Sweetpotato Research Progress Report 2021

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Table of Contents:

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Sweetpotato Collaborators Trial -- 2021

The first of two screening trials. This location was with Quail H Farms, south of Livingston, CA. Soil type was Hilmar loamy sand, slightly saline (pH 6.4, EC 1.87, Na 12.6% base sat). Conventional field, fumigated with metam-K prior to planting. Drip irrigated, water quality marginal.
Dry winter with below average precipitation, windy spring and fall, summer temperatures above average + wildfire smoke.
1 -row plots, 75 plants long, 10" spacing. machine harvested and sorted by grower crew. Cracks, splits, RC and RKN damage in some.

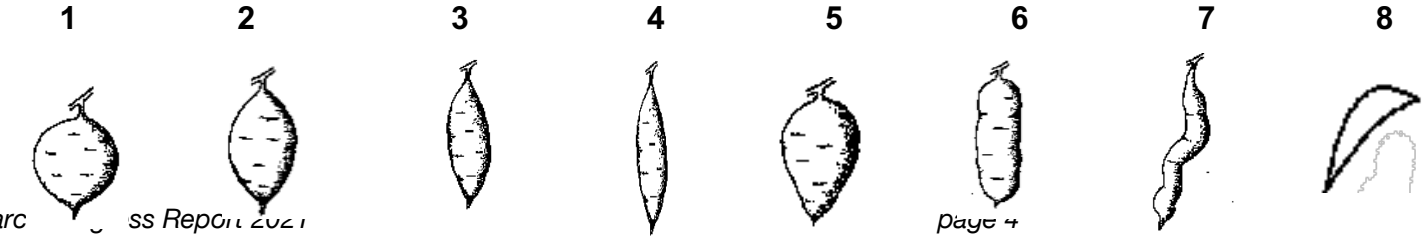
Rep	Var#	Variety Name	Skin Color	Skin Text	Flesh color	Eyes	Lents	Shape	Shape Uniform	Overall App	Comments
1	1	L-13-81 G2	purple	8	4	9	7	2, 3, 8	7	9	excellent
2											
1	2	L-14-31	dusty red	7	4	7	5	5,6	7	7	CV
2											
1	3	NC-09-122	dull purple	7	3	7	5	3,8	8	7	good shape
2											
1	4	NC11-0234	dull red	5	4	7	3	2, 3, 6	5	6	skin color off, lents
2											
1	5	Covington	Rose Cu	7	3	5	5	3,6	7	7	dull color
2											
1	6	Orleans	Cu	3	3	5	5	2,6	5	4	grooves, bumps, rough skin, CV
2											
1	7	Beauregard (G2)	Rose Cu	5	3	7	7	3, 6, 8	5	6	lumpy, rough, CV, RKN
2											
1	8	Bellevue	Orange	9	4	9	7	2, 8	5	7	chunky tear drops, some CV
2											
1	9	Bonita	tan	8	1	5	3	4, 5, 8	6	6	prominent lents and dark eyes
2											
1	10	Diane	red	3	4	5	3	3, 4	5	4	dark lents and lumpy
2											
1	11	L-16-173	Ruse Cu	7	3	7	7	long	8	7	long tails, some rough
2											
1	12	NC-13-604	Cream	7	1	5	7	3, 6	8	6	too round. High plant loss
2											
1	13	NC-13-151	purple	7	3	5	7	2, 5	8	9	looks nice

2											
1	14	NC09-119	Cu Rose	7	4	7	7	2, 6	7	8	similar to Cov, good shape
2											
1	15	NC10-0118	Cu orange	5	4	7	5	4, 7	7	7	lents, but otherwise attractive
2											
1	16	NC15-0185	Rose Cu	3	3	7	5	4, 7	5	5	rough skin, CV, veins
2											
1	17	L-14-11	Red	8	3	9	5	2, 3	8	8	nice red, little long
2											
1	18	L-17-171	Red	7	3	5	7	7, 8	5	6	lumpy, long, dull color
2											

Skin color:	**Skin Texture:**	**Flesh Color:**	**Eyes:**	**Lenticels:**
cream (Hanna)	1 = very rough	0 = white	1 = very deep	1 = very prominent
Tan	3 = moderately rough	1 = cream	3 = deep	3 = prominent
copper (Jewel)	5 = moderately smooth	2 = yellow	5 = moderate	5 = moderate
Rose (Beau)	7 = smooth	3 = orange	7 = shallow	7 = few
Purple (Garnet)	9 = very smooth	4 = deep orange	9 = very shallow	9 = none
		5 = very deep orange		

Shape:	**Shape Uniformity:**	**Overall Appearance:**	
1 = round	1 = very poor	1 = very poor	
2 = round-elliptical	3 = poor	3 = poor	**All ratings made on #1 roots.**
3 = elliptic	5 = moderate	5 = moderate	**YCR = yellow cortical ring**
4 = long elliptic	7 = good	7 = good	**RC = Russet Crack**
5 = ovoid	9 = excellent	9 = excellent	**RKN = root knot nematode**
6 = blocky			**LG = longitudinal grooves**
7 = irregular			**CV = color variation end to end**
8 = asymmetric			**WW = wireworm damage**

Shapes



NATIONAL SWEETPOTATO COLLABORATORS SUMMARY OF DATA

2021

STATE AND LOCATION REPORTING: Livingston, CA
DATE TRANSPLANTED: 5/24/2021. DATE HARVESTED: 10/13/2021. No. GROWING DAYS: 142
DISTANCE BETEEN ROWS (in): 40. DISTANCE IN ROW (in): 10
PLOT SIZE: NO. OF ROWS: 1 LENGTH (ft): 60 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.

