Sweetpotato Research Progress Report 2019

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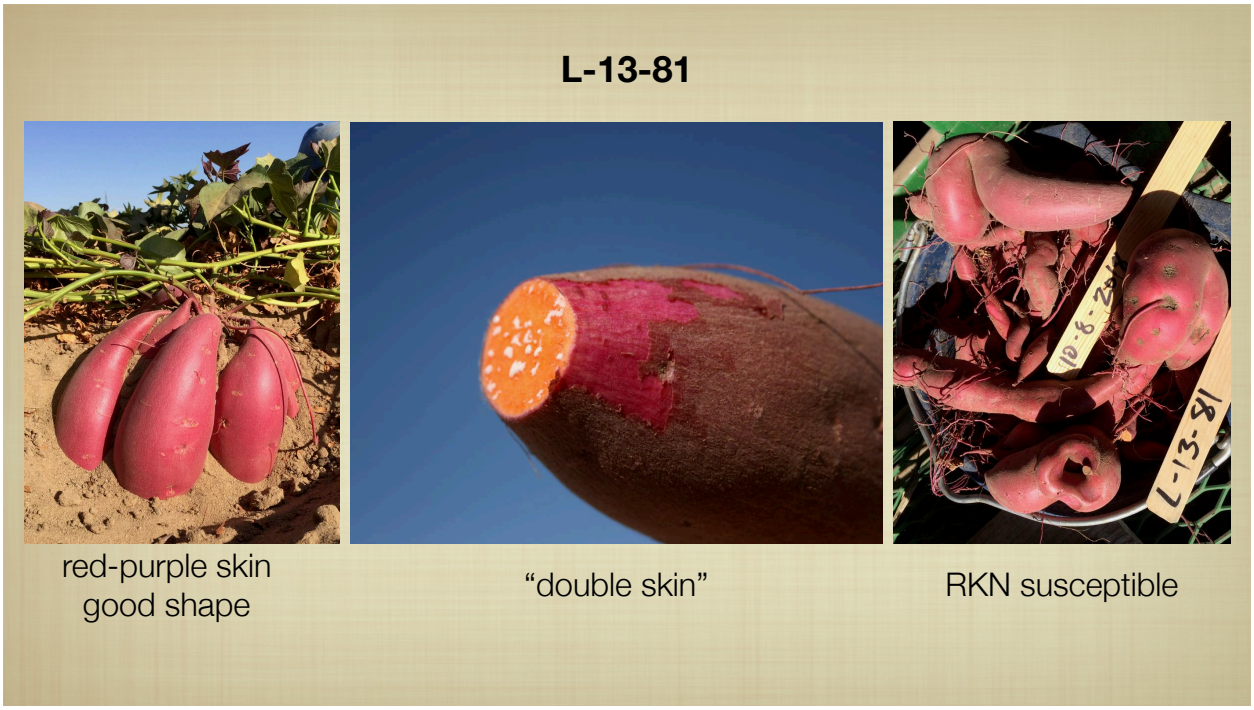

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UC CE UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources Cooperative Extension

Sweetpotato Collaborators Trial -- 2019

Scott Stoddard, UCCE Merced County

The first of two screening trials. This location was with Quail H Farms, south of Livingston, CA. Soil type was Dello sand, slightly saline (pH 7.3, EC 0.72, Na 8.6% base sat). Conventional field, fumigated with metam-K prior to planting. Drip irrigated, water quality marginal. Average winter with one major delayed spring rain event, average summer temperatures.
Two -row plots, machine harvested and sorted by grower crew. Nematode and wireworm damage in some plots.

Rep	Var#	Variety Name	Skin Color	Skin Text	Flesh color	Eyes	Lents	Shape	Shape Uniform	Overall App	Comments
1	1	Beauregard	Rose	7	3	7	5	3, 5	8	7	some WW
2			Rose Cu	7	3	9	7	3, 6	7	8	Some RC
1	2	Covington	Rose	8	3	7	7	6,3	7	7	some wieworm, LG
2			Rose red	7	3	5	7	3, 6	8	8	YCR
1	3	Orleans	Rose	7	3	7	5	3, 4, 5	6	7	smoother, better look than Beauregard
2			Rose Cu	7	3	9	7	3, 7	7	8	YCR, WW
1	4	Burgundy	Maroon	7	5	9	7	1, 6	7	7	blocky and smooth skin
2			dusty red	8	5	9	8	2, 5	7	7	some too round
1	5	Bellevue	Orange	9	4	9	9	3, 8	8	9	very smooth, nice shape
2			orange	9	4	9	7	3, 5	7	9	some WW, no air cracks
1	6	NC09-122 (G2	Purple	7	4	7	7	3,4	8	7	some tip rot, lents
2				7	4						uniform shape, scrapes white
1	7	L-13-81 (G3)	purple	7	3	5	6	2, 3	7	8	nice color, mostly smooth
2			red-purple	9	4	7	7	3, 5	5	7	hides scrapes
1	8	Diane	Red	7	4	7	7	3, 4	7	8	long, red
2			Red	9	4	9	7	3, 4	8	7	nice color, smooth
1	9	Bonita	tan	7	1	9	7	3, 4	8	6	some veins, pink zones
2			buff	9	1	7	7	8, 3	5	7	long, some WW
1	10	NC11-0234	red to Cu	5	4	9	5	1, 2	4	4	CV, high shape variability
2								3, 5			rough skin
1	11	L-14-31	purple	7	4	7	7	3, 5	7	8	Some WW and veins
2				6	5						eyes, lents
1	12	NC13-604	Cream	9	1	5	7	2, 6	7	8	green on ends, latex
2				7							root hairs on eyes, good color
1	13	NC13-151	purple	7	3	8	7	3, 6	6	8	nice skin color, good shape
2				9	3						tip rot, latex

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
LG = longitudinal grooves
CV = color variation end to end
WW = wireworm damage

NATIONAL SWEETPOTATO COLLABORATORS SUMMARY OF DATA

2019

STATE AND LOCATION REPORTING: Livingston, CA
DATE TRANSPLANTED: 5/29/2019. DATE HARVESTED: 10/11/2019. No. GROWING DAYS: 135
DISTANCE BETEEN ROWS (in): 40. DISTANCE IN ROW (in): 9
PLOT SIZE: NO. OF ROWS: 2 LENGTH (ft): 40 NO. OF REPS: 4
IRRIGATION: drip irrigation. 1.5 to 2 inches per week during summer, total 30".
FERTILIZER: PPI 60 gpa 8-8-8 followed by drip applied 10-0-10. About 175-50-175 N-P2O5-K2O.

			-------	40	lb box/A	-------		%	%
#	SELECTION	CLASS	US #1's	Medium	Jumbo	MKT YIELD	BINS/A	US #1's	CULLS
1	Beauregard	yam	524	179	93	796	32.8	66.1%	9.9%
2	Covington	yam	541	259	90	890	35.6	60.9%	9.5%
3	Orleans	yam	581	201	105	887	35.5	65.5%	4.1%
4	Burgundy	red yam	502	133	228	863	34.5	58.1%	6.2%
5	Bellevue	yam	566	215	108	889	35.6	63.7%	7.8%
6	NC09-122	red yam	662	174	227	1063	42.5	62.4%	3.5%
7	L-13-81	red yam	651	239	116	1006	40.2	64.7%	2.7%
8	Diane	red yam	716	302	143	1162	46.5	61.7%	2.4%
9	Bonita	sweet	627	207	120	954	38.1	65.6%	4.4%
10	NC11-234	yam	534	130	280	944	37.8	56.6%	3.1%
11	L-14-31	red yam	520	207	138	864	34.6	60.3%	4.0%
12	NC13-604	sweet	354	324	29	707	28.3	49.8%	2.4%
13	NC13-151	red yam	558	359	55	972	38.9	57.3%	0.8%
	Average		566.8	233.3	121.0	921.1	36.9	61.3%	4.8%
	LSD 0.05		86.1	49.6	63.3	133.9	5.4	4.1	5.4
	CV, %		10.6	14.8	35.8	10.1	10.1	4.6	78.3

US #1's — Roots 2 to 3.5 inches in diameter, length 3 to 9 inches, well shaped and free of defects.
Mediums — 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 amount are not significantly different (ns).

NC11-234 not included in statistical analysis due to insufficient reps

CV, % — Coefficient of variation, a measure of variability in the experiment.

SCORE SHEET FOR EVALUATION OF SWEETPOTATO SPROUT PRODUCTION - NSPCG TRIAL

Date bedded: 3/4/19 Location: North Ave, off Shanks Rd exit, near Delhi

Date Evaluated: 4/24/19 Type of bed: cold bed (no gin trash)

Evaluated by: S. Stoddard Botran & Devrinol at bedding

	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	yes	5	4	3	some rot	
2	Covington	yes	3	3	2	5	clumpy
3	Orleans	yes	5	4	3	5	like Beauregard
4	Burgundy	yes	4	3	2	5	non uniform, but good plants
5	Bellevue	yes	4	4	2	5	
6	NC09-122	yes	3	3	2	4	clumpy, dull green
7	L-13-81	yes	5	4	3	5	godd production
8	Diane	yes	5	4	3	5	no Southern Blight
9	Bonita	yes	4	3	3	5	no Southern Blight
10							
11							

(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) indicates 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.

