium 40 gallons/A + 1,3-D 12 gallons/A shanked, incorporated, and rolled; 5) Pic only at 150 lbs/A; 6) flat solarization. Split-plot treatments include two different fungicides and herbicides: Devrinol (napropamide) 4 lbs/A; Valor (flumioxizin) 1.5 oz/A; Botran (dichloro nitroaniline) 3.5 lbs per 14 gallons per 1000 sq ft; Mertect (thiabendizole) 30 fl oz per 14 gallons per 1000 sq ft; fungicide + herbicide combination; untreated control. Split plots were 8 ft x 12.5 ft.

Fumigation and solarization treatments were installed in the summer and fall of 2008; herbicide and fungicide applications were made after bedding in March 2009. Plots were evaluated for weed pressure, nematodes, root rotting caused by *Pythium* fungi, and plant production.

Results.
Soil temperature data were collected at 1, 3, 6, and 12 inches under bare ground (UTC) and the solarization treatment from July 15 to September 15, 2008. Daily maximum temperatures at each depth are shown in Figure 1. The clear plastic tarp used in this trial significantly ($p < 0.001$) increased average and maximum soil temperature at all depths. At one inch, temps exceeded 125° F with plastic, 109° F without.

Nematodes were sampled by taking a 500 cc soil sample from each of the main plots in February before the beds were installed and again at plant harvest in May. No root knot nematodes (*Meloidogyne incognita)* or other plant parasitic nematodes were found at either sampling event (Table 1). Similar to nematodes, the soil analysis for potential root rotting pathogens showed no significant differences among treatments. Pythium populations were extremely low in all plots (in general, Pythium populations in most soils in the San Joaquin Valley average between 20 and 50 cfu/g).

Weed pressure was not that high in this area, probably because it had been previously fumigated with MeBr. However, there were significant differences between the main plot treatments, with greatest number of weeds in the untreated (UTC) and solarization treatments (Table 1). These treatments also required the most hand weeding time, averaging 59 and 48 seconds per 2-man crew per 100 ft^2. Significant differences were also noted between the split plot treatments for weed control. Application of either herbicide significantly reduced weed pressure as compared to not treating (Figure 2), with Valor having the greatest efficacy on the weeds present at this location (puncture vine, malva, pigweed, mustard, and barnyard grass dominated). However, Valor caused some noticeable crop phytotoxicity, with a corresponding reduction in plant production (Figure 3). Even with this, plant production was excellent in 2009, with 240 – 280 plants per 4 ft^2 (much better than 2008 production). No crop phytotoxicity was seen as a result of the main plot fumigation treatments.

Root yields are shown in Table 1 and Figure 4. There was little difference observed between any of the treatments on total root field, indicating that there was little impact from the hotbed treatments on the ability of the transplants to produce marketable roots.

Research thus far has shown weeds to be the main pest issue sweetpotato growers must contend with in the hotbed area. As a result, the Telone + Vapam treatment has been the most effective and economical alternative to MeBr. Unfortunately, solarization has not been that effective in suppressing weed populations, probably a result of the length of time between treatment in the summer and bedding the following spring. The use of pre-plant herbicides Devrinol or Valor significantly improved weed control, especially in the Pic only, solarization, and untreated alternatives. Though Valor did cause a reduction of plants in the hotbed, there was no affect from this herbicide on the yield potential of the transplants taken to the field.

Acknowledgements
Many thanks to the following cooperators for their assistance with this project: Dave Souza, D&S Farms; Paul Domecq, Tri Cal; Mike Davis, Larry Burrow, Merced UCCE. This research was possible through a grant from the USDA ARS Pacific Area Wide Methyl Bromide Alternatives Outreach program.

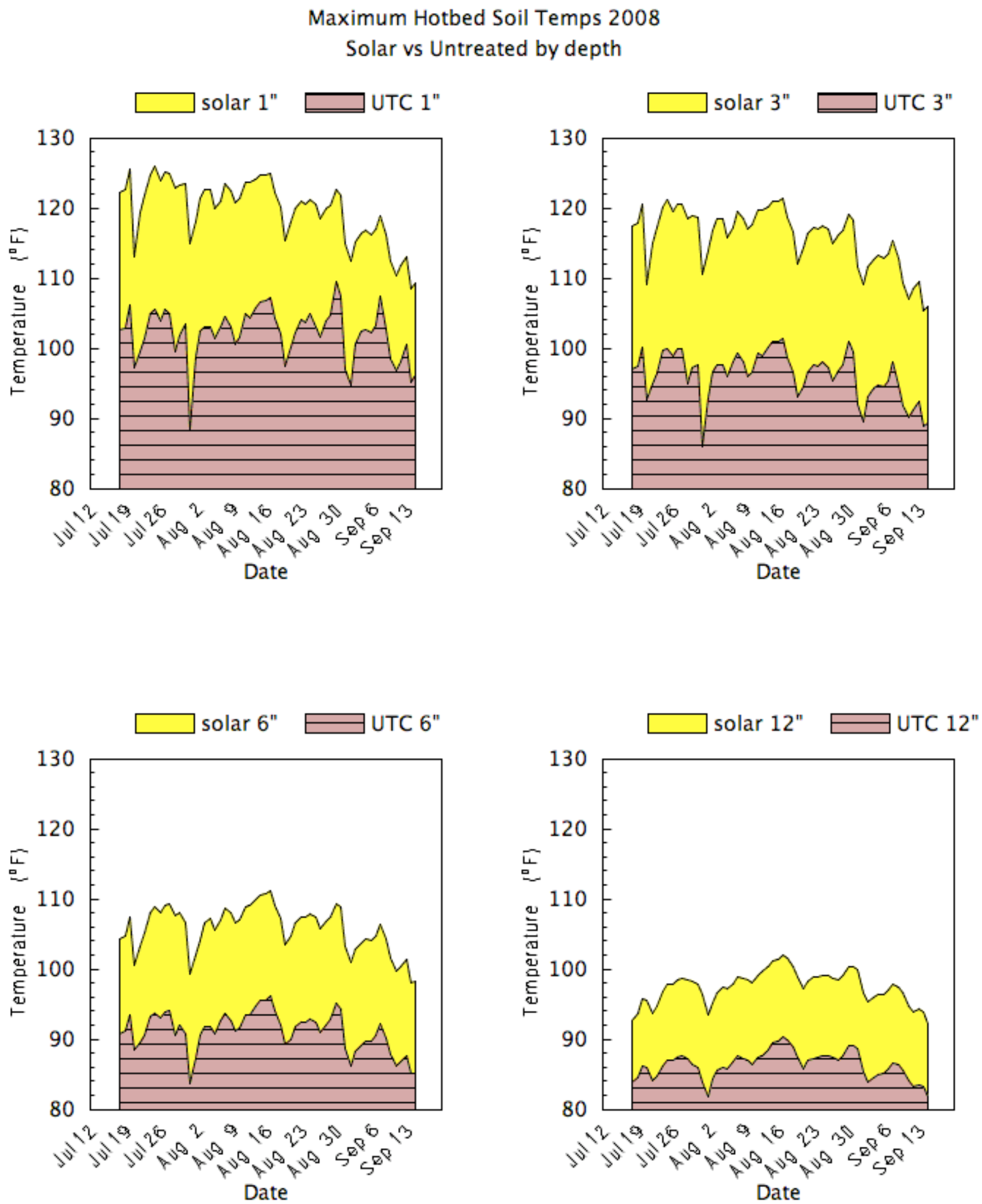


Figure 1. Hotbed soil temperatures at 1, 3, 6, and 12 inches for the untreated and solarized treatments between July 17 – Sept 15, 2008. Use of clear plastic tarp significantly increased soil temperatures at all sampling depths.