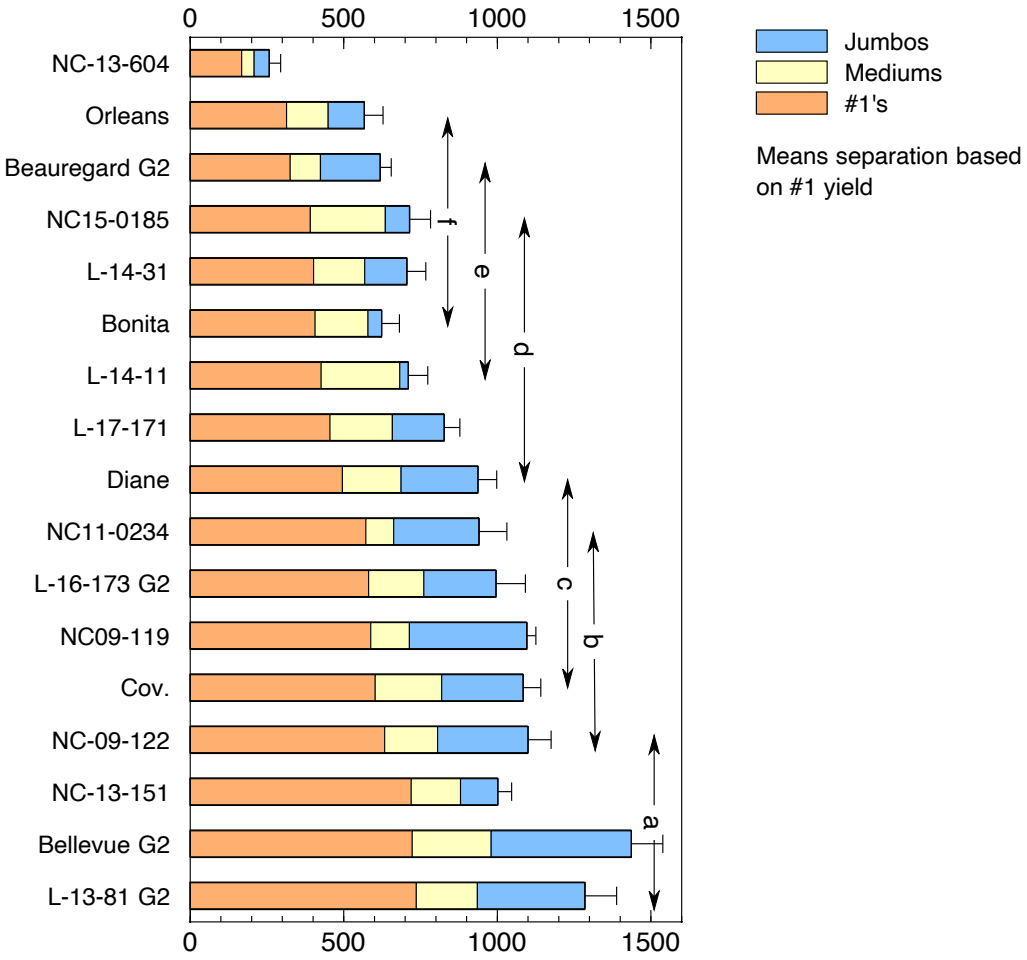
			-------	40 lb box/A		-------	total	%	%	
#	SELECTION	CLASS	US #1's	Medium	Jumbo	MKT YIELD	BINS/A	US #1's	CULLS	L:D
20	L-13-81 G2	red	736	198	350	1285	64.2	57.6%	4.9%	
21	Bellevue G2	yam	723	257	456	1436	71.8	50.6%	5.0%	
13	NC-13-151	red	719	161	121	1001	50.1	72.0%	12.0%	
3	NC-09-122	red	633	172	294	1100	55.0	57.6%	17.5%	
5	Cov.	yam	602	217	265	1084	54.2	55.8%	7.8%	
14	NC09-119	yam	588	126	382	1096	54.8	53.7%	13.6%	
11	L-16-173 G2	yam	581	180	235	995	49.8	58.4%	7.9%	
4	NC11-0234	red	572	91	277	940	47.0	61.4%	16.5%	
10	Diane	red	495	191	250	937	46.8	52.7%	16.3%	
18	L-17-171	red	455	203	168	827	41.3	55.3%	17.3%	
17	L-14-11	red	426	256	28	710	35.5	60.1%	11.2%	
9	Bonita	sweet	407	172	44	623	31.2	65.1%	12.9%	
2	L-14-31	red	402	167	137	706	35.3	56.7%	6.8%	
16	NC15-0185	yam	391	244	79	714	35.7	54.4%	19.1%	
19	Beauregard G2	yam	325	98	195	618	30.9	52.7%	21.9%	
6	Orleans	yam	314	135	118	567	28.3	55.5%	23.1%	
12	NC-13-604	sweet	167	41	49	257	12.9	65.2%	7.6%	
15	NC10-0118 *	yam	632	122	275	1029	51.5	63.3%	12.3%	
	Average		502	171	203	876	43.8	57.9%	13.0%	
	LSD 0.05		112.0	57.4	103.2	194.0	9.7	7.4%	9.0%	
	CV, %		15.7	23.6	35.8	15.5	15.5	9.0	48.3	

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 20 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.
L:D	Length to diameter ratio (10 root sample)
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.
NC10-0118 *	not included in statistical analysis

Sweetpotato Collaborators Trial 2021

Livingston, CA

boxes per A



boxes per A

SCORE SHEET FOR EVALUATION OF SWEETPOTATO SPROUT PRODUCTION - NSPCG TRIAL

Date bedded: 2/23/21 Location: Bear Creek Ranch, south of Hwy 140
Date Evaluated: 4/14/21 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	L-13-81 G5	yes	4	3	2	5	dark green
2	L-14-31	yes	2	2	1		dark green, slow
3	NC-09-122	yes	3	2	2		lg lvs, vining
4	NC11-0234	yes	3	4	2		dark green uniform
5	Cov.	yes	3	3	2		
6	Orleans G5	yes	2	2	1		late, slow, variable
7	Beauregard G5	yes	2	2	1		late, slow, variable
8	Bellevue	yes	1	1	1		dk purple, poor emergence
9	Bonita	yes	3	4	1		slow but uniform
10	Diane	yes	5	5	3		good
11	L-16-173	yes	---	---	---	5	different bed
12	NC-13-604	yes	5	5	3		all green
13	NC-13-151	yes	4	4	3		dark green
14	NC09-119	yes	3	4	1		dk green/purple, slow
15	NC10-0118	yes	2	1	2		green and variable emergence
16	NC15-0185	yes	4	3	2		dark green
17	L-14-11	yes	4	4	2		dark green/purple
18	L-17-171	yes	4	4	3		all green
19	Beauregard G2	yes	5	5	3		dk green, good production
20	L-13-81 G2	yes	---	---	---	5	new seed bed
21	Bellevue G2	yes	---	---	---	5	new seed bed

(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. Not applicable this year

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

Nat'l Sweet Potato Collaborator's Trial - 2021 **Kern County Trial Site**

Scott Stoddard, UCCE Merced County

Location: Valpredo and Campbell Rds, Mettler, CA
35°04'24.26" N 118°57'06.58" W
Soil: Excelsior sandy loam
Cooperator: Country Sweet
Bedded:
Transplanted: 6/10/21
Harvest: 11/11/21
Days: 154

1-row plots
50 plants, 10" spacing, about 40 ft per plot
CRD with 3 reps
Organic field, sprinkler irrigated

2021 National Sweetpotato Collaborators Trial yield and grade results, Bakersfield, CA.

#	Variety	40 lb box/A adj No. 1's	Meds	Jumbos	adj TMY box/A	total bins/A	No. 1's #1%	Culls cull%	harvest comments
1	L-13-81	22	111	0	133	6.6	10.4%	29.2%	poor yield
2	L-14-31	169	238	4	409	20.4	40.4%	22.7%	splits, growth cracks
3	NC-09-122	123	234	0	357	17.8	34.8%	27.6%	
4	NC13-151	116	219	0	335	16.7	30.6%	16.7%	growth cracks, long
5	Cov.	290	292	0	582	29.1	49.1%	14.8%	grub damage
6	L-17-182	109	399	0	508	25.4	23.9%	6.9%	nice red, tails
7	L-16-173	177	326	0	503	25.1	35.9%	18.7%	long, cuts
8	Bellevue	229	336	0	565	28.2	40.4%	10.2%	cuts, tails, WW
9	L-16-278	94	130	0	228	11.4	42.6%	44.8%	too long, poor shape
10	Diane	78	147	0	225	11.2	35.2%	36.5%	
11	Beauregard G2	194	102	30	326	16.3	56.9%	35.0%	
12	NC13-604	90	267	0	357	17.8	25.2%	14.0%	cuts, tails
17	L-14-11	0	87	0	87	4.4	0.0%	48.4%	
18	L-17-171	63	311	0	375	18.7	16.5%	13.5%	long, cuts
	Average	126	225	2.6	353	17.6	32.4	25.1	
	LSD 0.05	103	140	---	190	9.5	16.4	18.2	
	CV,%	49.1	37.4	---	32.2	32.2	30.2	43.5	

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 Yielc Total marketable yield is the sum of the above three categories.
bins/A bins/A are estimated based on market box yield assuming 20 boxes (17.6 Bu) per bin.
% US #1 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.