NATIONAL SWEETPOTATO COLLABORATORS SUMMARY OF DATA
2019

STATE AND LOCATION REPORTING: Bakersfield, CA
DATE TRANSPLANTED: 6/3/2019. DATE HARVESTED: 10/24/2019. No. GROWING DAYS: 143
DISTANCE BETEEN ROWS (in): 40. DISTANCE IN ROW (in): 10
PLOT SIZE: NO. OF ROWS: 1 LENGTH (ft): 40 NO. OF REPS: 4
IRRIGATION: sprinkler irrigation. 1.5 to 2 inches per week during summer, total 30".
FERTILIZER: Organic. Compost pre, fish fertilizer at planting. Total NPK not known

#	SELECTION	CLASS	------- 40 lb box/A ------- US #1's	Medium	Jumbo	MKT YIELD	BINS/A	% US #1's	% CULLS
1	Beauregard	yam	437	216	66	719	28.8	60.8%	15.8%
2	Covington	yam	713	383	88	1185	47.4	60.1%	2.9%
3	Orleans	yam	359	243	6	608	24.3	59.1%	12.9%
4	Burgundy	red yam	474	233	44	751	30.0	62.9%	5.7%
5	Bellevue	yam	528	344	20	892	35.7	59.2%	4.7%
6	NC09-122	red yam	409	353	78	840	33.6	48.8%	6.1%
7	L-13-81	red yam	215	283	0	498	19.9	43.0%	2.4%
8	Diane	red yam	379	262	0	641	25.7	59.3%	18.2%
9	Bonita	sweet	468	348	21	837	33.5	55.9%	5.3%
10	NC13-604	sweet	274	437	0	711	28.4	39.2%	2.2%
11	L-16-298	Japanese	274	327	2	603	24.1	44.4%	3.6%
12	L-16-278	red/white	417	199	39	655	26.2	64.0%	17.7%
13	L-16-26P	purple/purple	127	197	0	324	13.0	39.9%	4.0%
14	L-14-11	red	155	168	0	323	12.9	47.7%	6.2%
15	L-16-186	red yam	635	485	191	1312	52.5	48.4%	6.3%
	Average		373.5	285.2	26.1	684.8	27.4	53.2%	7.7%
	LSD 0.05		102.6	96.8	41.2	168.0	6.7	7.4	6.6
	CV, %		16.4	20.3	99.8	14.7	14.7	8.3	52.4

US #1's	Roots 2 to 3.5 inches in diameter, length 3 to 9 inches, well shaped and free of defects.
Mediums	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 amount are not significantly different (ns).
	L-16-186 not included in statistical analysis due to insufficient reps
CV, %	Coefficient of variation, a measure of variability in the experiment.

ALT 2019

Location: Bell and Bert Crane Rds, near Atwater
Cooperator: Dave Souza
Bedded: 2/28/19
Transplant: 5/15/19
Harvest: 10/21/19

Replicated lines in the 2019 Advanced Line Trial yield results (n = 4).

#	Var Name	market class	TMY lbs/A	40 lb box/A No. 1's	Meds	Jumbos	adjusted TMY box/A	bins/A	No. 1's #1%	Culls cull%	harvest comments
field	Bellevue	yam	95,159	794	453	846	2093	83.7	38.0%	0.3%	excellent
ALT1	L-13-81	red	74,153	719	437	476	1631	65.3	44.1%	0.9%	deep purple skin
ALT4	L-15-39	red/white	65,426	693	361	386	1439	57.6	48.3%	0.3%	Japanese type
ALT7	L-16-26P	purple	31,791	235	441	23	699	28.0	33.6%	0.0%	long
ALT13	NC-13-151	red	54,017	599	398	191	1188	47.5	50.0%	0.2%	good shape & color
ALT14	NC-13-604	sweet	36,854	339	438	33	811	32.4	41.8%	0.5%	nice colr, latex
	Average		59,567	563	421	326	1310	52.4	42.6%	0.4%	
	LSD 0.05		10,147	113.2	ns	119.6	227	8.9	4.2	ns	
	CV, %		11.5	13.5	16.1	24.7	11.5	11.5	6.6	169	

Advanced Line Trial (ALT) 2019 yield results (n = 2).

#	Var Name	market class	TMY lbs/A	40 lb box/A No. 1's	Meds	Jumbos	adjusted TMY box/A	bins/A	No. 1's #1%	Culls cull%	harvest comments
ALT2	L-14-11	red/orange	63,576	667	344	388	1399	55.9	47.8%	0.0%	nice red
ALT3	L-14-31	red/orange	45,458	393	221	386	1000	40.0	39.6%	2.2%	low set, good shape
ALT5	L-16-148	red/orange	51,538	406	377	351	1134	45.4	35.9%	0.3%	veins, low yield
ALT6	L-16-186	maroon/orange	57,933	462	323	489	1275	51.0	36.3%	0.0%	bally, small
ALT8	L-16-278	red/white	55,494	427	323	471	1221	48.8	34.4%	7.8%	red/white, long
ALT9	L-16-298	purple/white	38,118	269	380	189	839	33.5	32.0%	0.6%	long
ALT10	L-17-142	red/orange	56,944	404	475	374	1253	50.1	32.2%	0.4%	deep red, irregular shape
ALT11	L-17-171	red/orange	121,217	838	425	1404	2667	106.7	31.6%	1.7%	red, smooth, early
ALT12	L-17-189	red/orange	71,721	628	515	435	1578	63.1	39.9%	0.0%	red, irregular shape
	Average		62,444	499	376	499	1374	55.0	36.6%	1.5%	

US #1's	Roots 2 to 3.5 inches in diameter, length 3 to 9 inches, well shaped and free of defects.
Mediums	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 amount are not significantly different (ns).
CV, %	Coefficient of variation, a measure of variability in the experiment.

SCORE SHEET FOR EVALUATION OF SWEETPOTATO SPROUT PRODUCTION - ALT 2019

Date bedded: 2/28/19 Location: Cressy and McSwain Rds, near Atwater

Date Evaluated: 4/19/19 Type of bed: cold bed (no gin trash)

Evaluated by: S. Stoddard

	Selection	Roots presprouted yes/no	Plant Production 1-5 (1)	Uniformity of Emergence 1-5 (2)	Uniformity of Earliness 1-3 (3)	Root Conditions 1-5 (4)	Remarks (5)
ALT1	L-13-81	yes	4	4	3		green with crinkle, purple new growth
ALT2	L-14-11	yes	4	3	3		all green
ALT3	L-14-31	yes	4	4	3		deep green
ALT4	L-15-39	yes	5	4	3		all green
ALT5	L-16-148	yes	2	2	2		lvs look sick, splotchy and crinkled
ALT6	L-16-186	yes	2	1	1		green and purple
ALT7	L-16-26P	yes	1	1	1	solid	deep purple new growth, very few plants
ALT8	L-16-278	yes	5	4	3		deep green, lots of plants
ALT9	L-16-298	yes	4	4	3		mostly green
ALT10	L-17-142	yes	2	2	1		all green
ALT11	L-17-171	yes	3	2	2		all green
ALT12	L-17-189	yes	3	2	1		all green
ALT13	NC13-151	yes	5	5	5		dark green slightly purple new growth
ALT14	NC13-604	yes	5	5	5		light green and purple lvs

(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) indicates 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.

ICL Fertilizer Trial on Sweetpotatoes

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Introduction

The objective of this trial was to evaluate ICL's coated sulfate of potash (SOP, 0-0-48) and coated calcium nitrate fertilizer (13-0-0) on yield response of sweetpotatoes with and without additional compost in a commercial field.

METHODS

This trial was established in a commercial field near Cressey in Merced County, California. The soil is classified as Atwater loamy sand deep over hardpan, acidic (pH 5.7), with low fertility (CEC 6.7, soil K 47 ppm). Soil sample results are shown in Figure 1. The fertilizer program for this field included chicken manure compost, sidedress shanked applications of a complete NPK fertilizer blend containing humic acid and micronutrients, and additional fertilizer through the drip tape. For this test, coated SOP applications were made to beds both with and without compost. The chicken compost was applied as a surface band in the middle of the bed between the rows, made just before transplanting, at 7 tons/A. The field was sidedressed with 500 lbs/A of 8-8-8 liquid blend 2 weeks after transplanting. Additional fertilizer included liquid calcium nitrate -KCl blend (10-0-10) through the drip tape during the growing season to supply another 50 lbs N/A. Total N-P_2O_5-K_2O applied was about 135-80-170 lbs/A.

The ICL coated SOP and standard granular SOP were applied to the center of the bed under the drip just after transplanting to plots with and without chicken manure compost. The ICL SOP was applied at 520 lbs per acre to supply the equivalent amount of potassium as 500 lbs of standard SOP; an additional treatment was coated SOP at 75% rate, or 380 lbs/A. ICL coated calcium nitrate treatments were done over the top of the compost applications to provide an additional 40 or 80 lbs of N per acre. For the SOP trial, treatment design was a randomized block split-plot with 4 reps, with compost as the main plot and potash as the split treatment. For the coated CN9 trial, a RCD with 4 reps was used. All treatments received 50 gallons/A 10-0-10 through the drip tape in conjunction with the rest of the field. Sweetpotato variety 'Murasaki' was transplanted on May 31 and harvested on Oct 2, 2019. Murasaki is a high dry matter (>30%) cultivar with purple skin and white flesh, and represents about 10% of the sweetpotato market in California.

Plot background information and a listing of the treatments are shown in Table 1.

Leaf and petiole samples were taken from all plots on July 16 and August 7, 2019. Leaves with petioles were taken from the 6th leaf from the growing tip from 20 plants within each plot. Samples were air dried and submitted to AgSource Laboratories in Lincoln, NE, for complete analyses. Yields were estimated by weighing both rows in each plot using a standard 1-row harvester and the growers crew to separate the roots into #1's, mediums, jumbos, and culls.