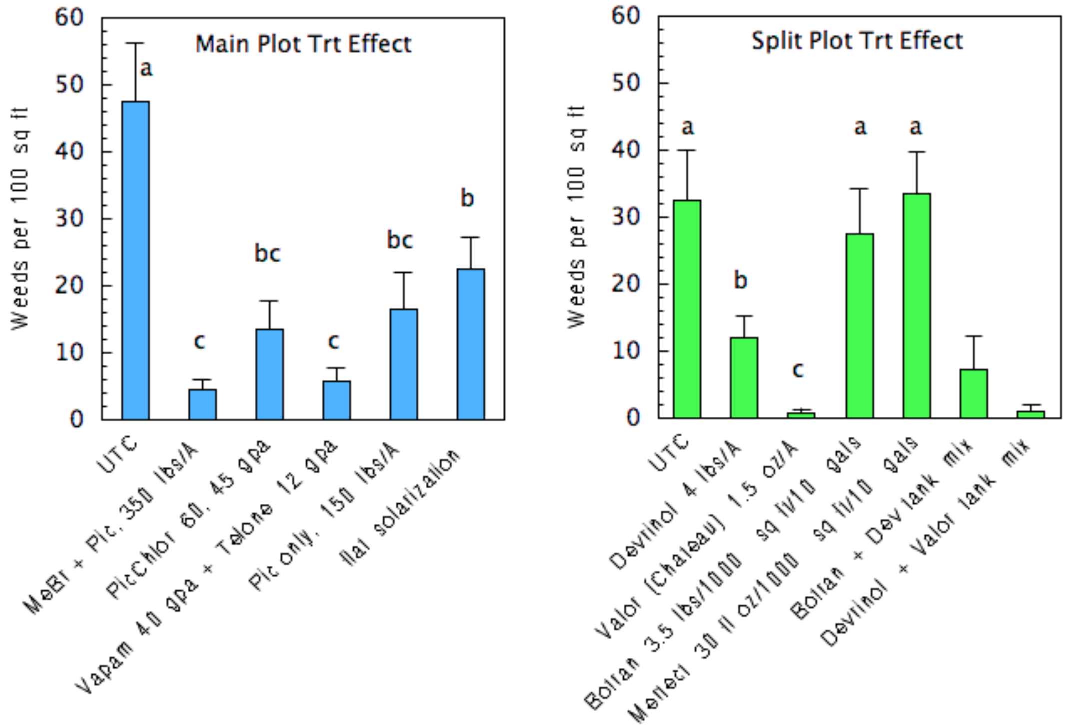


Figure 2. Weed pressure averaged across main treatments (left) and split-plots (right). Valor significantly reduced the number of weeds and weeding time as compared to the other treatments.

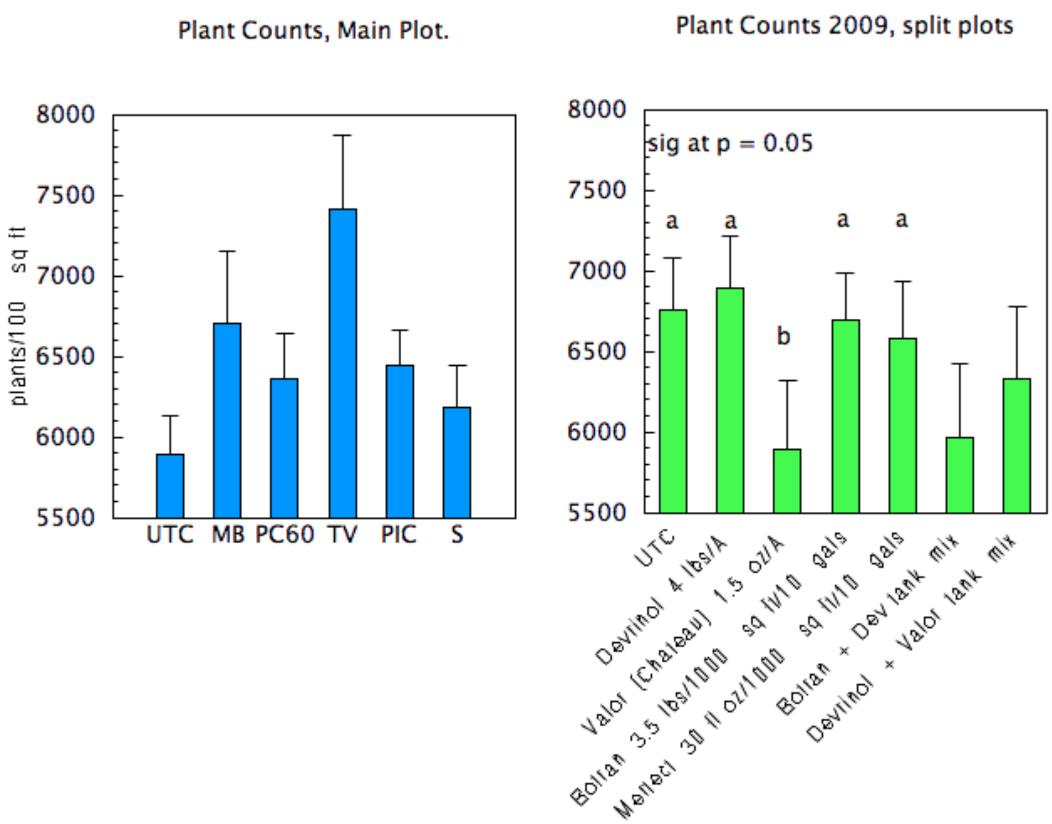


Figure 3. Plant counts were significantly reduced only in the treatments that had Valor.

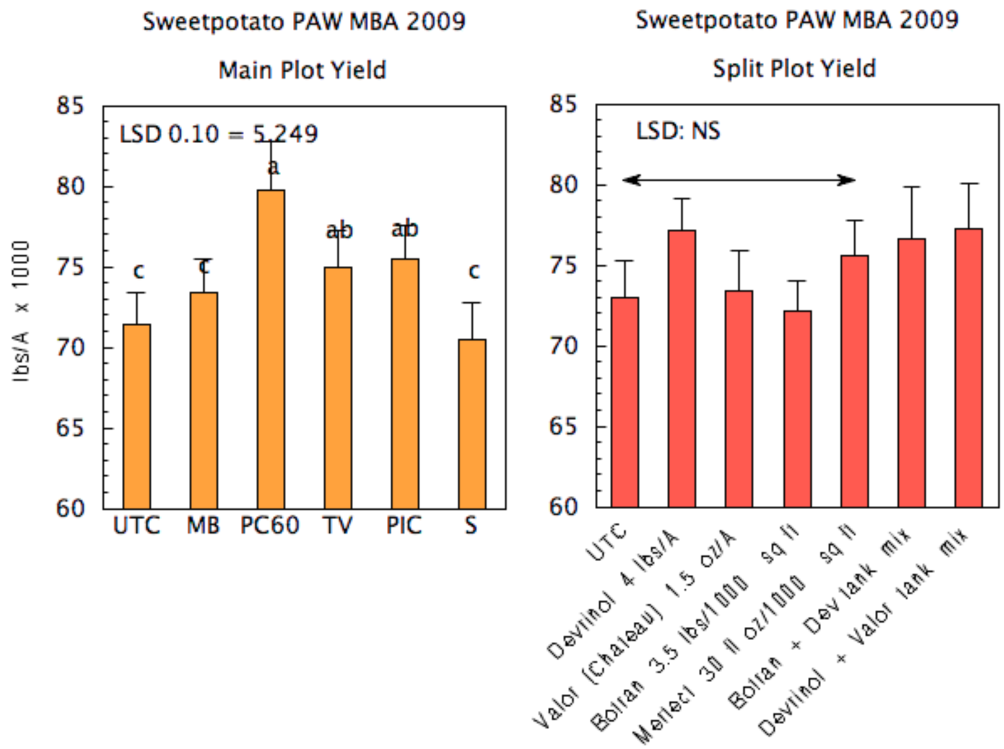


Figure 4. Total sweetpotato root yield, lbs per acre. A slight affect was seen with the main plot treatments

Table 1. Nematode, Pythium, weed counts, plant production, and yield from the 2nd year of the trial (2009).