Advanced Line Trial 2021

Location: Atwater Jordan, and Bert Crane Rds, near Atwater
Cooperator: Dave Souza
Bedded: 2/18/21
Transplant: 5/25/21
Harvest: 9/27/21
Days: 125

50 plant plots on 12" spacing, 1-row per variety
CRD with 4 reps for some varieties

Sweetpotato ALT 2021 yield and grade results, replicated lines (n = 4). Merced County 2021.

		40 lb box/A adj			adj TMY	total	No. 1's	Culls
	variety	No. 1's	Meds	Jumbos	box/A	bins/A	#1%	cull%
1	Bellevue	733	277	319	1329	66.5	55.0%	0.4%
2	Diane	704	468	85	1257	62.8	55.7%	1.0%
3	L-13-81	509	284	182	974	48.7	52.5%	1.8%
4	L-14-11	425	217	162	804	40.2	52.7%	1.2%
5	L-15-39	544	200	229	973	48.6	55.9%	0.1%
6	L-16-173	442	268	171	881	44.1	50.3%	4.1%
7	L-16-298	271	456	47	774	38.7	34.9%	1.3%
8	L-17-171	894	466	358	1718	85.9	52.0%	0.8%
9	L-17-182	654	422	167	1242	62.1	52.4%	0.8%
10	L-17-189	477	422	39	938	46.9	50.3%	2.9%
11	L-19-25	443	256	212	911	45.6	48.4%	1.4%
12	L-19-53P	361	263	131	755	37.7	47.9%	0.6%
13	L-19-56P	327	350	135	812	40.6	40.2%	0.2%
14	NC13-151	509	370	101	981	49.0	51.5%	0.5%
	Average	521	337	167	1025	51.2	50.0%	1.2%
	LSD 0.05	161.6	92.2	130.6	241	12.1	6.3	ns
	CV,%	18.3	16.8	44.8	14.0	14.0	7.6	169.0

Sweetpotato ALT 2021 yield and grade results, non-replicated lines. Merced County 2021.

	40 lb box/A adj			adj TMY	total	No. 1's	Culls
variety	No. 1's	Meds	Jumbos	box/A	bins/A	#1%	cull%
NC13-604	182	359	18	559	27.9	32%	1%
L-19-6P	332	343	33	709	35.4	47%	5%
L-19-93	392	246	327	966	48.3	41%	0%
L-19-46	343	371	44	758	37.9	45%	11%
L-19-118	698	386	368	1451	72.6	48%	0%
L-19-120	363	252	248	863	43.1	42%	5%
L-19-18	619	278	460	1357	67.9	46%	1%
Average	418	319	214	952	47.6	43%	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 20 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 2021

Date bedded: 2/18/21 Location: Cressy and McSwain Rds, near Atwater
Date Evaluated: 3/31/21 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)	Earliness 1-3 (3)	Root Conditions 1-5 (4)	Remarks (5)
NC-13-604	yes	5	5	3	5	all green
L-16-173	yes	3	3	2		dark green
L-19-118	yes	3	3	3		dark green
L-19-25	yes	4	4	3		dark green
L-13-81	yes	3	4	2		dark green w/ purple new growth
L-19-18	yes	2	2	1		dark green/purple
L-16-298	yes	4	3	2		dark green
L-19-29	yes	4	3	3		dark green
L-19-120	yes	3	4	2		dark green/purple
L-17-182	yes	3	4	1		dark green/purple
L-19-53	yes	3	2	2		dark green/purple
L-19-55P	yes	1	1	1		green
L-15-39	yes	4	4	2		all green
NC13-151	yes	5	5	3		dark green
L-14-11	yes	3	5	2		dark green w/ purple new growth
L-19-86	yes	3	4	2		dark green
L-19-110P	yes	2	1	1		mostly purple
L-16-26P	yes	0	0	0		no plants
L-17-182	yes	4	4	2		green
L-19-52	yes	3	3	2		dark green/purple
L-17-171	yes	4	5	3		dark green
L-19-6P	yes	3	2	2		lacy, purple new growth
L-19-46	yes	2	2	1		green
L-19-93	yes	4	3	2		all green
DIANE	yes	4	4	3		all green

(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.

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

POLY-4 Potassium Fertilizer Trial on Sweetpotatoes, 2021

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Introduction

The objective of this trial was to evaluate the leaf and yield response to Anglo-American's POLY-4 potassium fertilizer in drip irrigated sweetpotatoes in California.

METHODS

This trial was established in a commercial field near Winton in Merced County, California. The soil is classified as Atwater sand 0 – 3% slope, slightly acidic (pH 6.7), with low fertility (CEC 5.6 meq/100 g). At this location, pre-treatment composite soil samples were 150 ppm K and base saturation was 8.6% (high). Composite soil sample results are shown in Appendix 1. The growers standard 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 N fertilizer through the drip tape. The chicken compost was applied as a surface band in the middle of the bed between the rows, made just before transplanting, at 5 tons/A. The field was sidedressed with 50 gallons/A of 6.6 – 6.6 – 6.2 liquid blend ~4 weeks after transplanting. Additional fertilizer included liquid calcium nitrate (17-0-0) through the drip tape during the growing season to supply additional N. Total N-P_2O_5-K_2O applied was about 200-35-33 lbs/A, not including contributions from the compost or what was applied by this experiment.

This trial consisted of the grower's standard program with the addition of 164 to 193 lbs K_2O/A from sulfate of potash (SOP, 0-0-50), POLY-4 (0-0-14), or blends of these two products. Plots were 20 ft wide x 275 feet long (half the length of the field) and were arranged in a randomized complete block design with 4 replications. The fertilizer applications were made to the beds using a commercial fertilizer spreader borrowed from Simplot that shanked dry material 10" to each side of the drip tape at about 4 – 6" depth. The fertilizer blends were made by mixing products by hand before pouring into the spreader (Figure 1). Applications were made on May 26 when the plants had about 1 foot across and not yet started to vine-out. Because each treatment consisted of a different blend ranging from 0% POLY-4 to 100% POLY-4, product application rates changed between treatments. The spreader was calibrated between treatments to deliver a target K application of 150 lbs K_2O/A (Figure 2). Actual application rates were

verified by weighing the fertilizer before and after treatment. Actual rates from 131 to 160 lbs K_2O per (Table 1).

Figure 1. Fertilizer blends were done by hand in small batches.

each ranged acre

Sweetpotato variety 'Bonita' transplanted on 17-April and harvested on 22-Sept-2021. is a high yielding, tan skin, flesh variety and represents 15% of the sweetpotato in California.

was

Bonita white about market

Plot background information listing of the treatments is in Table 1.

and a shown

Leaf and petiole samples taken from all plots on June July 7, 2021. 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 Labs in Turlock, CA, for grinding and K analysis. In-season NVDI measurements were taken using a handheld GreenSeeker crop sensor (Trimble) from 20 ft of row from the center of each plot on July 7, 2021. Late season soil samples were taken at 0-12" depth from each plot per treatment using a standard 7/8" diameter soil probe and 10 cores per plot and composited. Samples were taken from the center of each plot below the drip tape. Yields were estimated by weighing both rows from the center of each plot using a standard 1-row harvester and the growers crew to separate the roots into #1's, mediums, jumbos, and culls.

were 18 and

Figure 2. Actual application rates were determined by weighing the amount of product remaining after treatment.