Results.
Leaf and petiole results for the coated CN9 and SOP trials for both sampling dates are shown in Tables 2 and 3, respectively. There were no significant differences in any of the measured nutrients between any of the CN9 treatments. In the SOP trial, adding additional K from the fertilizers significantly increased the amount of K in the plant as compared to the untreated plots. Higher plant tissue K occurred with 500 lbs of SOP or 520 lbs of ICL coated SOP as compared to the 380 lb rate, but these differences were not significant. Compost mostly did not have any significant effect on any of the plant tissue concentrations, except for P on the second sampling date.

Harvest results are shown in Tables 4 and 5. All three potassium fertilizers significant increased total marketable yield (TMY) over the untreated control by an average of 21.6% (the untreated control received K fertilizer, just not the additional granular applications tested here). There was no significant difference between the standard granular KCl treatment (19.2 bins/A) and 520 lbs coated SOP (18.7 bins/A) or 380 lbs coated SOP (19.4 bins/A). Compost also significantly increased yield, from 14.9 to 20.5 bins/A. However, there was no significant compost x SOP interaction (Figure 2). This is the first time I have documented a significant yield increase from additional potassium fertilizer in sweetpotoes.

Half of the Coated CN9 plots were accidentally harvested before weights could be measured, therefore no statistical analysis was made. Results from the remaining 2 plots are shown in Table 5. There was a strong trend toward increased total marketable yield (TMY) as CN9 rate increased, even though these treatments were applied on top of nitrogen inputs from sidedress fertilizer, compost, and drip applied N.

Acknowledgements: Many thanks to Arron Silva (Doreva Produce), Aaron Beene (Simplot), and Ilan Oliver (ICL) for their help and participation with this trial.

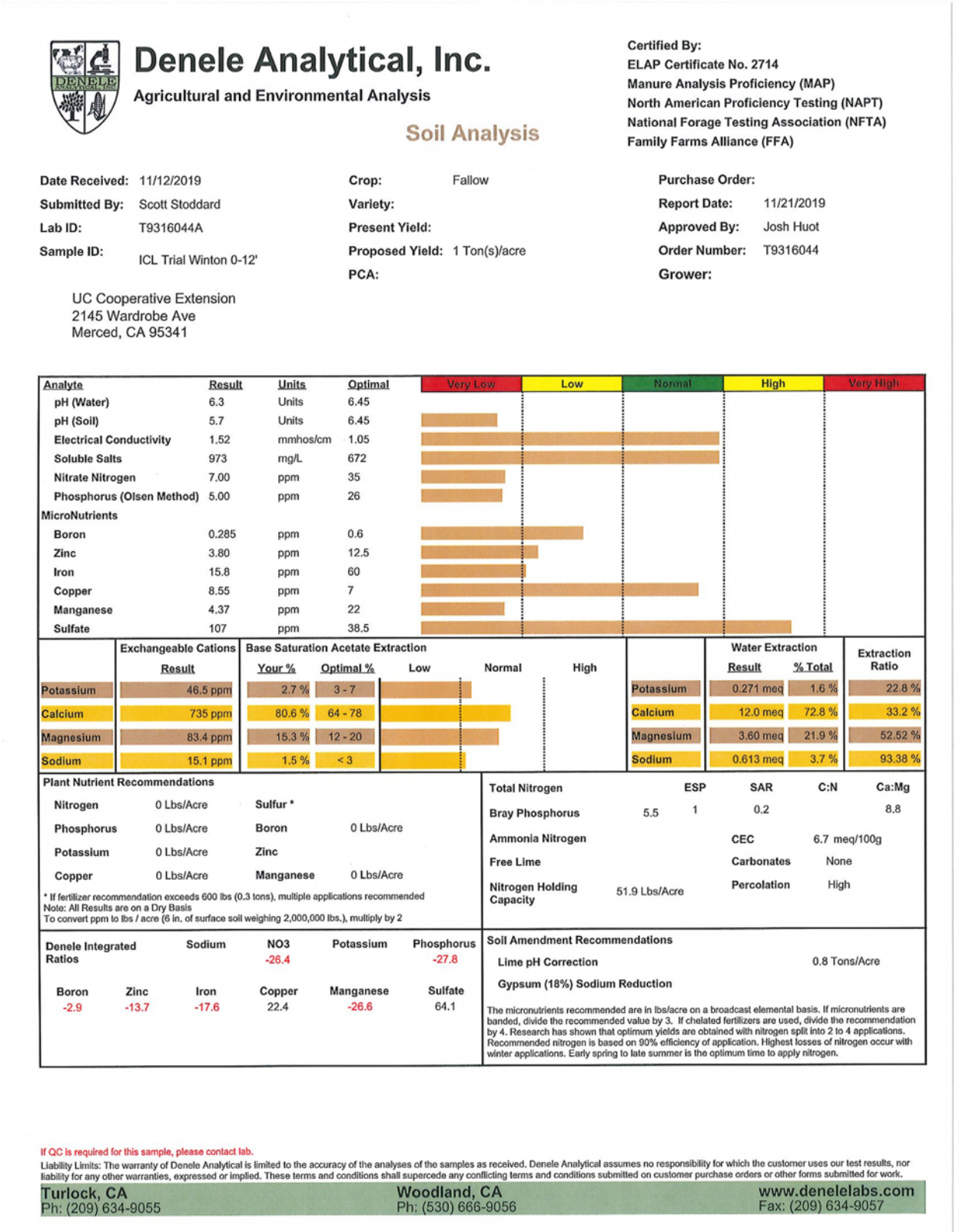
Table 1. Trial background and treatment information, ICL coated fertilizer trial, Merced County 2019.

Cooperator:	Aaron Silva, Doreva Produce Company, Livingston CA
Location:	Palm and West, near Cressey in Merced County
	37 24'47" N by 120 38'45" W
Soil:	Atwater loamy sand deep over hardpan
Variety:	Murasaki 5/31/19 transplanted
Plot size:	1 bed (2 rows) x 40 ft, RCB-split plot with 4 reps
	9" plant spacing
Irrigation:	surface drip
Fertilizer:	7 T/A chicken compost
	10-0-10 through the drip line, 50 gallons/A Sidedress 500 lbs 8-8-8 + humic acid and Zn Total N-P-K: 135 – 80 – 170 (estimated)
Tissue sampling:	July 16 and August 7
Harvest:	10/2/19
Days:	124

Treatments:

Compost	1.	no compost
	2.	chicken compost 7 T/A
K Fertilizer	1.	0 lbs/A
	2.	*Not part of test*
	3.	*Not part of test*
	4.	500 lbs/A SOP granular (250 lbs K_2O/A)
	5.	520 lbs/A ICL coated SOP 0-0-48 (250 lbs K_2O/A)
	6.	380 lbs/A ICL coated SOP 0-0-48 (183 lbs K_2O/A)
N Fertilizer	1.	chicken comost 7 T/A
	2.	300 lbs/A ICL coated cal nitrate 13-0-0 (39 lbs N/A)
	3.	600 lbs/A ICL coated cal nitrate 13-0-0 (80 lbs N/A)

Compost applied May 30 as a surface band between rows
All fertilizer treatments applied June 7 as a surface band between rows
Surface drip tape placed on top of fertilizer bands
Addition N through the irrigation system during the season from 10-0-10



Denele Analytical, Inc.

Agricultural and Environmental Analysis

Soil Analysis

Certified By:
ELAP Certificate No. 2714
Manure Analysis Proficiency (MAP)
North American Proficiency Testing (NAPT)
National Forage Testing Association (NFTA)
Family Farms Alliance (FFA)

Date Received: 11/12/2019
Submitted By: Scott Stoddard
Lab ID: T9316044A
Sample ID: ICL Trial Winton 0-12'

Crop: Fallow
Variety:
Present Yield:
Proposed Yield: 1 Ton(s)/acre
PCA:

Purchase Order:
Report Date: 11/21/2019
Approved By: Josh Huot
Order Number: T9316044
Grower:

UC Cooperative Extension
2145 Wardrobe Ave
Merced, CA 95341

Analyte	Result	Units	Optimal
pH (Water)	6.3	Units	6.45
pH (Soil)	5.7	Units	6.45
Electrical Conductivity	1.52	mmhos/cm	1.05
Soluble Salts	973	mg/L	672
Nitrate Nitrogen	7.00	ppm	35
Phosphorus (Olsen Method)	5.00	ppm	26
MicroNutrients			
Boron	0.285	ppm	0.6
Zinc	3.80	ppm	12.5
Iron	15.8	ppm	60
Copper	8.55	ppm	7
Manganese	4.37	ppm	22
Sulfate	107	ppm	38.5

Very Low | Low | Normal | High | Very High

	Exchangeable Cations Result	Base Saturation Acetate Extraction Your %	Optimal %
Potassium	46.5 ppm	2.7 %	3 - 7
Calcium	735 ppm	80.6 %	64 - 78
Magnesium	83.4 ppm	15.3 %	12 - 20
Sodium	15.1 ppm	1.5 %	< 3

Low | Normal | High

	Water Extraction Result	% Total	Extraction Ratio
Potassium	0.271 meq	1.6 %	22.8 %
Calcium	12.0 meq	72.8 %	33.2 %
Magnesium	3.60 meq	21.9 %	52.52 %
Sodium	0.613 meq	3.7 %	93.38 %

Plant Nutrient Recommendations

Nitrogen	0 Lbs/Acre	Sulfur *	
Phosphorus	0 Lbs/Acre	Boron	0 Lbs/Acre
Potassium	0 Lbs/Acre	Zinc	
Copper	0 Lbs/Acre	Manganese	0 Lbs/Acre