Main plot treatments:	Nematodes (RKN/100 g) 11-Feb	7-May	non parasitic 7-May	Pythium cfu/g soil	Weeds #/plot 9-Apr	Crop Phyto 9-Apr	Weed time secs per 2 men/plot	plant counts #/4 sq ft	Yield lbs/A
1 UTC	0	0	200	3.2	53.8	1.0	59	240	71,405
2 MeBr + Pic, 350 lbs/A	0	0	94	2.1	5.3	1.0	19	275	73,343
3 PicChlor 60, 45 gpa	0	0	111	2.5	15.9	0.7	33	256	79,750
4 Vapam 40 gpa + Telone 12 gpa	0	0	134	0.5	6.6	1.6	22	302	74,924
5 Pic only, 150 lbs/A	0	0	135	3	18.8	1.2	35	264	75,505
6 flat solarization	0	0	190	1.8	26.3	1.9	48	261	70,488
p value				0.75 NS	0.001	NS	0.03	0.83 NS	0
LSD 0.05				---	17.3	---	24.8	---	5,249
CV				147.3	60.5	88.1	47.8	16.4	13
Split plot treatments:									
1 UTC					32.3	0	not weeded	278	73,006
2 Devrinol 4 lbs/A					11.9	0.6	30	281	77,142
3 Valor (Chateau) 1.5 oz/A					0.7	4.3	14	242	73,344
4 Botran 3.5 lbs/1000 sq ft/10 gals					27.3	0.4	40	268	72,159
5 Mertect 30 fl oz/1000 sq ft/10 gals					33.4	0.6	51	274	75,529
6 Devrinol + Valor tank mix					*0.9*	*3.2*	*11*	*253*	77,243
7 Botran + Devrinol tank mix					*7.1*	*1.0*	*28*	*239*	76,656
p value					0.001	0.001	0.001	0.08	NS
LSD 0.05					8.6	0.7	11.6	29.3	---
CV					60.5	88.1	47.8	16.4	12.5
p value, Main plot x split plot interaction	ND	ND	ND	ND	0.001	0.78 NS	0.44 NS	0.59 NS	NS

Main plot treatments applied on July 15 and Dec 11, 2008. Split plot treatments applied March 9 (fungicides) and March 16 (herbicides), 2009.

Nematodes (RKN - root knot nematode) and Pythium were determined within main plot treatments only.

Weed counts are a combination of broadleaf, grass, and yellow nutsedge. Broadleaf weeds spp include puncture vine, malva, pigweed, mustard.

Weeding times measured using 2 or 3 man hoeing crew on April 17, 2009.

Plant counts taken at harvest on May 15, 2009.

Split plot treatments 6 & 7 not included in statistical analysis (non-uniform replication)

Sweetpotato Fertilizer Study 2008 - 09
Research Progress Report
Scott Stoddard, Farm Advisor
UCCE Merced & Madera Counties

Location of Work: Commercial sweetpotato field near Livingston, CA, and commercial storage room.

Project year: May 2008 – May 2009

Budget total: $5000.00

Background:
Food processors use California sweetpotatoes (*Ipomoea batatas*) to produce sweetpotato fries. Unfortunately, by February, raw product quality often deteriorates during long-term storage conditions typical for the area. Sugar accumulation in storage is problematic for processing because it creates darker colors and changes in texture, both undesirable in the finished product. Therefore, a project was conducted in 2008-09 to observe the effect of in-season N and K fertilizer on crop response, yield, and storage quality in orange-flesh (Beauregard) sweetpotatoes.

Procedure:
The test area for this trial was located in a commercial field that had been cropped to sweetpotatoes the previous year. The soil is a Delhi sand, 0 – 3% sloped. Beauregard sweetpotatoes were transplanted in early June. No preplant fertilizers were applied to the area of the field where this test was located. To better determine the effects of N management separate from that of K rate, two trials were held:

Trial 1. N source, N timing, and K source evaluation:
1. UAN32, 180 lbs N/A, applied early to mid-season (N early)
2. CAN17, 180 lbs N/A, applied early to mid-season (N early)
3. UAN32 applied throughout the season (late N application), 180 lbs N/A
4. CAN17 applied throughout the season (late N application), 180 lbs N/A

Nitrogen was injected through the drip system beginning June 27, 2008, and continued to July 22 for treatments 1 & 2, and June 27 -- August 26 for treatments 3 & 4. Fertilizer was applied one time per week using a battery operated piston pump, injecting a pre-measured quantity of fertilizer into the requisite irrigation lines.

Split Plots
1. 200 lbs K_2O/A from muriate of potash (KCl)
2. 200 lbs K_2O/A from sulfate of potash (K_2SO_4)

Granular potassium was applied to the split plots on June 13 to the center of each bed, under the drip tape, and lightly incorporated into the upper 2 inches of soil.

The test plot design was a randomized block split-plot with six (6) replications. Plot size 1 bed (2 rows, 6.67 ft) by 50 ft. The trial was supplied with a separate irrigation system so that fertilizer inputs were controlled and not affected by grower applications. Soil, leaves, and roots were sampled for N and K; monthly storage weight loss was measured through the winter of 2008/09. Harvest was done with commercial equipment on October 22 – 24, 2008.

Initial soil samples were taken prior to establishment of the test plots by making a composite sample from 20 cores of the upper 12 inches of the field. Samples were air dried and submitted to DANR labs at UC Davis for fertility analysis. In the fall, a hand probe was used to take soil samples from 0 – 12” and 12 – 24” depths, directly under the drip tape in the center of each plot. Eight to 10 cores from each plot were composited, air dried, and sent to DANR labs for analysis. Leaf samples were taken on July 14 and Aug 5 by sampling the 6th leaf from the growing tip from 25 plants per plot. Samples were air dried at 40° C and submitted for analysis.

Root analysis was performed by making a composite sample from 3 roots per plot. The roots were quartered, ground using an electric meat grinder, bagged, and frozen before submitting to DANR labs where they underwent further sample preparation (freeze drying and grinding). Dry matter determination was done on 100 g samples of the same roots. Dry matter averaged 23.6%.

Trial 2. Potassium rate evaluation:

1. 0 lbs K_2O/A
2. 100 lbs SOP/A
3. 200 lbs SOP/A
4. 300 lbs SOP/A

Split plots:

1. 0 lbs K_2O/A through drip tape
2. 50 lbs K_2O/A through the drip tape as KNO_3
3. 100 lbs K_2O/A through the drop tape as KNO_3

Main plot potassium rates were applied June 13, shortly after planting, in the center of each bed directly under the drip tape. Split-plot K treatments were made at the same time as nitrogen applications in the N Trial, from June 25 – July 22, 2008, applied once per week. The combination of main and split plot treatments gave K rates ranging from 0 – 400 lbs per acre in 50 lb increments. Plots received 180 lbs/A of N. The statistical design was a randomized block with five (5) replications. Plot size was one bed (2 rows) by 55 ft, located adjacent to the nitrogen trial. Trial was conducted in a commercial sweetpotato field, irrigated and managed accordingly. Harvest was done with commercial equipment on October 22 – 24, 2008. Soil, leaf, and roots were analyzed for N and K as with the nitrogen trial, monthly storage weight loss was measured through the winter.

Results:

N Trial. Initial soil sample results are shown in Table 1. Potassium tested very low in this location and a response to K fertilizer would be expected.

Leaf and petiole results for the N Trial are shown in Figure 1. Significant differences were observed between the treatments at both sampling events, with greater nitrogen accumulation in the plants that received the early N treatments. Whole leaf N was less variable than NO_3-N and was a better indicator of crop nutrient status. Total marketable yields (medium + #1's + jumbos) are shown in Figure 2. Significant differences were observed between nitrogen treatments, however, there was no consistency in the results: neither timing nor source was significant. Potassium source did not have a significant affect on yield, though there was a small improvement in yield with SOP (Table 2).