Table 1. Trial background information and treatments.

Cooperator:	Jed Kruppa, Kruppa Farms
Location:	SE corner of Almond and Vine Rd, west of Winton, CA
	37 22'48.41" N 120 37'43.31" W
Soil Type:	Atwater Sand
Variety:	Bonita
Transplant:	4/17/21
Plot Size:	3 beds by 275+ ft
Irrigation:	surface drip
Fertilizer	Grower program:
	Simplot 6.6 - 6.6 - 6.2 @ 50 gpa PPI
	CAN17 at 10 gpa applied 10 times during the season
	5 tons/A compost
Sampling:	Leaf: June 18 and July 7
	Soil: Sept 1
Harvest:	9/22/21 Harvest center bed from each plot
Days:	158

Fertilizer Treatment and rate		K2O/A
1	Pre Plant 6-6-6 @ 50 gpa	33
2	SOP @320 lbs/A	193
3	60% SOP/40% Poly Blend @ 368 lbs/A	164
4	40% SOP/60% Poly Blend @ 533 lbs/A	183
5	Poly 4, 0-0-14 @ 1141 lbs/A	193

applied May 26, 2021,, with grower equipment
shanked 10" off-center, 6" deep on both sides of tape
RCBD with 4 reps
Harvest from center row of each plot

Results.

Leaf and end of season soil sample results for K are shown in Table 2. There was no significant difference between any of the K treatments in this trial and the low rate of potash (33 lbs/A) on %K in the leaves. NVDI values were also very similar across treatments (NVDI measure "greenness" of the crop canopy and therefore this result is not unexpected). Because soil samples were composited, no statistical comparisons could be made. Average soil K was 112 ppm, however, this includes the relative low values found in the 100% POLY-4 treatment and therefore may not be indicative of the field as a whole.

Yield results are shown in Table 3 and Figure 3. Despite showing no significant increase in leaf K, all potassium treatments significantly increased yield above the control plots that did not receive supplemental K fertilizer. However, there was no significant difference between straight SOP and any of the POLY-4 blends. There was also no correlation between total marketable yield (TMY) and end of the season soil K (Figure 5) – yields were just as high at 75 ppm K as 150 ppm. Based on the results of this trial and many others I have conducted since 2000, a fall soil sample is an unreliable indicator for sweetpotato crop response to applied potassium fertilizer. Potash rates are better determined by potential yield: 5 lbs K_2O per harvested bin to replace what is removed from the field.

Acknowledgements. Many thanks to Jed Kruppa with Kruppa Farms for his help and cooperation with this trial.

Table 2. Sweetpotato Poly-4 K trial leaf and soil analyses results, Merced County 2021.

	Fertilizer Treatment and rate	lbs K2O/A	18-Jun leaf %K	7-Jul leaf %K	7-Jul NVDI	soil K ppm
1	Pre Plant 6-6-6 @ 50 gpa	33	2.73	4.13	0.82	95.8
2	SOP @320 lbs/A	193	2.69	4.53	0.79	134.0
3	60% SOP/40% Poly Blend @ 368 lbs/A	164	2.85	4.40	0.80	110.0
4	40% SOP/60% Poly Blend @ 533 lbs/A	183	2.87	4.53	0.79	152.0
5	Poly 4, 0-0-14 @ 1141 lbs/A	193	2.86	3.68	0.79	68.6
	Average		2.80	4.25	0.80	112.1
	LSD 0.10		0.14	0.74	ns	---
	CV, %		4.0	14.2	2.7	---

Grower program: 6.6-6.6-6.2 at 50 gpa PPI then CAN17 at 100 gpa in-season through drip tape

Poly-4 shanked 10" OC at 6" deep

LSD 0.10 = Least Significant Difference at 90% confidence level. NS = not significant.

CV = coefficient of variation

Table 3. Sweetpotato yield and quality response to potassium fertilizer treatments, Merced County 2021.

	Fertilizer Treatment and rate	lbs K2O/A	TMY lbs/A	40 lb box/A No. 1's	Jumbo	Med	adjusted TMY box/A	bins/A	No. 1's #1%	Culls cull%
1	Pre Plant 6-6-6 @ 50 gpa	33	37,641	344	244	164	753	37.6	45.7%	19.6%
2	SOP @320 lbs/A	193	44,037	410	303	167	881	44.0	46.6%	18.4%
3	60% SOP/40% Poly Blend @ 368 lbs/A	164	43,181	402	292	170	864	43.2	46.6%	17.4%
4	40% SOP/60% Poly Blend @ 533 lbs/A	183	44,824	445	248	204	896	44.8	49.7%	14.7%
5	Poly 4, 0-0-14 @ 1141 lbs/A	193	45,137	444	277	182	903	45.1	49.2%	16.0%
	Average		42,964	409	273	178	859	43.0	47.6%	17.2%
	LSD 0.10		---	61.7	ns	ns	101.0	5.0	ns	ns
	CV, %		---	12.0	17.2	16.9	9.3	9.3	7.4	17.7

Grower program: 6.6-6.6-6.2 at 50 gpa sidedress then 12-0-8 at 100 gpa in-season through drip tape

Sidedress fertilizer shanked 10" OC at 6" deep

Adj TMY = adjusted total marketable yield at 80% packout (20 boxes per bin)

LSD 0.1 = Least Significant Difference at 90% confidence level. NS = not significant.

CV = coefficient of variation

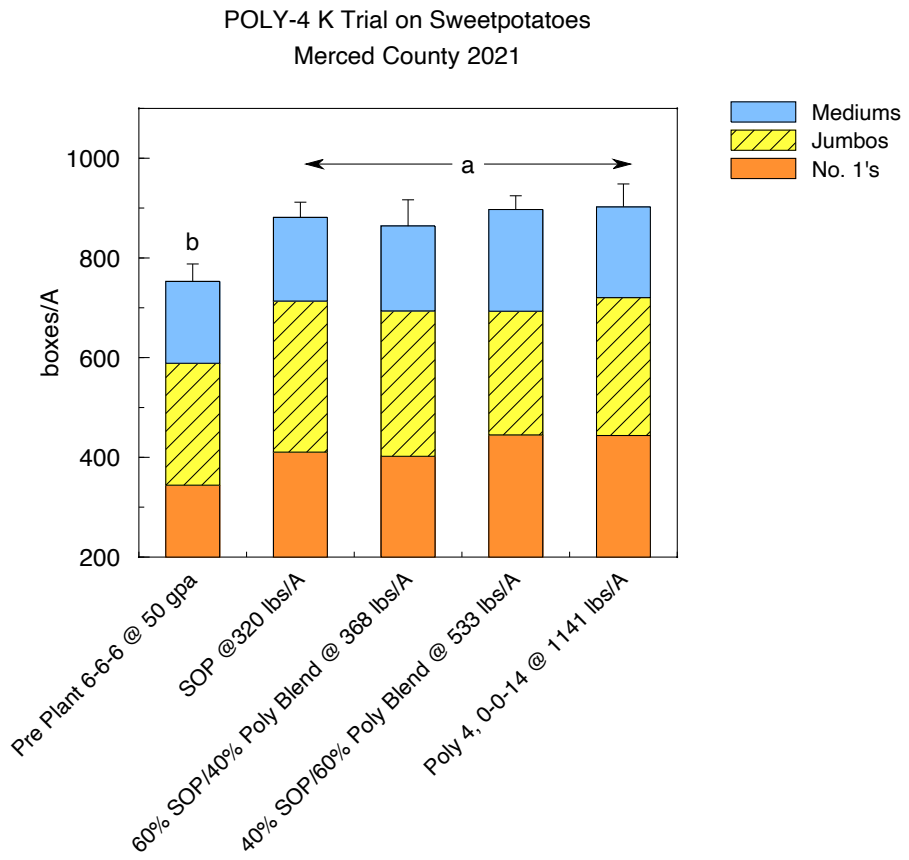

Figure 3. Sweetpotato yield as affected by fertilizer treatment, Merced County 2021.