* If fertilizer recommendation exceeds 600 lbs (0.3 tons), multiple applications recommended
Note: All Results are on a Dry Basis
To convert ppm to lbs / acre (6 in. of surface soil weighing 2,000,000 lbs.), multiply by 2

		ESP	SAR	C:N	Ca:Mg
Total Nitrogen					
Bray Phosphorus	5.5	1	0.2		8.8
Ammonia Nitrogen			CEC	6.7 meq/100g	
Free Lime			Carbonates	None	
Nitrogen Holding Capacity	51.9 Lbs/Acre		Percolation	High	

Denele Integrated Ratios

Sodium	NO3	Potassium	Phosphorus
	-26.4		-27.8

Boron	Zinc	Iron	Copper	Manganese	Sulfate
-2.9	-13.7	-17.6	22.4	-26.6	64.1

Soil Amendment Recommendations

Lime pH Correction	0.8 Tons/Acre
Gypsum (18%) Sodium Reduction	

The micronutrients recommended are in lbs/acre on a broadcast elemental basis. If micronutrients are banded, divide the recommended value by 3. If chelated fertilizers are used, divide the recommendation by 4. Research has shown that optimum yields are obtained with nitrogen split into 2 to 4 applications. Recommended nitrogen is based on 90% efficiency of application. Highest losses of nitrogen occur with winter applications. Early spring to late summer is the optimum time to apply nitrogen.

If QC is required for this sample, please contact lab.

Turlock, CA
Ph: (209) 634-9055
Woodland, CA
Ph: (530) 666-9056
www.denelelabs.com
Fax: (209) 634-9057

Figure 1. Soil sample results from the ICL test plot location, Merced County 2020.

RESULTS

Table 2. Sweetpotato leaf analysis on July 16 and Aug 7 for coated calcium nitrate treatments.

Treatment		SMPL DATE	Total N %	P %	K %	Ca %	Mg %	B ppm	Fe ppm	Mn ppm	Cu ppm	Zn ppm	Mo ppm
1	0 lbs coated CN	**16-Jul**	5.08	0.36	3.05	0.95	0.50	55.33	164.75	192.73	17.43	30.43	1.61
2	300 lbs coated CN		5.04	0.36	3.02	0.93	0.47	47.60	158.48	153.00	17.93	31.57	0.65
3	600 lbs coated CN		5.18	0.35	3.07	1.00	0.50	48.25	155.93	173.00	17.53	31.01	1.44
	Average		5.10	0.36	3.05	0.96	0.49	50.39	159.72	172.91	17.63	31.00	1.23
	LSD 0.05		ns	ns	ns	ns	ns	4.5	ns	ns	ns	ns	ns
	CV, %		6.7	5.2	8.2	7.3	10.3	5.1	11.3	11	11	10.7	120
1	0 lbs coated CN	**7-Aug**	4.43	0.28	2.83	1.17	0.57	57.75	134.75	184.78	15.63	29.87	0.23
2	300 lbs coated CN		4.60	0.27	2.82	1.09	0.52	53.20	151.48	174.58	15.48	30.26	0.39
3	600 lbs coated CN		4.35	0.26	2.61	1.16	0.53	50.25	123.25	154.70	14.55	28.84	0.50
	Average		4.46	0.27	2.75	1.14	0.54	53.73	136.49	171.35	15.22	29.66	0.37
	LSD 0.05		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
	CV, %		8.9	5.2	6.5	7.7	7	16.6	26.2	16.6	10.1	8.9	151

LSD 0.05 Least significant difference. Means separated by less than this amount are not significantly different (ns).

CV, % Coefficient of variation, a measure of variability in the experiment.

Table 3. Sweetpotato leaf analysis on July 16 and Aug 7 for coated sulfate of potash (SOP) treatments.

Treatment		SMPL DATE	Total N %	P %	K %	Ca %	Mg %	B ppm	Fe ppm	Mn ppm	Cu ppm	Zn ppm	Mo ppm
1	no compost no K	**16-Jul**	4.85	0.29	2.61	1.21	0.54	41.05	163.38	163.45	15.90	28.00	0.15
4	no compost 500 lb/A SOP		5.06	0.29	3.62	1.12	0.53	45.05	207.00	200.88	18.70	32.12	1.12
5	no compost 520 lb/A coated SOP		4.88	0.31	3.46	1.04	0.49	43.45	195.05	208.23	18.28	31.57	0.90
6	no compost 380 lb coated SOP		5.25	0.31	3.26	0.98	0.47	45.35	180.58	225.08	18.90	34.75	0.01
5C	520 lb/A SOP + compost		4.98	0.30	3.14	0.92	0.49	51.65	193.03	169.50	16.43	29.28	0.01
6C	380 lb/A coated SOP + compost		4.84	0.32	3.41	0.84	0.42	48.88	157.53	168.08	16.75	30.31	0.01
	Average		4.98	0.30	3.25	1.02	0.49	45.90	182.76	189.20	17.49	31.00	0.37
	LSD 0.05		ns	ns	0.62	0.17	ns	6.4	ns	45.2	ns	ns	ns
	CV, %		6.3	7.7	12.7	10.9	11.7	9.3	25.3	15.8	10.8	9.5	309
1	no compost no K	**7-Aug**	4.44	0.22	1.94	1.27	0.57	41.53	144.85	193.78	15.43	27.50	0.73
4	no compost 500 lb/A SOP		4.30	0.23	2.66	0.99	0.44	42.80	158.05	206.38	17.35	29.64	0.85
5	no compost 520 lb/A coated SOP		4.53	0.23	2.68	1.02	0.49	41.73	150.08	224.18	18.13	32.28	1.29
6	no compost 380 lb coated SOP		4.40	0.22	2.39	1.15	0.58	44.23	164.13	229.35	17.40	30.37	1.27
5C	520 lb/A SOP + compost		4.60	0.25	2.61	0.92	0.48	57.20	134.80	185.10	15.20	28.80	1.75
6C	380 lb/A coated SOP + compost		4.61	0.25	2.46	0.99	0.50	51.40	139.45	190.73	16.80	29.77	0.43
	Average		4.48	0.23	2.46	1.06	0.51	46.48	148.56	204.92	16.72	29.73	1.05
	LSD 0.05		ns	0.03	0.33	0.21	ns	10.1	ns	ns	ns	ns	ns
	CV, %		4.8	7.7	8.8	13.3	18.6	14.3	21.4	17.4	12.2	11.2	179

LSD 0.05 Least significant difference. Means separated by less than this amount are not significantly different (ns).

CV, % Coefficient of variation, a measure of variability in the experiment.

Table 4. Sweetpotato cv 'Murasaki' yield as affected by dry material treatment and compost. Merced, CA, 2019.

	Treatment	TMY lbs/A	40 lb box/A No. 1's	Jumbos	Mediums	adjusted TMY box/A	bins/A	No. 1's #1%	Culls cull%
1	UTC	17834	237	9	146	392	15.7	60.3%	3.2%
2	350 lbs/A Novihum	17986	244	4	147	396	15.8	61.5%	2.6%
3	700 lbs/A Novihum	19896	282	17	139	438	17.5	64.3%	2.4%
4	500 lbs/A potassium sulfate	21806	308	16	156	480	19.2	63.7%	2.9%
5	ICL coated SOP, 520 lbs/A	21227	304	16	148	467	18.7	64.5%	4.6%
6	ICL coated SOP, 380 lbs/A	22036	301	17	168	485	19.4	60.8%	2.3%
	LSD 0.05	3401	ns	ns	ns	74.9	3.0	ns	ns
	Compost 0 tons/A	16954	227	12.1	134	373	14.9	60.5%	3.5
	7 tons/A	23307	332	13.8	167	513	20.5	64.5%	2.5
	p-test	0.02	0.01	ns	ns	0.01	0.01	ns	ns
	Treatment x compost p test	ns	ns	ns	ns	ns	ns	ns	0.02
	Average	20131	279	13	151	443	18	62.5%	3.0%
	CV, %	16.5	21.4	109	19.4	16.6	16.6	9.1	62.1

TMY — total marketable yield, the sum of No. 1's, mediums, and jumbos.
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 amount are not significantly different (ns).
CV, % — Coefficient of variation, a measure of variability in the experiment.

Table 5. Sweetpotato cv 'Murasaki' yield as affected by coated calcium nitrate rate. Merced, CA, 2019.

	Treatment	TMY lbs/A	40 lb box/A No. 1's	Jumbos	Mediums	adjusted TMY box/A	bins/A	No. 1's #1%	Culls cull%
1	chicken comost 7 T/A	15116	186	10	136	333	13	55.8%	2.1%
2	300 lbs/A ICL coated cal nitrate 13-0-0	19204	251	9	162	422	17	59.3%	3.9%
3	600 lbs/A ICL coated cal nitrate 13-0-0	21325	286	25	158	469	19	60.8%	1.8%
	Average	18548	241	15	152	408	16	58.6%	2.6%

Lost 2 of 4 reps at harvest; no statistical analysis.