Residual soil nitrogen was measured at the end of the growing season (post fertilizer application but prior to harvest) and very little was found at either sample depth (12 & 24 inches) regardless of treatment (Figure 3). This could indicate that the crop was using all of the applied nitrogen; conversely, it could also indicate that deeper sampling is required to confirm that the N was not leached beyond the root zone.

No differences were observed on weight loss of the harvested roots in storage as a result of N timing, source, or K source at any month or for the accumulated loss during the October – May storage period (Figure 4). The accumulated moisture loss was about 16% during the 8 months that these roots were monitored. This loss was from shrinkage only: total losses, which include rotting and mice damage, were about 36%.

N and K removal in the roots was calculated by multiplying the yield by the level of each nutrient per treatment, assuming a dry weight of 23.65. Nitrogen source or timing did not significantly affect N content or removal in the roots, and K source had no affect on K content or removal. On average, the harvested roots removed 103, 42, and 173 lbs/A of N, P_2O_5, and K_2O, respectively. This is equivalent to 2.3, 0.9, and 3.8 lbs per bin of each of these nutrients.

K Trial. Leaf and petiole results are shown in Figure 5. The amount of K in the leaf tissue significantly increased as pre-plant K rates increased, but overall the affect of the K treatments was subtle even though rates ranged from 0 to 400 lbs K_2O per acre and the soil initially tested very low (table 1). As with the N trial, the crop K levels dropped rapidly between the July and August sampling dates.

Harvest results are shown in Figure 6 and in Table 3. There was not a strong response to applied pre-plant K (significant only at the 90% confidence level), however, there was a significant response to KNO_3 treatments. Overall yields peaked at about 250 lbs per acre of total K_2O (200 lbs pre-plant + 50 lbs supplied from KNO_3.

Even at 400 lbs of applied K_2O per acre, this soil at this location did not ever achieve levels that would be considered sufficient (figure 7), though there was a response to K rate.

Weight loss in storage is shown in Figures 8 and 9. Monthly weight loss was highest in November and least in February. Potash application rates of 300 lbs/A or higher resulted in greater weight loss by the end of the project in May 2009 than treatments receiving less potash.

The amount of K in the roots significantly increased as K fertilizer rates increased (Figure 10 and Table 3). The amount of potassium that was removed in the harvested roots gave a quadratic response curve, with greatest removal occurring around 300 lbs per acre of total applied K. At higher rates, the amount of K removed did not increase even though root %K was increasing because yields declined at the highest K rates used in this study. Based on the root nutrient concentration for N, P, and K and an average dry matter of 23.56%, crop removal estimates can be calculated. On average, the harvested crop removed 103, 40, and 172 lbs per acre of N, P_2O_5, and K_2O, respectively. This is equivalent to 2.4, 0.9, and 4.0 lbs per bin of each of these nutrients (assuming 22 boxes, or 880 lbs, per bin). These values agree almost exactly with the results from the N trial.

In summary, sweetpotato crop response to applied fertilizer K was modest. Best yields were obtained with rates of about 250 lbs K_2O per acre; rates much higher than this actually resulted in some yield decline even though plant assimilation in leaves and roots continued to increase. There was no observed storage benefit to high rates of K; rather, losses in storage were increased at rates higher than 300 lbs K_2O/A. Further investigation of the soil data is needed, as overall levels seemed too low relative to the amount that was applied and the observed crop response.

Table 1. Initial soil sample results

Sample Type: SOIL   Date Sampled: Various; Grower/Location/Project: Test Plots

SAMPLE #	DESC	SP [SOP 200.02] %	pH [SOP 205.02]	EC [SOP 215.02] dS/m	Ca (SP) [SOP 235.02] meq/L	Mg (SP) [SOP 235.02] meq/L	Na (SP) [SOP 235.02] meq/L	Cl (SP) [SOP 227.02] meq/L	NO3-N [SOP 312.02] ppm	Olsen-P [SOP 340.02] ppm	X-K [SOP 360.02] ppm	Zn (DTPA) [SOP 380.02] ppm
6	SP K Trial (Weimer)	24	6.4	0.46	2.2	0.5	0.8	0.3	9.0	14.3	67	4.7
7	SP N Trial 08	26	6.3	0.59	2.5	0.7	1.2	0.3	14.3	13.5	59	4.5
7 dup			6.3	0.59	2.5	0.7	1.2	0.3	15.0	13.1	61	4.6
Analysis Date:		10/8/12	10/9/12	10/9/12	10/10/12	10/10/12	10/10/12	10/11/12	9/10/12	9/12/12	9/19/12	10/3/12

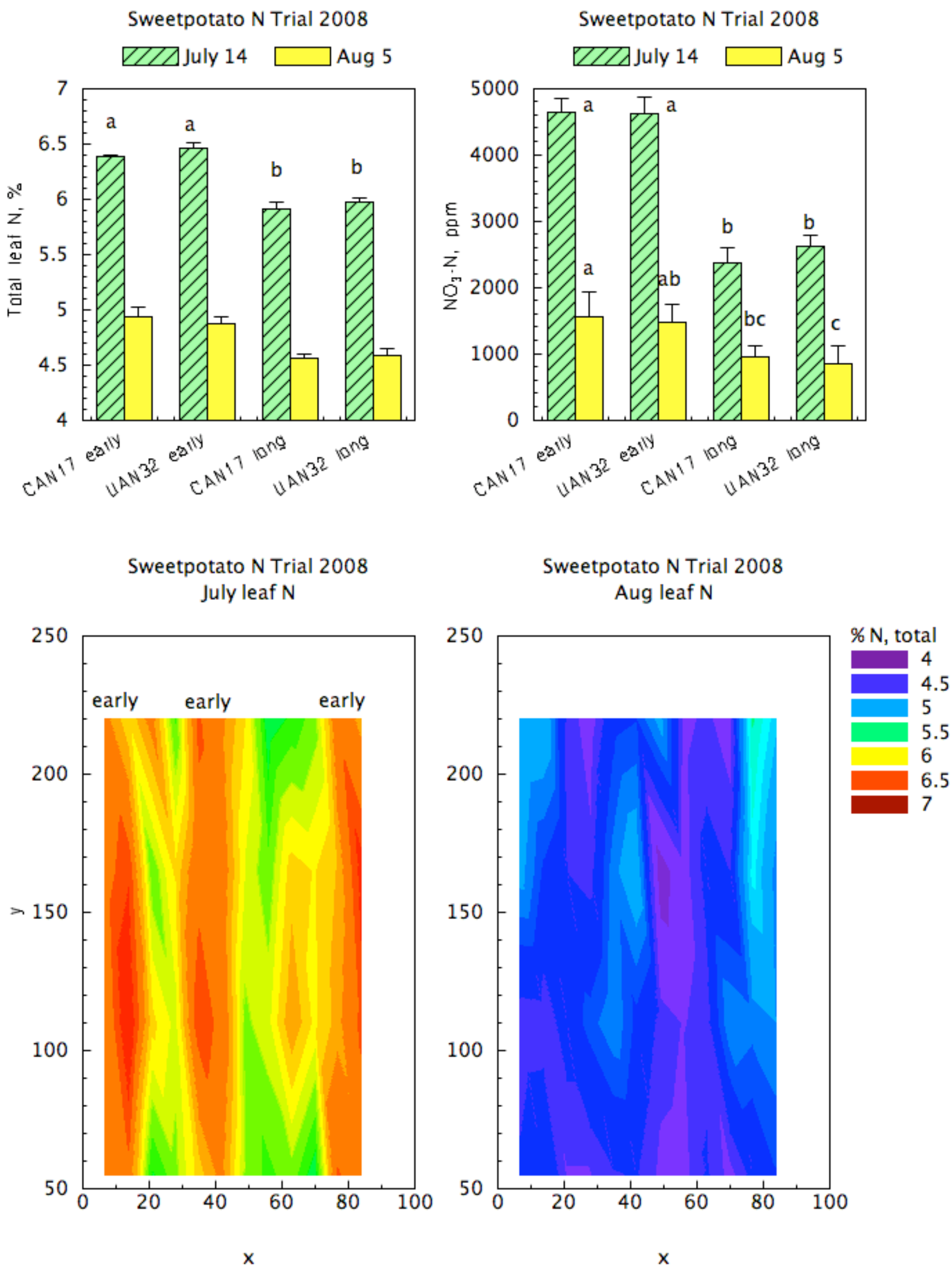


Figure 1 (top). Sweetpotato leaf N and NO_3-N on July 14 and Aug 5 were significantly different between the timing of nitrogen applications. Whole leaf N was a better indicator of crop status than NO_3-N. (Bottom) Nitrogen levels in the leaves dropped dramatically between the two sampling dates, reinforcing the notion that the time of sampling is critical for the correct interpretation of results.