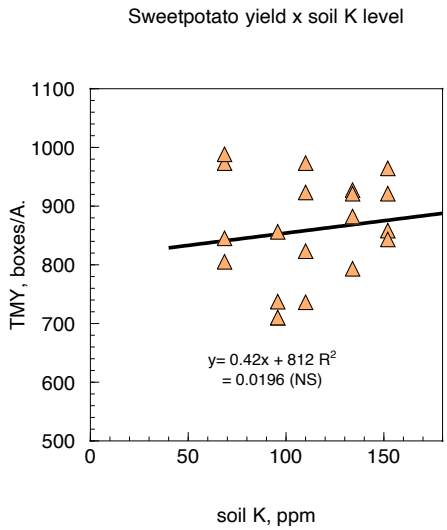

Figure 4. Relationship between soil K and TMY.

Denele Analytical, Inc.

Agricultural and Environmental 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)

Soil Analysis

Date Received: 9/24/2021
Submitted By: Scott
Lab ID: T12670821
Sample ID: SP K Trial Comp. 0-12' UTC

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

Purchase Order:
Report Date: 10/19/2021
Approved By: Josh Huot
Order Number: T1267082
Grower:

Scott Stoddard
2145 Wardrobe Ave
Merced, CA 95341

Analyte	Result	Units	Optimal	Very Low	Low	Normal	High	Very High
pH (Water)	7.5	Units	6.45					
pH (Soil)	6.1	Units	6.45					
Electrical Conductivity	1.10	mmhos/cm	1.05					
Soluble Salts	704	mg/L	672					
Nitrate Nitrogen	8.00	ppm	35					
Phosphorus (Olsen Method)	23.0	ppm	26					
MicroNutrients								
Boron	0.314	ppm	0.6					
Zinc	10.9	ppm	12.5					
Iron	5.94	ppm	60					
Copper	7.01	ppm	7					
Manganese	2.45	ppm	22					
Sulfate	38.0	ppm	38.5					

	Exchangeable Cations	Base Saturation Acetate Extraction				
	Result	Your %	Optimal %	Low	Normal	High
Potassium	150 ppm	8.6 %	3 - 7			
Calcium	599 ppm	66.3 %	64 - 78			
Magnesium	111 ppm	20.6 %	12 - 20			
Sodium	45.1 ppm	4.4 %	< 3			

	Water Extraction		Extraction Ratio
	Result	% Total	
Potassium	1.06 meq	10.2 %	27.71 %
Calcium	4.35 meq	41.9 %	14.76 %
Magnesium	2.31 meq	22.3 %	25.27 %
Sodium	2.66 meq	25.6 %	135.75 %

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

Total Nitrogen		ESP	SAR	C:N	Ca:Mg
Bray Phosphorus		3.4	1.5		5.4
Ammonia Nitrogen			CEC	5.8 meq/100g	
Free Lime			Carbonates	None	
Nitrogen Holding Capacity	40.5 Lbs/Acre		Percolation	High	

Denele Integrated Ratios	Sodium	NO3	Potassium	Phosphorus
	40	-28.3	49.9	16

Boron	Zinc	Iron	Copper	Manganese	Sulfate
0.4	15.5	-82.7	20.1	-72.3	19.6

Soil Amendment Recommendations

Lime pH Correction	0.5 Tons/Acre
Gypsum (18%) Sodium Reduction	0 Tons/Acre

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

Sweetpotato Nematicide Trial 2021

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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). In 2020, there were at least 10 townships in Merced County which hit this cap, a result of strong demand by both sweetpotatoes and orchard replanting. In response, the industry has resorted to greater use of metam potassium, usually 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 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 and sidedressing with fertilizer shanks. 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. Velum has shown efficacy both as a preplant shank application and through the drip tape 4 to 6 weeks after transplanting. Biological nematicides have also shown potential, but results have been more variable. Compared to untreated plots, Grandevo and Majestine (Marrone Bio) yield response has ranged from 45% to -13%.

The objective of this trial in 2021 was to evaluate nematode control and crop response to drip sidedress applications of various biological nematicides on sweetpotatoes grown in a commercial field in California.

Methods.
This trial was conducted in 2021 in a commercial sweetpotato field in Merced County, CA, in the buffer zone where no fumigant was used. The field had been in continuous sweetpotato production for more than 10 years. Treatments included multiple biological products from Innvictis, Velum (fluopyram, Bayer Crop Science), and Salibro (fluazaindolizine, Corteva Agriscience) nematicides on root knot nematode (RKN) control and

sweetpotato yield and quality. Treatments were designed to be injected in various combinations during the growing season. Untreated control plots and Telone fumigation were used for comparison.

Nematicide treatments were applied at 4, 6, and 8 weeks after transplanting (WAT), depending on product use guidelines, by injecting into surface drip tape positioned between two rows of sweetpotatoes. Sweetpotatoes were planted 2 rows to a bed, 20" off-center. All products were first diluted into 2 gallons of water, then injected into a second drip line running down the center of the plot while the field was being irrigated. Injection time was about 10 minutes per plot and was followed by 4 or more hours of surface irrigation. RKN sampling was performed in June and August from all plots. Samples were taken from the center of each bed to 12", 4 cores per plot. Sweetpotato variety 'Diane' (RKN susceptible) was transplanted on May 7 and harvested on Sept 30. Harvest was done using the grower's mechanical digger and crew to separate roots by size (#1's, mediums, jumbos) and grade (culls). The plots were 1 bed x 100 feet, and 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 are shown in Table 1.

Results

Nematode samples in June were taken from the UTC and Telone-treatment areas only. RKN counts were an average of 31.5 J2s per 250 cc soil in the untreated, and not detected in the Telone area (Table 2). By August, however, there were no significant differences in RKN counts between any of the treatments (Table 3). Nematode pressure was very high at this location, with an average of 602 J2's per 250 cc soil at the August sampling, equivalent to ~ 1200 per pint. Samples from the Telone treated area were also very high, however, there were significant differences in yield between treatments. Only Telone, Velum, and Salibro increased yield as compared to the untreated control (Table 4). While Salibro increased yield, this treatment still had very low yields this year compared to Telone (Figure 1). Only Telone significantly reduced the number of culls, as a percentage of the marketable yield, compared to the UTC treatment. Overall cullage was very high regardless of nematicide treatment, at 56.6%. Most of the culled roots were a result of nematode damage (cracking, pimples, necrosis in the lenticles, and poor skin color). None of the biological nematicides, including Majestine, improved yield or quality of harvested roots as compared to the untreated control.

In replicated trials from 2017 – 2021, drip applications of Salibro and Velum have increased yields of sweetpotatoes 36.9% and 15.2% as compared to the untreated check plots in an unfumigated buffer area (Table 5). In general, higher rates improve performance. These yield increases occurred even though nematode sampling has not shown a significant decrease in nematode numbers in mid – to late season sampling. Salibro has shown a greater crop response, with significantly increased yield in every year from 2017 - 2021.