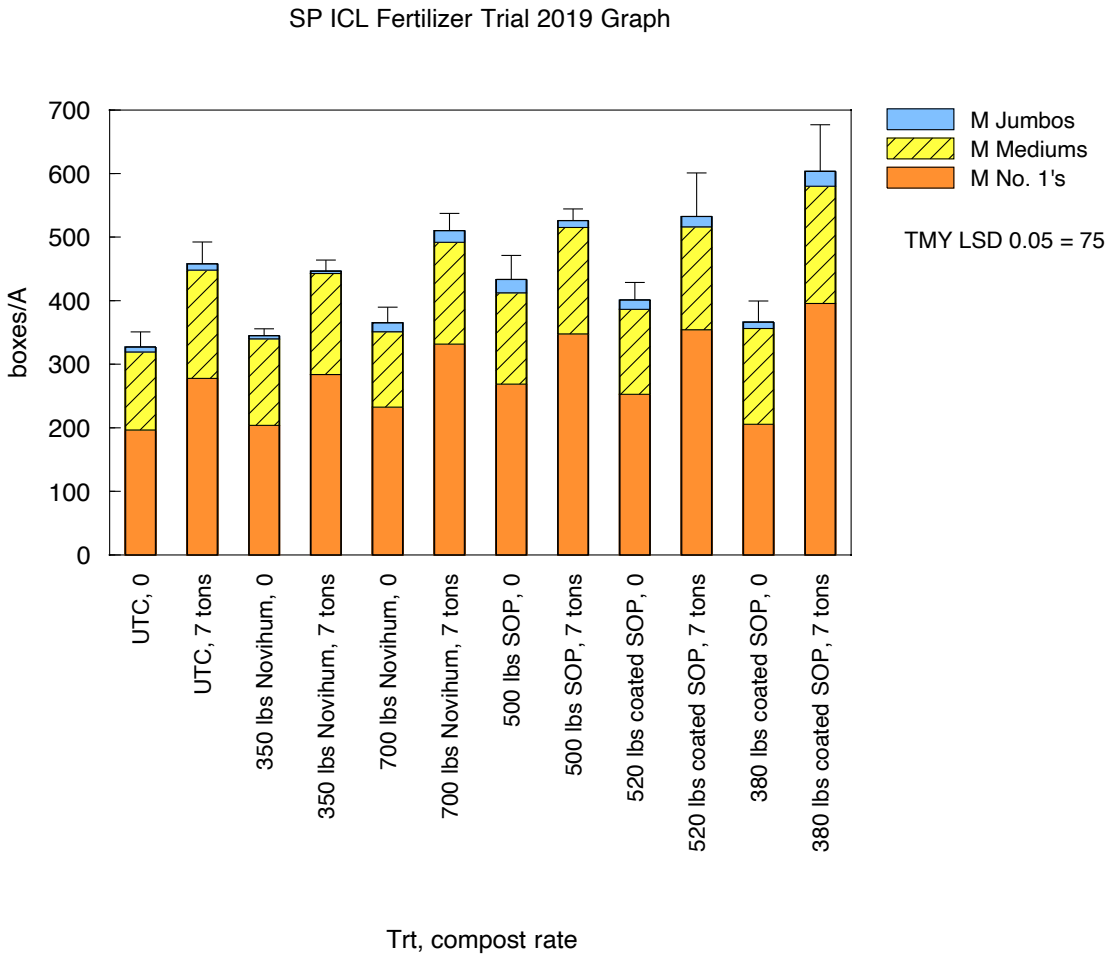


Figure 2. Murasaki sweetpotato yield as affected by chicken compost and potassium treatment. The average total marketable yield (TMY) increase with compost was 140 boxes per acre (significant at p = 0.05) and the average increase from applying SOP was 69 boxes/A (box = 40 lbs). Note: the above chart includes treatments not discussed in this report.

Novihum soil amendment on tomatoes and sweetpotatoes

Scott Stoddard, Farm Advisor
UCCE Merced County

Introduction

Novihum is a stable humus concentrate made from carbon and nitrogen-rich organic matter and has the physical appearance of a dark granular fertilizer. The product contains about 70% heat stabilized organic matter and 25% moisture, the remaining being ash. It tests at 3.5% N, however, this is mainly unavailable to plants during a growing season, and therefore the product has no significant nitrogen fertilizer value. However, it has a high Cation Exchange Equivalent of over 100 meq/100 g, thus, incorporation of this material could potentially increase soil CEC, and therefore improve nutrient holding ability and crop yield. The objective of these trials was to evaluate different rates of Novihum applied as an incorporated band on the growth and production of sweetpotatoes and processing tomatoes.

Methods.

Sweetpotato Trial. The sweetpotato test plot was established in a commercial field near Cressey in Merced County, California. The soil is classified as Atwater loamy sand deep over hardpan, acidic (pH 5.7), with low fertility (CEC 6.7, soil K 47 ppm). Soil sample results are shown in Figure 2. The fertilizer program for this field included chicken manure compost, sidedress shanked applications of a complete NPK fertilizer blend containing humic acid and micronutrients, and additional fertilizer through the drip tape. For this test, Novihum applications were made to beds both with and without compost. The chicken compost was applied as a surface band in the middle of the bed between the rows, made just before transplanting, at 7 tons/A. The field was sidedressed with 500 lbs/A of 8-8-8 liquid blend 2 weeks after transplanting. Additional fertilizer included liquid calcium nitrate -KCl blend (10-0-10) through the drip tape during the growing season to supply another 50 lbs N/A. Total N-P_2O_5-K_2O applied was about 135-80-170 lbs/A.

The Novihum and standard granular SOP were applied to the center of the bed under the drip just after transplanting to plots with and without chicken manure compost. Novihum at 350 lbs/A and 700 lbs/A were compared to 500 lbs/A of standard sulfate of potash (SOP) and an untreated control. The treatment design was a randomized block split-plot with 4 reps, with compost as the main plot and Novihum/potash as the split treatment. All treatments received 50 gallons/A 10-0-10 through the drip tape in conjunction with the rest of the field. Sweetpotato variety 'Murasaki' was mechanically transplanted on May 31 and harvested on Oct 2, 2019. Plot size was 2 rows by 40 feet. Murasaki is a high dry matter (>30%) cultivar with purple skin and white flesh, and represents about 10% of the sweetpotato market in California.

Plot background information and a listing of the treatments are shown in Table 2.

Leaf and petiole samples were taken from all plots on July 16 and August 7, 2019. Leaves with petioles were taken from the 6th leaf from the growing tip from 20 plants within each plot. Samples were air dried and submitted to Denele Laboratories in Turlock, CA, for %NPK analyses. Yields were estimated by weighing both rows in each plot using a standard 1-row harvester and the growers crew to separate the roots into #1's, mediums, jumbos, and culls.

Results

Sweetpotato Trial. Leaf and petiole results for both sampling dates are shown in Table 6. Nitrogen content (%N) in the leaves was significantly greater for the Novihum treatments as compared to the untreated plots that received compost (3.89% N). The application of 500 lbs of SOP also significantly increased the %K in the leaf tissue on both sampling dates. Compost mostly did not have any significant effect on any of the plant tissue concentrations, except for P on the second sampling date.

Harvest results are shown in Table 7. SOP and the high rate of Novihum significantly increased No. 1 root yield, SOP also significantly increased total marketable yield (TMY) over the untreated control by an average of 21.6 %. Compost also significantly increased TMY, from 14.7 to 19.4 bins/A. There was no significant compost x Novihum/SOP interaction.

Acknowledgements: Many thanks to Arron Silva (Doreva Produce) and Aaron Beene (Simplot) for their help and participation with this trial

Table 2. Trial background information and treatments for the Novihum trial on sweetpotatoes, Merced County 2019.

Cooperator:	Aaron Silva, Doreva Produce Company, Livingston CA
Location:	Palm and West, near Cressey in Merced County
	37 24'47" N by 120 38'45" W
Soil:	Atwater loamy sand deep over hardpan
Variety:	Murasaki 5/31/19 transplanted
Plot size:	1 bed (2 rows) x 40 ft, RCB-split plot with 4 reps
	9" plant spacing
Irrigation:	surface drip
Fertilizer:	7 T/A chicken comport
	10-0-10 through the drip line, 50 gallons/A Sidedress 500 lbs 8-8-8 + humic acid and Zn
	Total N-P-K: 135 – 80 – 170 (estimated)
Tissue sampling:	July 16 and August 7
Harvest:	10/2/19
Days:	124

Treatments:

Compost	1	no compost
	2	chicken compost 7 T/A
Noviihum	1	0 lbs/A
	2	350 lbs Novihum
	3	700 lbs Novihum
	4	500 lbs/A SOP granular

Compost applied May 30 as a surface band between rows
Novihum and fertilizer treatments applied June 7 as a surface band between rows
Surface drip tape placed on top of fertilizer bands
Addition N through the irrigation system during the season

Table 6. Sweetpotato leaf analysis on July 16 and Aug 7 for Novihume and potash (SOP) treatments.