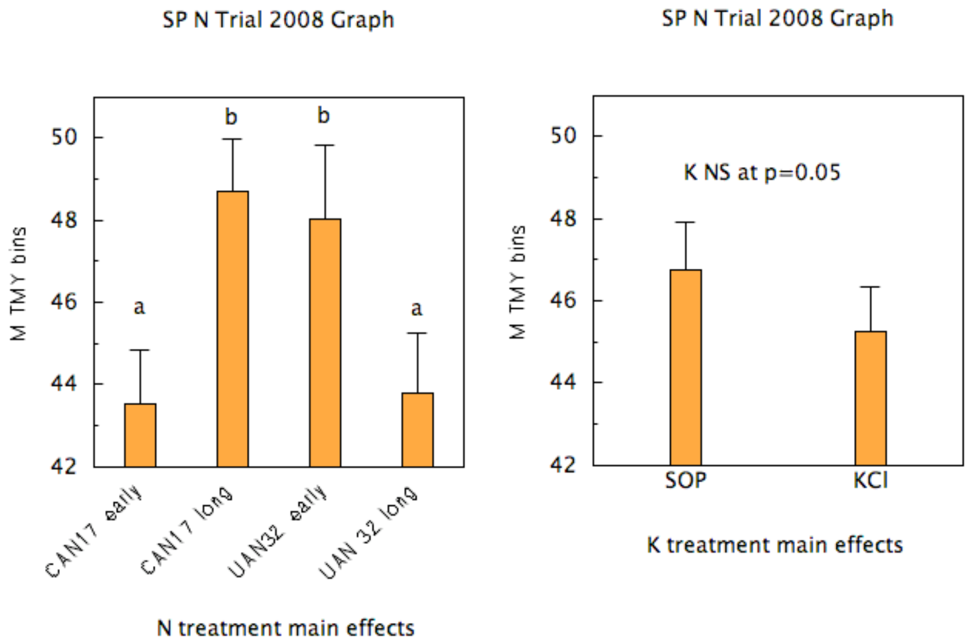


Figure 2. Sweetpotato root yields as impacted by N and K treatments for the N Trial. Unlike in 2007, there was no consistent response in root yield to the treatments. TMY = total marketable yield, which is the sum of medium, #1, and jumbo sized roots. One bin weighs ~ 900 lbs.

Table 2. Summary of yield results for the sweetpotato N trial, 2008.

	Fertilizer Treatment	No. 1s/A	40 lb box Med/A	Jumbo/A	TMY boxes/A	TMY bins	#1 %	culls %	gross $$
1	UAN32 early	484.3	140.6	332.7	957.7	43.5	50.8%	8.2%	$ 6,142.16
2	CAN17 early	511.3	152.4	392.9	1056.5	48.0	49.0%	4.0%	$ 6,620.92
3	UAN32 late	553.2	159.4	358.5	1071.0	48.7	51.8%	7.2%	$ 6,947.11
4	CAN17 late	485.9	172.0	305.2	963.1	43.8	50.5%	9.9%	$ 6,169.13
	KCl	512.7	150.6	332.3	995.6	45.3	51.8%	7.8%	$ 6,447.25
	SOP	504.7	161.6	362.4	1028.6	46.8	49.3%	6.8%	$ 6,492.40
F tests:									
	N Treatment	0.01	ns	0.03	0.01	0.01	ns	0.01	0.01
	K treatment	ns	ns	ns	ns	ns	0.03	ns	ns
	N x K	ns	ns	ns	ns	ns	ns	ns	ns
	N LSD 0.05	44.6	ns	60.2	83	3.77	ns	3.2	507
	CV, %	10.5	19.7	20.8	9.8	9.8	7.9	52.5	9.4

N applied at 180 lbs/A; potash applied at 200 lbs K20 per acre.
gross returns based on $18 #1's, $9 for mediums and jumbos
LSD = least significant difference. Means separated by less than this amount within a column are not significantly different at the 95% confidence interval.
ns = not significant.
CV = coeficient of variation.

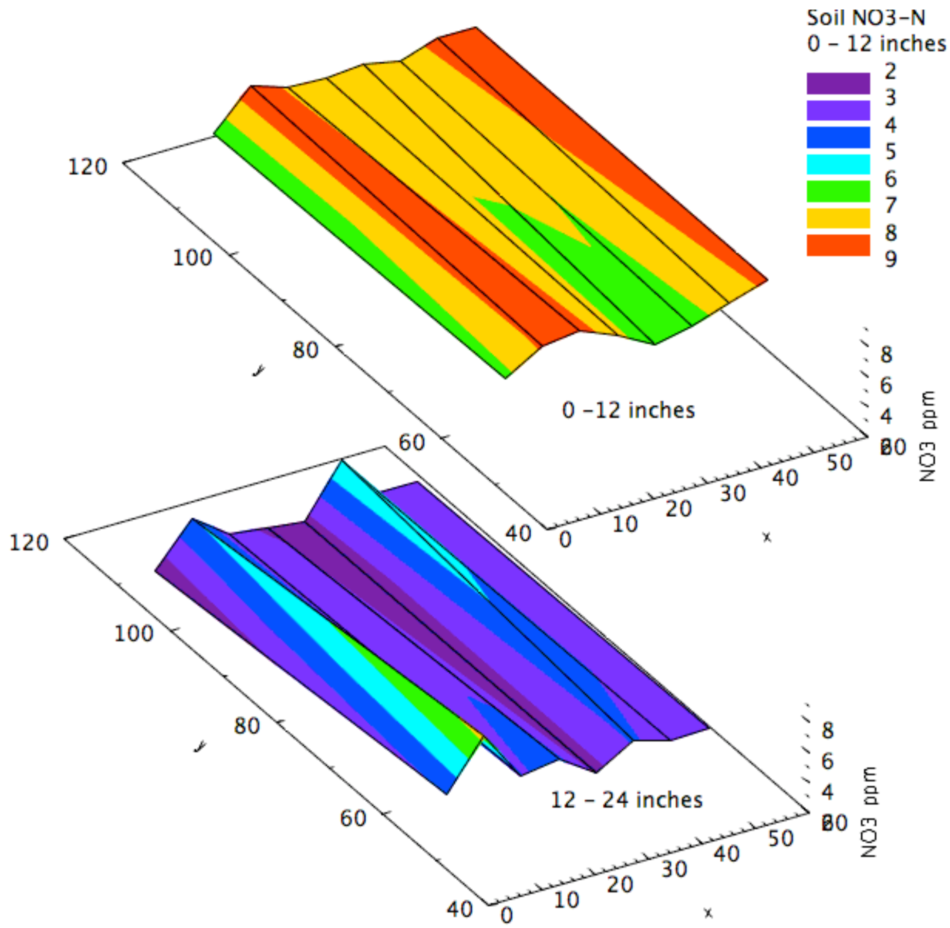
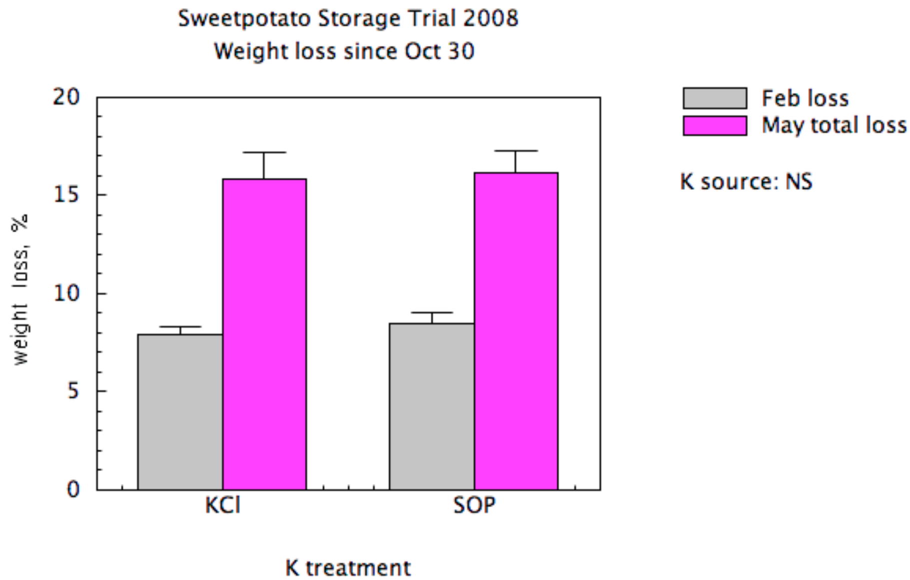