Acknowledgements: many thanks to Robert Silveira with Classic Yam and foreman Flocco for his help and cooperation with this trial.

Table 1. Sweetpotato nematicide trial information and treatments, Merced County 2021.

Location:	Directly south of Target in Atwater, off Applegate Rd				
	37. 20' 27.84" N 120. 36' 48" W				
	Continuous sweetpotatoes > 5 yrs, buffer zone no fumigation				
Soil:	Atwater sand				
Cooperator:	Robert Silveira, Classic Yam				
Variety:	Diane				
Transplant:	7-May-21				
Harvest:	30-Sep-21				
days:	146				
	Machine harvest, grower crew sorted by size and grade				
Sampling:	Soil RKN nematode sampling on 15- Jun & 23-Aug				
Application	injection into secondary drip line, using rates calculated for that plot (6.67 x 100 ft) during normal irrigation				
	10 minute application time followed by 4 hours irrigation				
Dates:	1st app	6/2/21	=	26	days
	2nd app	6/9/21	=	33	days
	3rd app	6/25/21	=	49	days
Plot Design:	RCBD with 4 reps				
	Plots 1 bed (6.67 ft) x 100 ft				

	Treatments:	rate	Applications		
1	UTC	---	---	---	---
2	Majestine	1 gpa	2-Jun	9-Jun	25-Jun
3	SOIL SHOT	1.5 gpa	2-Jun	9-Jun	25-Jun
4	N-TEX	2 qt/A	2-Jun	9-Jun	25-Jun
5	BOREAL	0.8 oz/A	2-Jun	9-Jun	25-Jun
6	SOIL SHOT + BOREAL	1.5 + 0.8	---	9-Jun	25-Jun
7	SOIL SHOT + N-TEX+ BOREAL	1.5 + 2 + 0.8	2-Jun	---	25-Jun
8	GALVANIZE + TURN	5 lb + 1 pt/A	2-Jun	9-Jun	25-Jun
9	Velum	7 oz/a	---	9-Jun	25-Jun
10	Salibro	30 oz/A	---	9-Jun	25-Jun
11	Telone	10 gpa	15-Apr		

All nematicide treatments diluted in 2 gals water prior to application.

Table 2. Nematode soil test results, June 15, 2021.

Treatment	rep	Root Knot	Ring	SR
		----- # J2's per 250 cc soil -----		
1. UTC	1	10	0	8
	2	64	22	0
	3	16	0	0
	4	36	0	12
11. Telone	1	0	0	0
	2	0	0	34
	3	0	0	10
	4	0	0	18
Avg UTC		31.5	5.5	5
Ave Telone		0	0	15.5

RKN	Southern Root Knot Nematode, Meloidogyne incognita
Ring	Mesocriconema xenoplax
SR	Stubby Root - Paratrichodorus

Table 3. Nematode soil test results, Aug 23, 2021.

	Treatment	Root Knot	Ring	SR
		----- # J2's per 250 cc soil -----		
1	UTC	652	10	0
2	Majestine	498	10	1
3	SOIL SHOT	692	11	7
4	N-TEX	740	22	0
5	BOREAL	526	11	2
6	SOIL SHOT + BOREAL	781	14	1
7	SOIL SHOT + N-TEX+ BOREAL	289	13	0
8	GALVANIZE + TURN	486	14	2
9	Velum	925	8	0
10	Salibro	523	24	1
11	Telone	511	5	3
	Average	602	13	1.3
	LSD 0.05	ns	ns	ns
	CV, %	60.2	136	300

RKN	Southern Root Knot Nematode, *Meloidogyne incognita*
Ring	*Mesocriconema xenoplax*
SR	Stubby Root - *Paratrichodorus*
LSD	Least significant difference at the 95% confidence level. NS = not significant.
CV, %	Coefficient of Variation

Table 4. Sweetpotato yield and grade results by nematicide treatment, Merced County 2021.

		bins per acre					
	Treatment	No. 1's	Jumbo	Medium	TMY	% No. 1's	% culls
1	UTC	5.3	1.9	1.9	9.1	60.2%	53.5%
2	Majestine	5.1	1.3	1.5	7.9	62.4%	61.4%
3	SOIL SHOT	4.1	1.6	1.8	7.4	54.3%	63.7%
4	N-TEX	4.9	1.6	1.6	8.1	60.6%	60.7%
5	BOREAL	5.7	1.3	1.5	8.5	66.6%	58.7%
6	SOIL SHOT + BOREAL	5.0	1.3	2.0	8.3	61.3%	56.0%
7	SOIL SHOT + N-TEX+ BOREAL	5.2	1.0	1.8	8.0	68.5%	61.5%
8	GALVANIZE + TURN	5.2	1.0	0.9	7.1	74.2%	64.8%
9	Velum 14 oz/A	5.6	3.4	1.9	10.9	51.5%	56.6%
10	Salibro 60 oz/A	9.2	2.2	2.4	13.8	67.0%	43.5%
11	Telone 10 gpa	25.6	12.8	9.8	48.2	53.1%	5.1%
	Average	7.4	2.7	2.5	12.5	61.8	53.2
	LSD 0.05	2.4	1.8	1.4	4.0	11.9	15.2
	CV, %	22.8	45.9	38.6	22.2	13.3	19.7

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.
TMY Total marketable yield is the sum of the above three categories.
bins/A bins/A are estimated based on market box yield assuming 20 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.

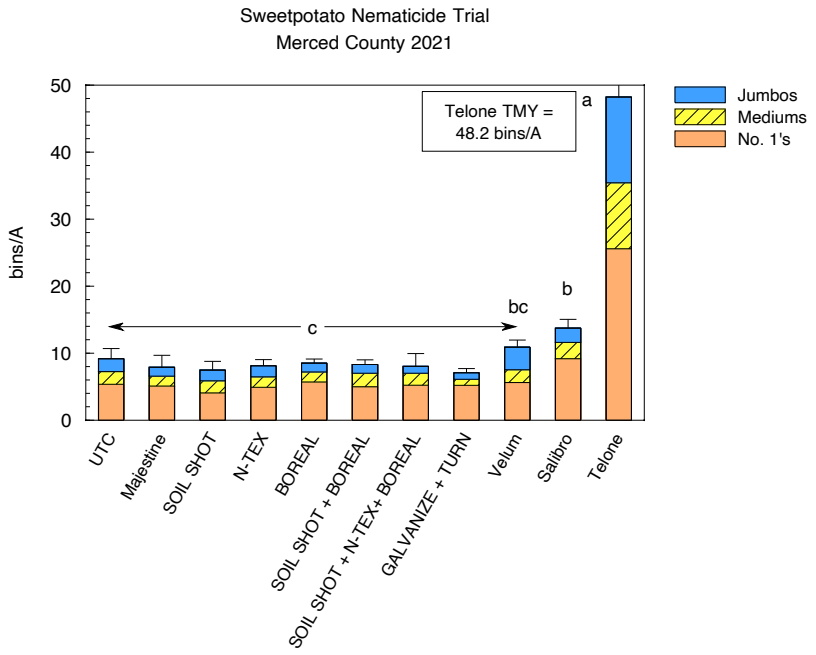


Figure 1. Sweetpotato yield as affected by nematicide treatment, Merced County 2021.

Table 5. Yield differences between drip applications of Velum and Salibro nematicides as compared to untreated plots in commercial sweetpotato fields, Merced County 2017 - 2021.