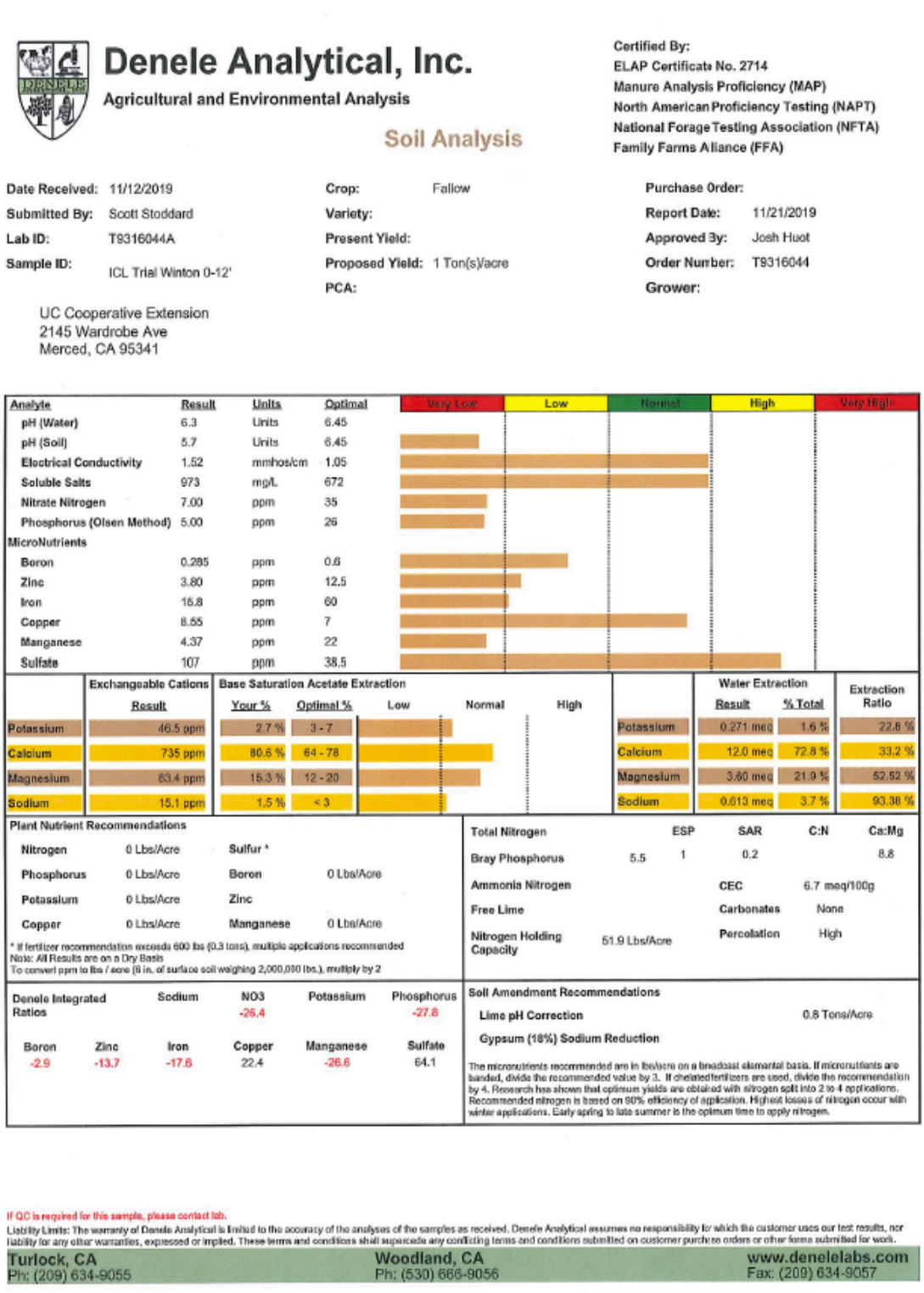
		16-Jul-19			7-Aug-19		
Treatment		**%N**	**%P**	**%K**	**%N**	**%P**	**%K**
1 0 lbs/A	no compost	4.85	0.29	2.61	4.44	0.22	1.94
	chicken compost 7 T/A	3.89	0.27	2.18	3.40	0.26	1.80
2 350 lbs Novihum	no compost	4.09	0.28	2.10	3.15	0.23	1.42
	chicken compost 7 T/A	4.23	0.27	2.21	3.39	0.26	1.80
3 700 lbs Novihum	no compost	4.18	0.29	2.00	3.25	0.24	1.54
	chicken compost 7 T/A	4.22	0.29	2.22	3.44	0.26	1.81
4 500 lbs/A SOP granular	no compost	5.06	0.29	3.62	4.30	0.23	2.66
	chicken compost 7 T/A	4.24	0.28	2.42	3.46	0.26	2.05
	LSD 0.05	0.32	ns	0.42	0.19	ns	0.17
Compost	0 tons/A	4.54	0.29	2.58	3.78	0.23	1.89
	7 tons/A	4.14	0.28	2.26	3.42	0.26	1.86
	p-test	ns	ns	ns	*	*	ns
	Treatment x compost	**	ns	*	***	ns	***
	Average	4.34	0.28	2.42	3.6	0.24	1.88
	CV, %	7.06	6.06	16.4	5.02	4.5	8.6

LSD 0.05 Least significant difference. Means separated by less than this amount are not significantly different (ns).
p-test *, **, *** significant at 0.05, 0.01, and 0.001 respectively
CV, % Coefficient of variation, a measure of variability in the experiment.

Table 7. Sweetpotato cv 'Murasaki' yield as affected by Novihum treatment and compost. Merced, CA, 2019.

	Treatment	TMY lbs/A	40 lb box/A No. 1's	Jumbos	Mediums	adjusted TMY box/A	bins/A	No. 1's #1%	Culls cull%
1	UTC	17,834	237	9	146	392	15.7	60.3%	3.2%
2	350 lbs/A Novihum	17,986	244	4	147	396	15.8	61.5%	2.6%
3	700 lbs/A Novihum	19,896	282	17	139	438	17.5	64.3%	2.4%
4	500 lbs/A potassium sulfate	21,806	308	16	156	480	19.2	63.7%	2.9%
	LSD 0.05	2,439	43.5	ns	ns	53.7	2.2	ns	ns
	Compost 0 tons/A	16,710	225	12.0	130.0	368	14.7	61.0%	2.8
	7 tons/A	22,050	310	10.8	164.2	485	19.4	64.0%	2.8
	p-test	0.01	0.01	ns	ns	0.01	0.01	ns	ns
	Treatment x compost p test	ns	ns	ns	ns	ns	ns	ns	ns
	Average	19,380	268	11.4	147.2	426	17.1	62.5%	2.8%
	CV, %	12.0	15.5	122.8	17.3	12.0	12.0	9.1	57.0

TMY	total marketable yield, the sum of No. 1's, mediums, and jumbos.
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 amount are not significantly different (ns).
CV, %	Coefficient of variation, a measure of variability in the experiment.



Denele Analytical, Inc.

Agricultural and Environmental Analysis

Soil Analysis

Certified By:
ELAP Certificate No. 2714
Manure Analysis Proficiency (MAP)
North American Proficiency Testing (NAPT)
National Forage Testing Association (NFTA)
Family Farms Alliance (FFA)

Date Received: 11/12/2019
Submitted By: Scott Stoddard
Lab ID: T9316044A
Sample ID: ICL Trial Winton 0-12'

Crop: Fallow
Variety:
Present Yield:
Proposed Yield: 1 Ton(s)/acre
PCA:

Purchase Order:
Report Date: 11/21/2019
Approved By: Josh Huot
Order Number: T9316044
Grower:

UC Cooperative Extension
2145 Wardrobe Ave
Merced, CA 95341

Analyte	Result	Units	Optimal	Very Low	Low	Normal	High	Very High
pH (Water)	6.3	Units	6.45					
pH (Soil)	5.7	Units	6.45					
Electrical Conductivity	1.52	mmhos/cm	1.05					
Soluble Salts	973	mg/L	672					
Nitrate Nitrogen	7.00	ppm	35					
Phosphorus (Olsen Method)	5.00	ppm	26					
MicroNutrients								
Boron	0.285	ppm	0.6					
Zinc	3.80	ppm	12.5					
Iron	16.8	ppm	60					
Copper	8.55	ppm	7					
Manganese	4.37	ppm	22					
Sulfate	107	ppm	38.5					

	Exchangeable Cations Result	Base Saturation Acetate Extraction Your %	Optimal %	Low	Normal	High
Potassium	46.5 ppm	2.7 %	3 - 7			
Calcium	735 ppm	80.6 %	64 - 78			
Magnesium	63.4 ppm	15.3 %	12 - 20			
Sodium	15.1 ppm	1.5 %	< 3			

	Water Extraction Result	% Total	Extraction Ratio
Potassium	0.271 meq	1.6 %	22.8 %
Calcium	12.0 meq	72.8 %	33.2 %
Magnesium	3.60 meq	21.9 %	52.52 %
Sodium	0.613 meq	3.7 %	93.38 %

Plant Nutrient Recommendations

Nitrogen	0 Lbs/Acre	Sulfur *	
Phosphorus	0 Lbs/Acre	Boron	0 Lbs/Acre
Potassium	0 Lbs/Acre	Zinc	
Copper	0 Lbs/Acre	Manganese	0 Lbs/Acre

* If fertilizer recommendation exceeds 600 lbs (0.3 tons), multiple applications recommended
Note: All Results are on a Dry Basis
To convert ppm to lbs / acre (6 in. of surface soil weighing 2,000,000 lbs.), multiply by 2

		ESP	SAR	C:N	Ca:Mg
Total Nitrogen					
Bray Phosphorus	5.5	1	0.2		8.8
Ammonia Nitrogen			CEC	6.7 meq/100g	
Free Lime			Carbonates	None	
Nitrogen Holding Capacity	51.9 Lbs/Acre		Percolation	High	

Denele Integrated Ratios

Sodium	NO3	Potassium	Phosphorus
	-26.4		-27.8

Boron	Zinc	Iron	Copper	Manganese	Sulfate
-2.9	-13.7	-17.6	22.4	-26.6	64.1

Soil Amendment Recommendations

Lime pH Correction	0.8 Tons/Acre
Gypsum (18%) Sodium Reduction	

The micronutrients recommended are in lbs/acre on a broadcast elemental basis. If micronutrients are banded, divide the recommended value by 3. If chelated fertilizers are used, divide the recommendation by 4. Research has shown that optimum yields are obtained with nitrogen split into 2 to 4 applications. Recommended nitrogen is based on 80% efficiency of application. Highest losses of nitrogen occur with winter applications. Early spring to late summer is the optimum time to apply nitrogen.