Figure 3. Soil ppm NO_3-N at 12 and 24 inches in the test plot area at the end of the growing season, September 2008. Levels were very low regardless of nitrogen treatment.



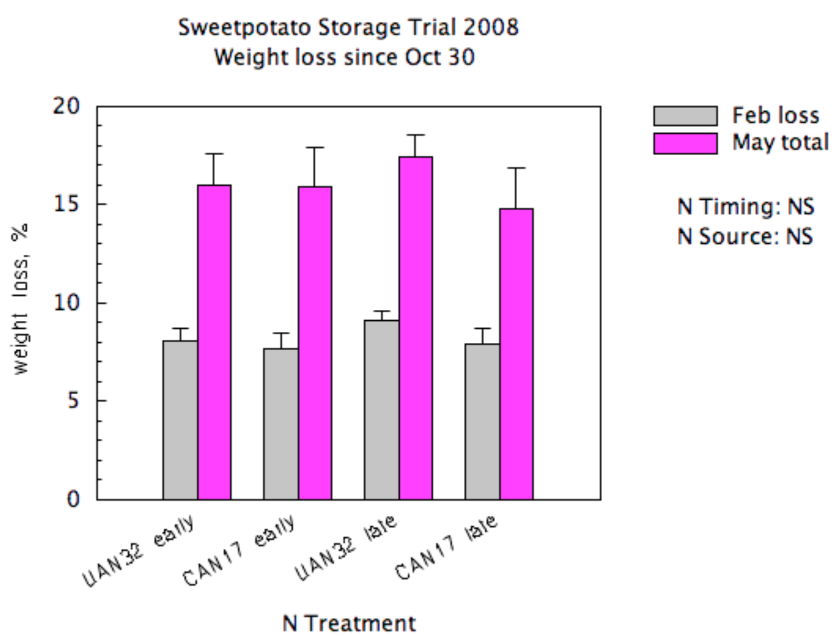


Figure 4. Cumulative weight loss in storage for the Oct – Feb and Oct – May time periods. There were no significant differences for N source, K source, or N timing.

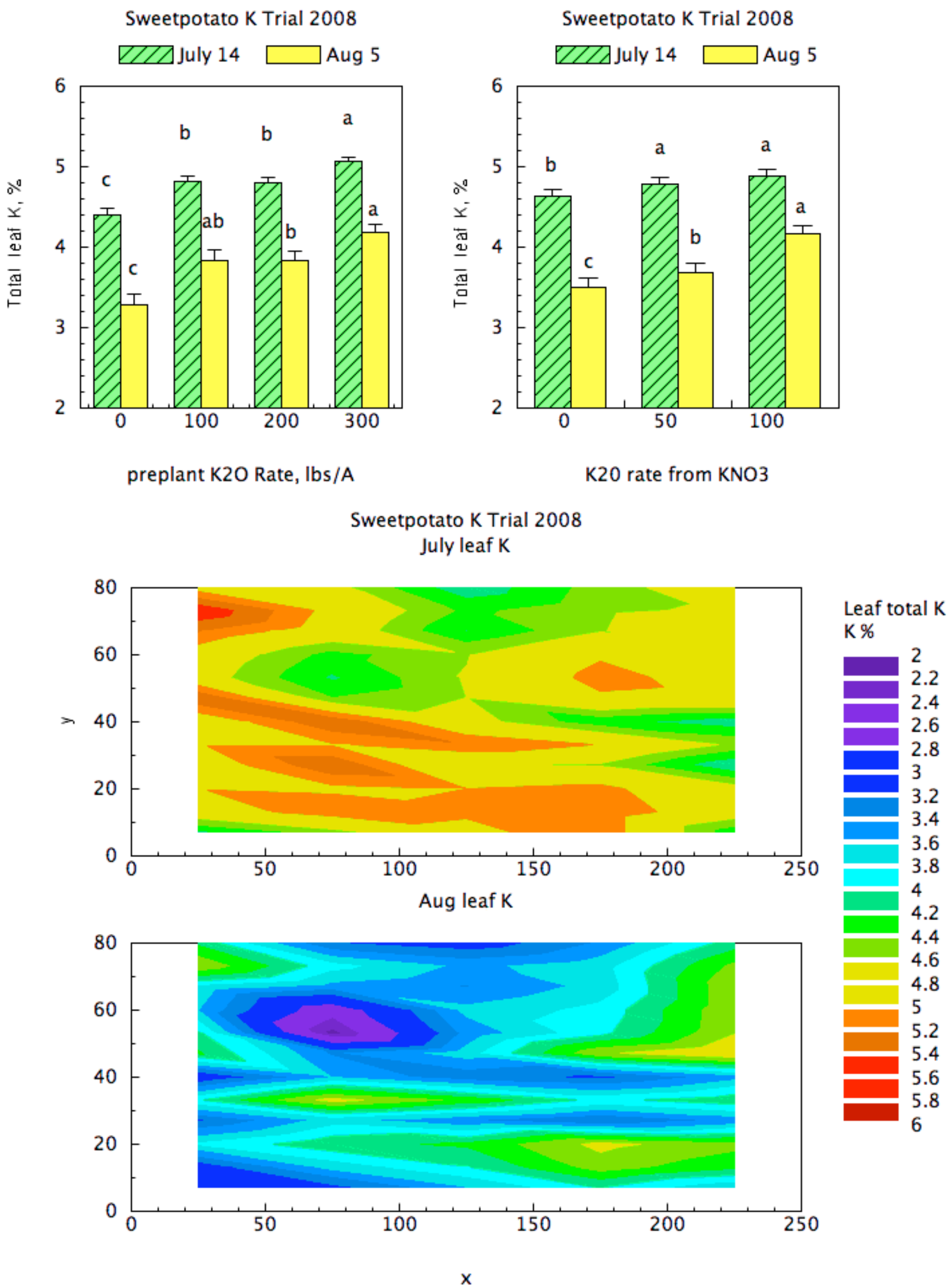


Figure 5. Whole leaf potassium levels as affected by potassium treatment in the K Trial. Crop response was significant but subtle, even at very high rates of potash. Like the N Trial, levels of this nutrient in the crop dropped quickly between the two sampling dates for this trial.