Year	UTC TMY bins/A	Salibro drip TMY bins/A	Velum drip TMY bins/A	Salibro p=0.05	Velum p=0.05	Salibro vs UTC %	Velum vs UTC %
2017	42.0	49.4	39.6	*	ns	17.6%	-5.7%
2018	25.7	41.1	32.0	*	ns	59.9%	24.5%
2019	16.1	22.3	20.4	*	*	38.5%	26.7%
2020	31.4	36.7	35.2	*	ns	16.9%	12.1%
2021	9.1	13.8	10.9	*	ns	51.6%	19.8%
					AVERAGE	**36.9%**	**15.2%**

TMY = Total Marketable Yield

Untreated (UTC) compared to split application of Salibro (60 fl oz/A) or Velum (14 fl oz/A).

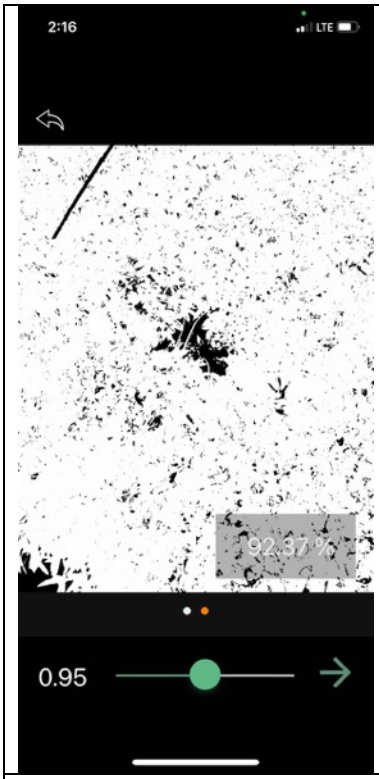
* significant difference at the 95% confidence level as compared to UTC. NS = not significant.

Sweetpotato Southern Blight Fungicide Trial 2021
Scott Stoddard, Farm Advisor

SUMMARY
The 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. Four fungicides plus and untreated control were evaluated using a randomized block design with 4 reps, with applications starting at the time of bed establishment on March 9, 2021. The first trial location was with Weimer Farms using conventional grower practices (no gin trash, medium sweetpotatoes), and microjet irrigation. Plots were 8 ft x 5 feet long. The variety was Diane that had been pre-sprouted since late February and showed no obvious sign of disease. The initial application of Botran fungicide (dichloro nitroaniline) was applied with a backpack CO_2 hand sprayer using the equivalent of 120 gpa after bedding but prior to covering with soil. Post emergence applications were started when there was about 3 - 5% emergence of plants, on March 31. Fungicides were applied using a 2-gallon watering can, using 2 gallons for 4 plots followed by an additional 2 gallons of plain water to incorporate and push the fungicides into the soil. Fungicides included Kphyte 7 LP (phosphorus acid), Quadris Top (azoxystrobin + difenoconazole), Rhyme (flutriafol), plus an untreated control (water only). No adjuvants were used. Post emergence fungicides were applied 4 times with 7 days between applications. Subjective disease evaluations were made on each application date (April 7, 14, and 21), however, there were no visible blight symptoms on any of these evaluation dates. On May 12 plants were cut from a 2 ft x 2 ft square and separated into "infected" and "clean" plants based on visual observation of disease symptoms to determine if fungicides impacted plant production or disease. On June 1, 50 plants from each plot were cut above the soil line and transplanted into field plots on May 1 using an RCB design. In addition to the plants taken from the trial plots, infected Diane plants from an adjacent hotbed were also harvested and separated into “pulled” and “cut” categories, where the cut plants were cut several inches above the soil to exclude infections at the base of the plant. These plants were then transplanted along with the plants from the fungicide treatments. Trial harvest was done with grower crew and equipment on October 20, 2021. Trial background information is listed in Table 1.

Because of the lack of disease incidence in the first trial, a second location was also evaluated. The second location with Kandola Farms in a hotbed that had taken out and re-bedded due to high incidence of Southern Blight. Only post emergence fungicides were evaluated at this location. Plots were 8 ft x 5 ft and replicated 4 times. The variety used was Diane. As with the first trial location, fungicides were applied using a 2-gallon watering can. Post emergence applications began April 16, 2021, using 2 gallons for 4 plots followed by an additional 2 gallons of plain water to incorporate and push the fungicides into the soil. Fungicides

included Kphyte 7 LP (phosphorus acid), Quadris Top (azoxystrobin + difenoconazole), Rhyme (flutriafol), Aprovia Top (difenoconazole + benzovindiflupyr) plus an untreated control (water only). No adjuvants were used. In addition to the subjective disease evaluations (0 – 10 rating scale, where 0 = no disease and 10 indicates complete loss of plants to Southern blight), estimates of green canopy cover were made using the mobile phone app "Canopeo" at 4 ft from the top of the bed. The app converts green to white in an image, and all else is displayed as dark areas, then estimates the canopy coverage within the camera frame (Figure 1). A significant negative correlation (R^2 = 0.93) was obtained between these measurements and the subjective scale readings (Figure 2), which indicates that this app worked very well at estimating disease incidence. Unlike in the first location, there were no plant cuttings made, and the trial was terminated after the 4th fungicide application. Trial background information is listed in Table 2.



Disease score = 2, green canopy is 92%	Disease score = 4 (a score of 3 should have been assigned based on 80% green canopy)

Figure 1. Canopeo app output and corresponding disease scores.

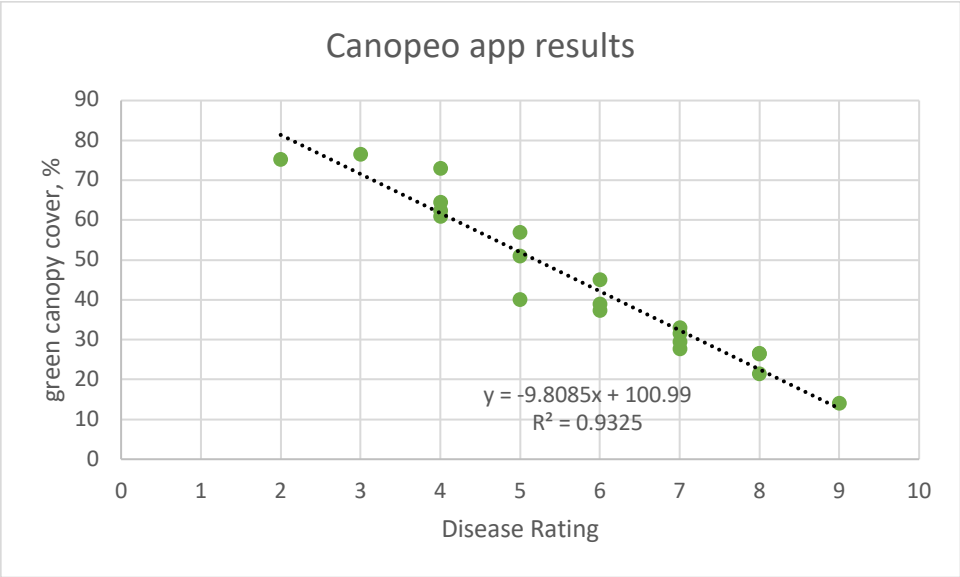


Figure 2. Correlation between Canopeo app results and subjective disease scores at the Kandola Farms location.