If QC is required for this sample, please contact lab.
Liability Limits: The warranty of Denele Analytical is limited to the accuracy of the analyses of the samples as received. Denele Analytical assumes no responsibility for which the customer uses our test results, nor liability for any other warranties, expressed or implied. These terms and conditions shall supercede any conflicting terms and conditions submitted on customer purchase orders or other forms submitted for work.

Turlock, CA
Ph: (209) 634-9055

Woodland, CA
Ph: (530) 666-9056

www.denelelabs.com
Fax: (209) 634-9057

Figure 2. Soil test results from the Novihum sweetpotato trial location.

Sweetpotato Nematicide Trial 2019

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Merced, CA 95341
209-385-7403
csstoddard@ucanr.edu

Introduction.
In California, soil fumigation is done both in the fall and spring in commercial sweetpotato (*Ipomea batatas*) fields to suppress root knot nematodes (RKN), predominantly *Meloidogyne incognita*, and soil insects such as wireworms (*Limonius* spp) and grubs (*Diabrotica* spp, *Phyllophaga* spp). Telone (1,3-D), metam (methyldithiocarbamate), and chloropicrin (pic) are registered for use. Unfortunately, the availability of the preferred fumigant, Telone, is insufficient to meet the needs of the industry because California restricts Telone by implementing "use caps" for the entire state. These caps limit the amount of Telone used in any year to 136,000 lbs a.i per township (640 acres), which is only 17% - 50% of demand where most sweetpotatoes are grown in the Merced County area. In response, the industry has resorted to greater use of metam potassium, shank applied before transplanting.

Regardless of material, all fumigants require a fumigation management plan to be filed with the Agriculture Commissioner prior to an application. These plans are time intensive and must be done by a certified PCA. In addition to rate restrictions, Telone and metam are also subject to numerous other regulations, including restrictions on timing, application method, and buffer zones. New nematicides offer the potential for effective alternatives for areas where fumigation is restricted, and in buffer zones where no fumigation at all is allowed.

Previous research on timing and method of application of nematicides in sweetpotatoes has evaluated preplant, at-plant, and post plant applications. Preplant broadcast applications were shanked or shallow incorporated, at-plant were delivered in the transplant water or as an in-furrow drench immediately after transplanting, and post-plant applications have been made using surface drip tape. The most effective method, timing, and rate is different depending on the nematicide. Nimitz, for example, is limited to preplant incorporated methods because of its potential phytotoxicity to the crop, while Salibro works well as a sidedress application through the drip tape.

The objective of this trial was to evaluate nematode control and crop response to shank and drip sidedress applications of Velum, Salibro, and MBI 304 on sweetpotatoes grown in commercial fields in California.

Methods.
This trial was conducted in 2019 in a commercial sweetpotato field in Merced County, CA, that had not been fumigated. Treatments included Velum (fluopyram, Bayer Crop Science), Salibro (fluazaindolizine, Corteva Agriscience), and MBI 304 (Marrone Bio Innovations) nematicides on RKN control and sweetpotato yield and quality. Treatments were designed to test different methods of application (shank

with fertilizer or drip sidedress). Untreated control plots were used for comparison. The field had been in continuous sweetpotato production for several years. Velum was initially applied 2 weeks after transplanting at the time of sidedress fertilizer application on 4-Jun-2019. Using grower equipment, 34 oz of Velum was mixed with 1.0 gallon of water, then added to a 300-gallon fertilizer tank calibrated to inject 60 gallons per acre. The fertilizer was a liquid 8-8-8 with 1 shank per row, 6" deep and 12" from the plant row; 6 rows were treated per pass. Thus, the Velum rate was 6.8 fl oz/A. Passes were about 900 feet in length and were alternated in the field to allow for untreated areas that were later shanked with just fertilizer.

At 6 and 8 weeks after transplanting, additional sidedress applications of nematicides were superimposed over the shank treatments using the drip tape. One hundred feet of a secondary drip tape between two rows (one per bed) was placed at the north end of the field, and the nematicides were added at recommended rates in 1 gallon of water during an irrigation event. Drip plots were 1 bed x 100 feet with 4 replications.

Sweetpotato variety Burgundy (root knot nematode resistant) was transplanted on May 21 and harvested on November 8. RKN sampling was performed in early July, and again in September from all plots. Samples were taken from the center of each bed to 12", 4 cores per plot. Treatment design was a randomized block with four replications. Means separation was performed using Fisher's protected LSD at P=0.05.

Treatment details and site information is shown in Table 1.

Results

There were some initial compatibility issues with Velum and the fertilizer blend – the Velum coagulated and did not go readily into solution even with agitation. This was remedied by first diluting Velum into water, then adding to the fertilizer tank.

Average end-of-season RKN counts were 703 J2's/250 g soil and were not significantly different between treatments (Table 2). These numbers are very high (~ 1500 per pint), and as a result there were a significant number of roots with nematode damage even though Burgundy is a resistant variety. However, there was no difference in the cull % between any of the treatments (11%), and most of the culled roots were a result of nematode damage (cracking, pimpling, poor skin color). Total marketable yield (TMY) and #1 yield were significantly

increased with all the treatments as compared to the untreated control (UTC), however, drip applications performed better in this trial location (Table 3 and Figure 1). Velum drip applied at 6 and 8 weeks, Salibro, and MBI-304 had better yield than the plots where Velum was shanked with the fertilizer. Average drip application yield had a 37% increase in TMY as compared to the untreated plots.

Over 3 years of evaluating different methods of nematicide application, shank applications on average have not performed as well as other methods of application such as preplant broadcast followed by mechanical incorporation or drip applications around 6 weeks after transplanting (Table 4).

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Table 1. Nematicide treatment rate and timings to sweetpotatoes, Merced County 2019.

Objective:	Evaluate efficacy of sidedressed and drip applied nematicides in sweetpotatoes
Location:	Bear Creek Ranch, south of Hwy 140
	37 17'39.0" N 120 48'33.0"
Soil:	Hilmar loamy sand, slightly saline-alkali
Cooperator:	Nolan Mininger, Mininger Farms
Variety:	Burgundy, transplanted May 21
Application:	Velum sidedressed June 4, 2019
	see treatments for other application dates
Fertilzer:	liquid 8-8-8 at 6" deep and 8" OC, 60 gallons per acre
Sampling:	Soil RKN nematode sampling on July 9 & Sept 16
Harvest:	Nov 8 and 11, 2019, 1 bed per treatment x 100 feet
	Machine harvest, grower crew sorted by size and grade
Plot Design:	RCB with 4 reps
	sidedress plots 3 beds (20 ft) x ~ 900 ft long
	chemigation plots 100 ft long x 1 bed (6.67 ft)

	Treatments:	application date:	
1	UTC	---	---
2	Velum 6.8 fl oz sidedress with fertilizer 2 WA	6/4/19	---
3	Velum 6.8 sidedress + drip 6.8 fl oz/A	6/4/19	7/9/19
4	Velum drip 6.8 fl oz 2X	7/9/19	7/24/19
5	Salibro drip 31 fl oz 2X	7/9/19	7/24/19
6	MBI 304 drip 4 lbs/A 2X	7/9/19	7/24/19

All treatments diluted in water prior to application.

Table 2. Soil sampling nematode results, sweetpotato nematode trial Merced County 2019.

		17-Sep J2's/250 cc soil			11-Jul	
		Root Knot	Stubby Root	Ring	Root Knot	Subby Root
	treatment	Meloidogyne	Paratrichodorus	MX	Meloidogyne	Paratrichodorus
1	UTC	373	4	914	4	9
2	Velum 6.8 fl oz sidedress with fertilizer 2 WAT	920	26	2	1	2
3	Velum 6.8 sidedress + drip 6.8 fl oz/A	787	14	0	---	---
4	Velum drip 6.8 fl oz 2X	722	14	3	---	---
5	Salibro drip 31 fl oz 2X	497	9	4	---	---
6	MBI 304 drip 4 lbs/A 2X	921	13	102	---	---
	Average	703	13	171	2.5	5.5
	LSD 0.05	ns	ns	---	---	---
	CV, %	77.9	114	---	---	---

LSD 0.05 = Least significant difference at 95% confidence level. NS = not significant.

July 11 sampling only on sidedress treatments as drip applications had not started.

10 cores per plot, center of bed, 0-12" depth

Table 3. Sweetpotato yield and grade as affected by nematicide treatment, Merced 2019.

		TMY	40	lb box/A		adjusted TMY		No. 1's	Culls
	Treatment	lbs/A	No. 1's	Mediums	Jumbos	box/A	bins/A	#1%	cull%
1	UTC	18282	266	111	25	402	16.1	66.4%	12.9%
2	Velum 6.8 fl oz sidedress with fertilizer 2 WAT	22267	345	130	15	490	19.6	70.4%	5.3%
3	Velum 6.8 sidedress + drip 6.8 fl oz/A	20843	305	131	22	459	18.3	66.1%	13.1%
4	Velum drip 6.8 fl oz 2X	23208	345	110	56	511	20.4	67.7%	13.6%
5	Salibro drip 31 fl oz 2X	25358	360	134	64	558	22.3	64.7%	11.0%
6	MBI 304 drip 4 lbs/A 2X	26451	412	122	48	582	23.3	70.7%	10.4%
	Average	22735	339	123	38	500	20.0	67.6%	11.1%
	LSD 0.05	4319	71	ns	25.4	95	3.8	ns	ns
	CV, %	12.6	13.9	12.7	43.9	12.6	12.6	4.3	34.1

TMY total marketable yield, the sum of No. 1's, mediums, and jumbos.