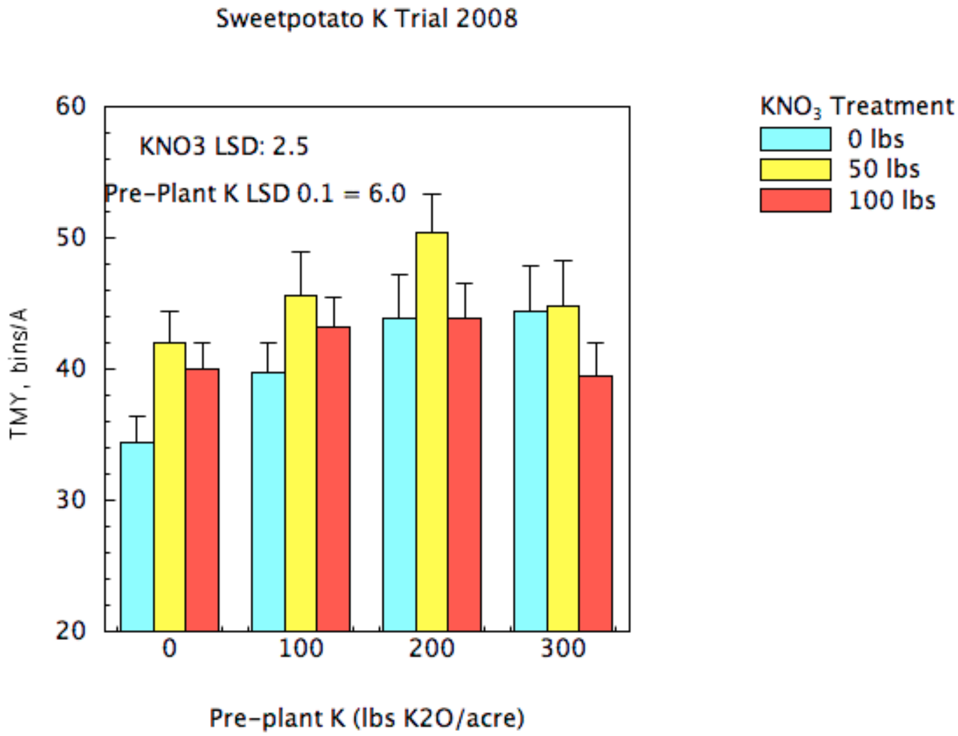


Figure 6. Sweetpotato root yields as impacted by pre-plant and post plant K treatments for the potassium Trial. Yields peaked at 250 lbs/A. TMY = total marketable yield, which is the sum of medium, #1, and jumbo sized roots. One bin weighs ~ 900 lbs.

Table 3. Summary of yield results and root K for the sweetpotato K trial, 2008.

	Fertilizer Treatment	40 lb box No. 1s/A	Med/A	Jumbo/A	TMY boxes/A	TMY bins	#1 %	culls %	gross $$	root K%	rem'd K2O lbs/A
1	0 lbs/A PPI	447	141	264	853	38.8	52.6	6.7	5953	1.37	131.7
2	100 lbs/A PPI	436	146	359	941	42.8	46.5	7.4	6153	1.58	173.2
3	200 lbs/A PPI	485	142	362	1012	46	47.9	7.2	6729	1.69	194.5
4	300 lbs/A PPI	448	132	385	942	42.8	47.6	6.9	6241	1.8	196.1
	0 lbs/A KNO3	419	136	338	893	40.6	47.3	6	5873	1.58	164.2
	50 lbs/A KNO3	518	155	330	1004	45.6	51.8	6.2	6946	1.53	178
	100 lbs/A KNO3	425	130	359	914	41.6	47	8.9	5987	1.71	176.8
F tests:											
	K rate, PPI	ns	ns	0.1	ns	ns	0.02	ns	ns	0.003	0.003
	KNO3 rate	0.001	0.02	ns	0.001	0.001	0.02	0.01	0.001	ns	ns
	K x KNO3	0.02	ns	ns	ns	ns	ns	ns	0.01	ns	ns
	PPI K LSD 0.05	ns	ns	104	ns	ns	3.9	ns	ns	0.2	35.3
	KNO3 LSD	34.2	18.4	ns	56	2.5	3.6	1.8	356	ns	ns
	CV, %	11.7	20.3	23.4	9.2	9.2	11.5	40	8.8	11.7	19.3

N applied at 180 lbs/A; potash applied at 200 lbs K20 per acre.

gross returns based on $18 #1's, $9 for mediums and jumbos

LSD = least significant difference. Means separated by less than this amount within a column are not significantly different at the 95% confidence interval.

ns = not significant.

CV = coeficient of variation.

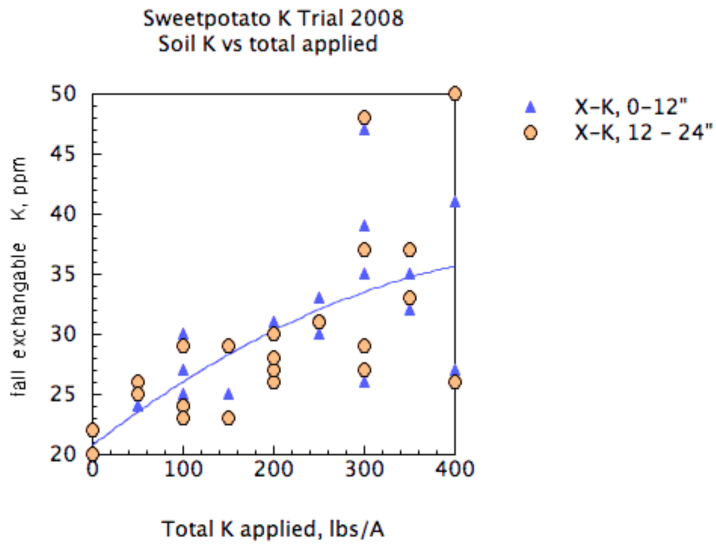


Figure 7. Relationship between applied K and measured soil exchangeable K in the fall.

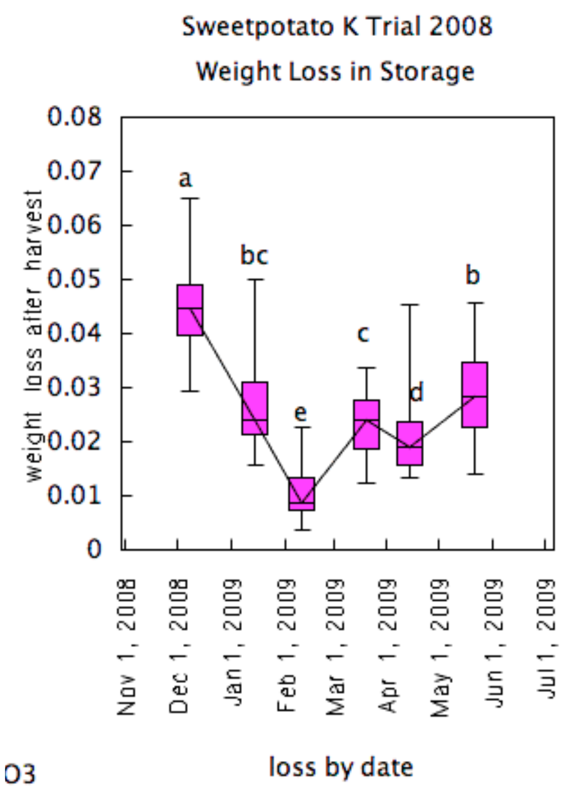


Figure 8. Monthly over-winter weight loss in storage for Beauregard sweetpotatoes.

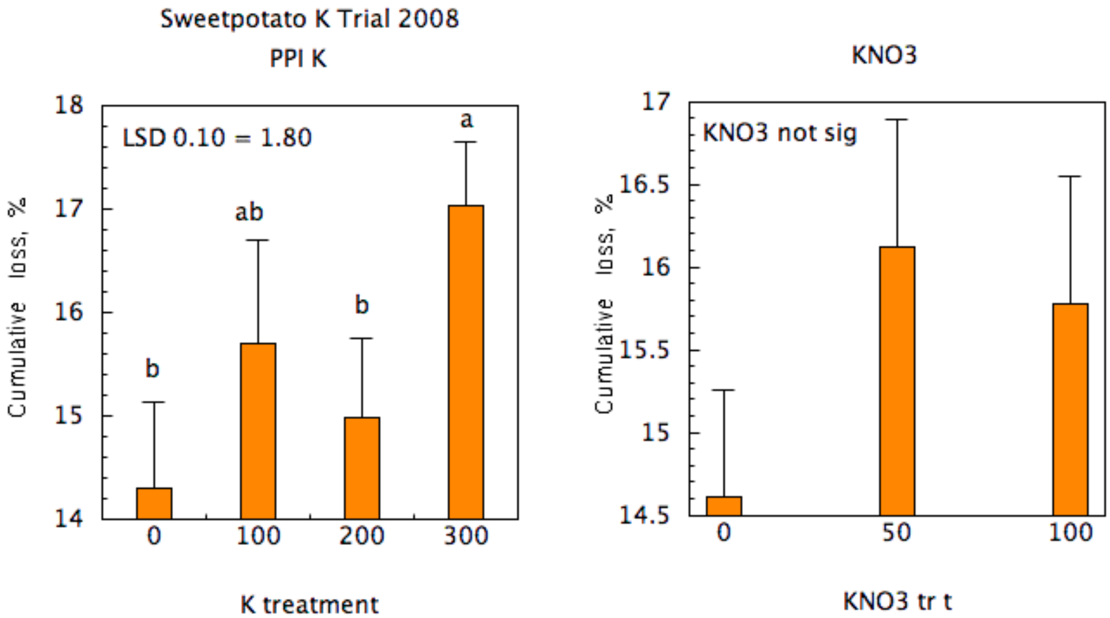
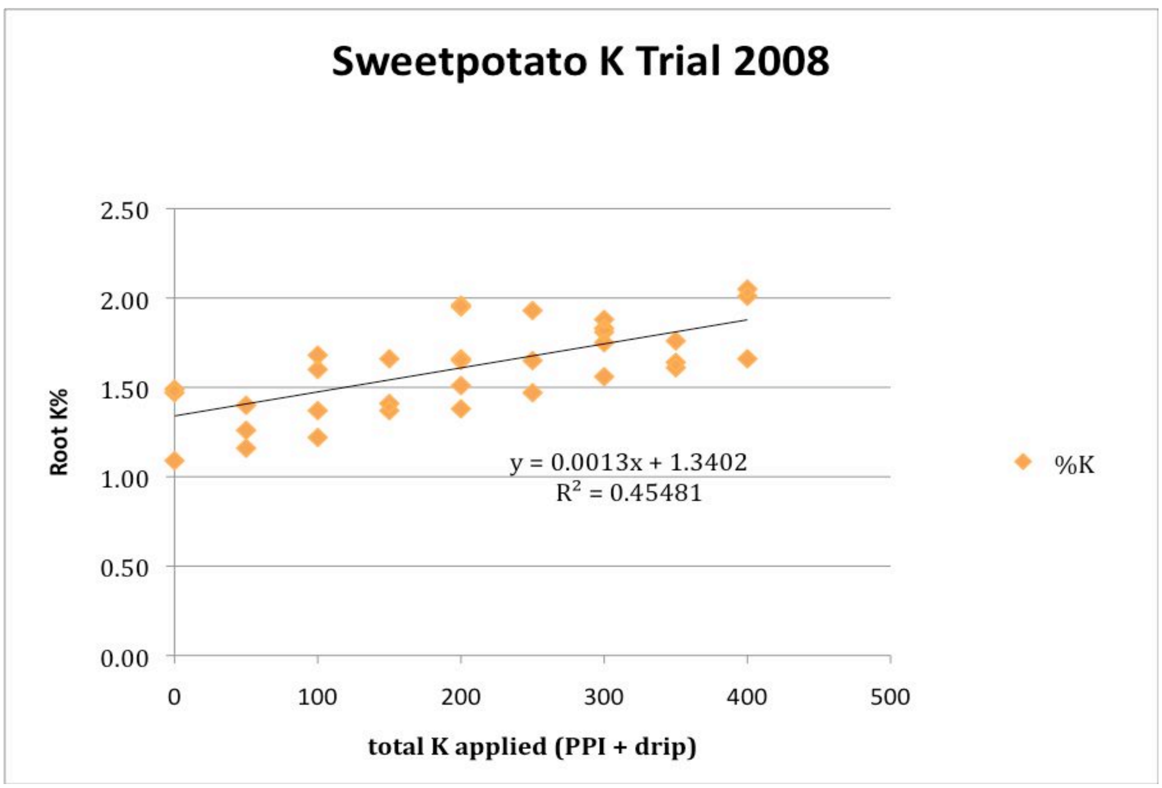


Figure 9. Cumulative weight loss in storage (October – May) was higher when more fertilizer potash was applied; however, KNO3 treatments were not significant.



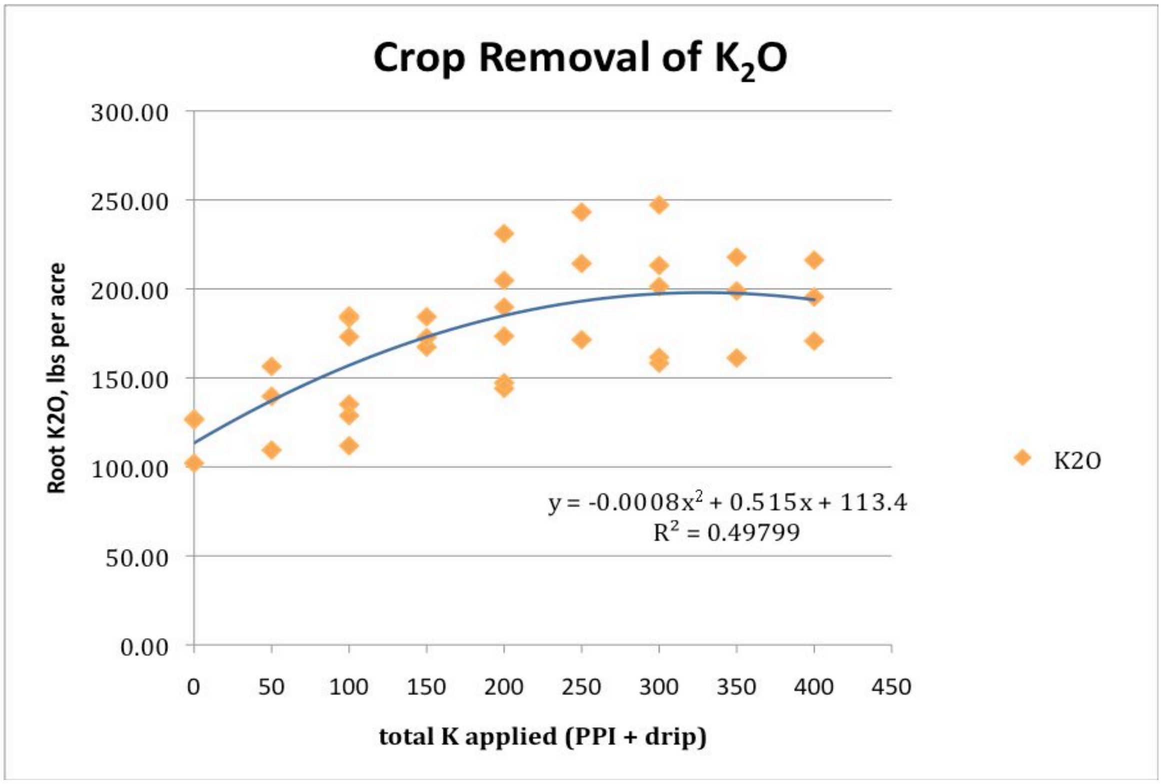


Figure 10. As fertilizer K rates increased, so did the amount in the roots (top). The amount of K that was removed with harvest plateaued around 200 – 250 lbs/A (bottom).