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 amount are not significantly different (ns).

CV, % Coefficient of variation, a measure of variability in the experiment.

Table 4. Yield differences between method of Velum nematicide application in commercial sweetpotato fields, Merced County 2017 - 2019.

Year	UTC TMY bins/A	Velum PPI TMY bins/A	Velum drip TMY bins/A	significant p=0.05	drip v UTC %	PPI v UTC %
2017	42.0	---	39.6	ns	-5.7%	
2017	35.3	32.0	---	ns		-9.3%
2018	23.7	25.9	---	ns		9.3%
2018	25.7	---	32.0	*	24.5%	
2019	16.1	19.6	20.4	*	26.7%	21.7%
				AVERAGE	**15.2%**	**7.2%**

TMY = Total marketable yield. 1 bin is approximately 1000 lbs.
Statistical test comparing UTC to highest yielding fungicide within year at 95% confidence. NS = not significant.

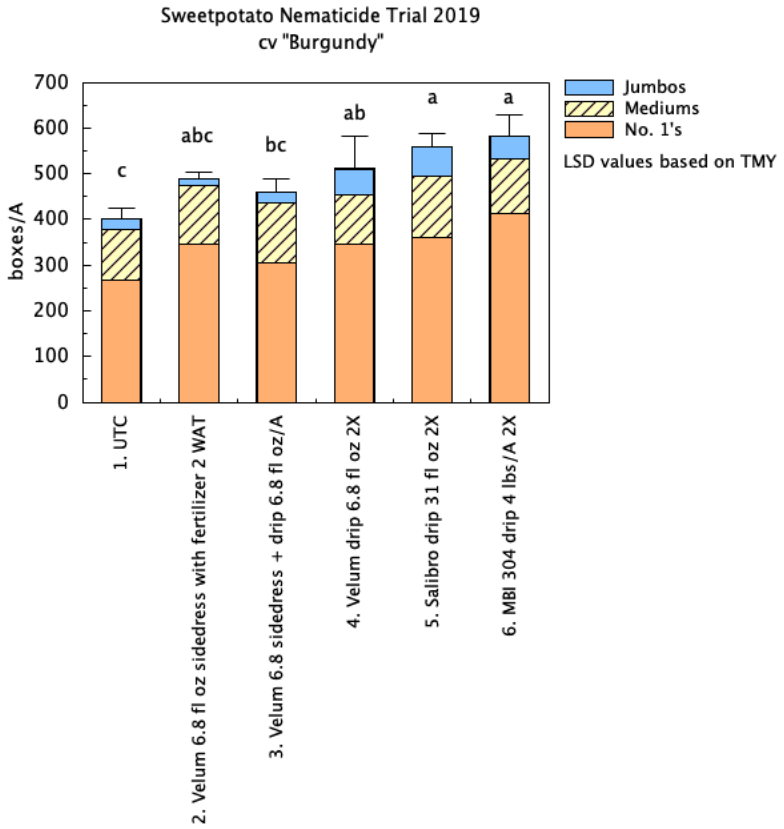

Figure 1. Sweetpotato yield as affected by nematicide treatment, Merced County 2019.

Southern Blight fungicide trial on sweetpotatoes 2019
Scott Stoddard, UCCE Merced County

SUMMARY

Objective of this trial was to evaluate the efficacy of several different commercial fungicides on the control of southern blight (Sclerotium rolfsii) in sweetpotato hotbeds. Five fungicides plus an untreated control were evaluated using a randomized block design with 4 reps in an established hotbed showing symptoms of this disease. The variety was Diane, bedded about 6 weeks prior to the start of the treatments. Fungicides were applied with a backpack CO_2 hand sprayer using the equivalent of 120 gpa and were then watered in using the established irrigation system. Latron B NIS adjuvant was added to the Quadris, Aprovia Top, and Fontelis treatments. Fungicides were applied 3 times with 7 days between applications. A subjective disease evaluation was made after the second application (April 24). Plots were harvested May 15 by cutting all within a 2 ft x 2 ft square and separating into "infected" and "clean" plants based on visual observation of disease symptoms.

Disease incidence was well advanced at the onset of this experiment. There appeared to be a significant reduction in disease incidence for the fungicide treatments as compared to the untreated control on April 24, however, there were no statistical difference in the percentage of infected plants between any of the treatments at plant harvest on May 15 (Figure 1 and Table 1). While K-Phyte at 4 qts/A had 34% infected plants as compared to 52% in the untreated plots, extremely high variability prevents this difference from being statistically different. Best plant production occurred in the K-Phyte 4 qts/A and the Quadris treatments, at 180 and 172 plants/4 sq ft, respectively.

The late start for the fungicide applications were likely the reason for minimal disease reduction in this test. Additional work is planned for 2020.

Table 1. Southern blight disease on Diane sweetpotatoes as affected by fungicide treatment, Merced County 2019.

Treatment	24-Apr 0 - 10 Score	Disease %	15-May clean plants #/4 sq ft	infected %	infected arcsin corr.
1. UTC (adjuvant only)	3.75	31.8	113.3	52.2%	46.08
2. K-Phyte 2 qts/A	2.75	19.0	110.0	52.9%	46.71
3. K-Phyte 4 qts/A	1.50	7.1	180.0	33.9%	32.34
4. Botran 5F 4.8 oz/3500 sq ft fb Aprovia Top 13.5 fl oz/A 2X	1.50	6.3	135.0	45.1%	41.22
5. Quadris 14 fl oz/A + adjuvant	2.00	12.5	171.8	38.9%	37.52
6. Fontelis 30 fl oz/A + adjuvant	2.50	16.4	105.8	47.8%	45.34
Average	2.33	15.50	136.0	45.1%	41.54
LSD 0.05	1.4	---	ns	ns	ns
CV, %	39.1	---	65.9	70.6	50.9

0 - 10 subjective score: 0 = no disease, 5 = 50% of plants, 10 = 100% of plants

Disease % based on score ratings.

LSD 0.05 = Least significant difference at the 95% confidence interval. NS = not significant.

CV = coefficient of variation

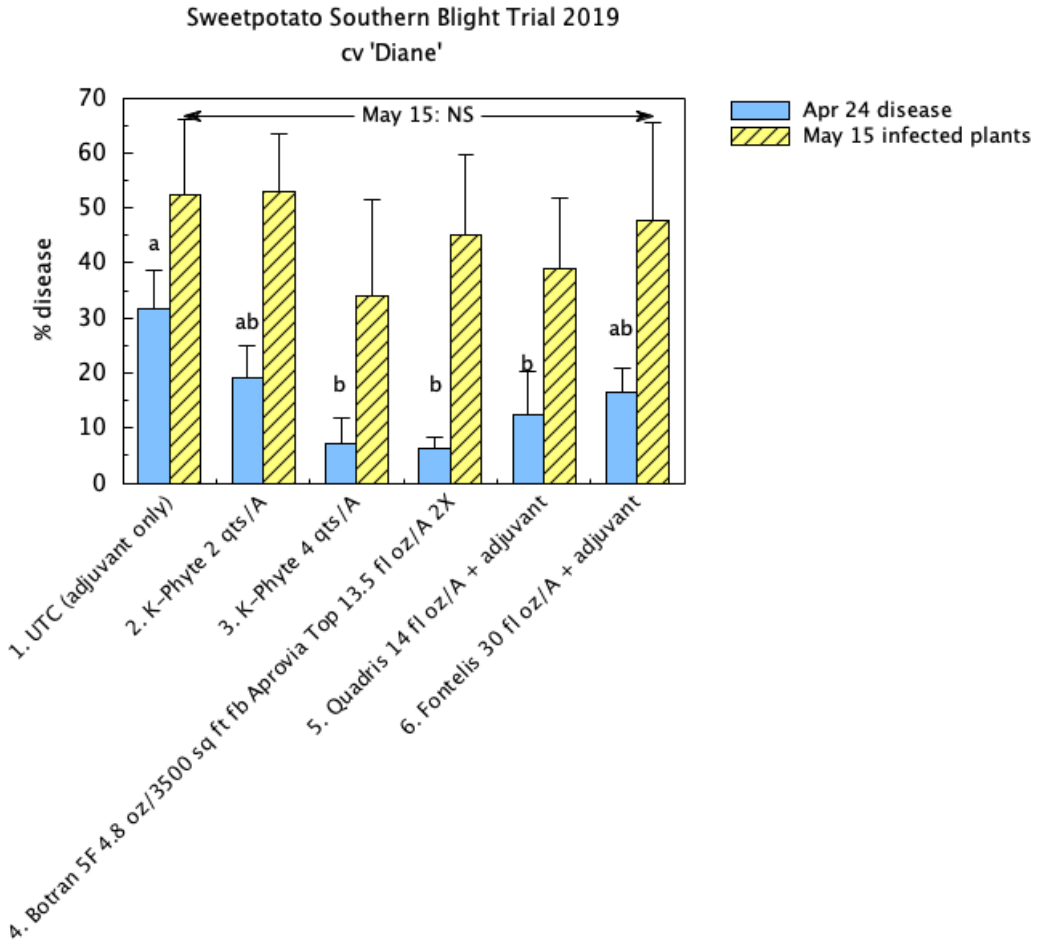

Figure 1. Disease incidence was initially suppressed by the fungicide treatments, but the number of infected plants at final cutting was not significantly different.

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