RESULTS

Weimer Farms. Southern blight incidence at the Weimer Farms location was very low and only observed in the Kphyte treated plots, and therefore no significant differences were seen between the fungicide treatments for diseases incidence, plant production, or plant weight (Table 3). Disease incidence was less than 3% when averaged across all plots. No crop phytotoxicity was observed from any of the treatments, and there were no significant differences in plant stand 3 weeks after transplanting from plants taken from the hotbed treatments. There was also no significant impact from the fungicide treatments on root production. Average yield (Table 4) was very good, over 50 bins per acre at this location, with 12% culls (most culls were not from Southern Blight).

However, there were large differences in yield from infected plants that were either pulled or cut from the beds, and then transplanted into this same location. Southern blight infected pulled plants had a 10-bin reduction in total marketable yield and increased cull% from 11.6 to 20.7%. The yield from using infected buy cut plants (47.1 bins/A) was almost as much as cut plants that were not infected (50.3 bins from UTC). This suggests that cutting plants is an effective way to use plants from beds where this disease is a problem.

Kandola Farms. At the Kandola location, incidence of Southern blight had been so severe that the beds were removed, and new seed was put back in the same area. As a result, only post emergence applications were made, beginning 9 days after bedding. Disease incidence ratings were made on after the last fungicide application, beginning May 7. Disease ratings at this time were also estimated using the Canopeo app. Disease incidence was very high in all plots, ranging from about 45 to 65%. No significant differences were seen between fungicide treatments on May 7 and 4, but Rhyme had significantly less southern blight at the last evaluation date on May 25 (Table 5). Disease incidence at this time was 35% on average – high, but significantly less than the untreated control, which was > 80%.

ACKNOWLEDGEMENTS

Many thanks to Bob Weimer, Alfonso Jimenez, and Pete Kandola for their help and cooperation with this trial.

Table 1. Trial background information.

Grower	Bob Weimer, Weimer Farms							
Location, hotbeds	Westside Blvd and Cressey Way							
Location, field	NE corner of Longview and Bert Crane							
Variety	Diane	bedded 3/9/2021 one bin per rep						
Treatments and		**hotbed treatments**	applied	9-Mar	31-Mar	7-Apr	14-Apr	21-Apr
application dates	1	UTC (water only)	0	---	---	---	---	---
	2	Botran 5F 5.73 fl oz/3500 sq ft seed spray only	8.2 ml	X	---	---	---	---
	3	Kphite 7 LP 2 qts/100 gals post emergence	40 ml	---	X	X	X	X
	4	Quadris Top 1 fl oz/1000 sq ft post emergence	5 ml	---	X	X	X	X
	5	Rhyme 22.7% 7 fl oz/A post emergence	1 ml	---	X	X	X	X
	6	SB infected pulled and cut plants	0	---	---	---	---	---
		Botran applied directly to seed before covering						
		Post emergence treatments in 2 gals water						
		Treatments #1 and #2 also received 2 gals water						
		Plots 5 ft long, 8 ft wide, RBD with 4 reps						
		Treatment #6 for field plots only						
		Clethodim applied 3/31 for grass control						
Plant harvest		# per 2 sq ft on May 12						
Transplant		1-Jun						
		12" spacing, 1-row plots						
Harvest		20-Oct						
Days		141						
		RBD with 4 reps, 50 plants per plot						

Table 2. Second trial location background information.

Grower	Pete Kandola, Kandola Farms							
Location, hotbeds	Atwater Jordan and Arena Way							
Location, field	none							
Variety	Diane	rebedded April 7, 2021, after being lost to Southern Blight						
Treatments and		**hotbed treatments**	applied	4/7/21	16-Apr	23-Apr	30-Apr	7-May
application dates	1	UTC (water only)	0	X	---	---	---	---
	2	Kphite 7LP 2 qts/100 gals post emergence	40 ml	---	X	X	X	X
	3	Quadris Top 1 fl oz/1000 sq ft POST	5 ml	---	X	X	X	X
	4	Rhyme 22.7% 1 oz/1000 sq ft POST	5 ml	---	X	X	X	X
	5	Aprovia Top 18 fl oz/A POST	2.5 ml	---	X	X	X	X
		No at bedding treatments (Botran)						
		Post emergence treatments in 3 gals water						
		Treatment #1 also received 3 gals water						
		Plots 5 ft long, 8 ft wide, RBD with 4 reps						
		6" soil temps in bed 80 - 86 F						

Table 3. "Good" and infected ("bad") plants in the hotbed at plant harvest as affected by fungicide treatment, Weimer Farms 2021.

		# plants per 2 sq ft on May 12				pulled plants			Plot Rating
#	hotbed treatments	Good	Bad	Total	%S. blight	g/10	g/10	g/plant	0-10
1	UTC (water only)	125.8	0.3	126.0	0.2%	106	120	11.3	0.3
2	Botran 5F 5.73 fl oz/3500 sq ft seed spray only	119.0	0.0	119.0	0.0%	115	130	12.3	0.3
3	Kphite 2 qts/100 gals post emergence	133.3	25.5	158.8	13.4%	98	115	10.7	0.5
4	Quadris Top 1 fl oz/1000 sq ft POST	143.0	0.0	143.0	0.0%	113	113	11.3	0.0
5	Rhyme 22.7% 7 fl oz/A POST	135.8	0.0	135.8	0.0%	108	120	11.4	0.0
	Average	131.4	5.2	136.5	2.7%	108.0	119.6	11.4	0.2
	LSD 0.05	ns	---	ns	---			ns	---
	CV, %	14.3	---	17	---			8.1	---

Good = plants with no observable lesions on roots or stems.
0 - 10 rating. Subjective scale. 0 = no disease, 1 = 2.5%, 2 = 10%, 3 = 21%, 4 = 35%, 5 = 50%, 6 = 65%, 7 = 79%, 8 = 90%, 9 = 97.5%, 10 = total crop loss
LSD 0.05 Least significant difference. Means separated by less than this amount are not significantly different (ns). --- = not enough data to test
CV, % Coefficient of variation, a measure of variability in the experiment.

Table 4. Yield and size results from the southern blight hotbed treatments, Weimer Farms 2021.

		28-Jun	40	lb box/A adj		adj TMY	total	No. 1's	Culls
#	hotbed treatments	# of plants	No. 1's	Meds	Jumbos	box/A	bins/A	#1%	cull%
1	UTC (water only)	47.0	426	235	345	1006	50.3	42.1%	10.0%
2	Botran 5F 5.73 fl oz/3500 sq ft seed spray only	48.0	503	273	361	1137	56.8	44.1%	8.3%
3	Kphite 2 qts/100 gals post emergence	48.3	455	247	296	998	49.9	45.7%	14.9%
4	Quadris Top 1 fl oz/1000 sq ft POST	47.5	497	245	378	1121	56.0	44.3%	8.5%
5	Rhyme 22.7% 7 fl oz/A POST	48.5	460	311	394	1165	58.2	39.4%	9.0%
6	SB infected pulled plants	47.5	309.9	122.7	319.5	752.1	37.6	41.1%	20.7%
6b	SB infected cut plants	45	432.1	191.2	318.9	942.1	47.1	45.8%	11.6%
	Average	47.4	440.5	232.0	344.7	1017.2	50.9	43.2%	11.8%
	LSD 0.05	ns	ns	ns	ns	ns	ns	ns	ns
	CV, %	5.5	15.2	23.8	17.7	11.1	11.1	9	37.3

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.
TMY Total marketable yield is the sum of the above three categories.
bins/A bins/A are estimated based on market box yield assuming 20 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). Treatment #6 not included (limited reps)
CV, % Coefficient of variation, a measure of variability in the experiment.

Table 5. Southern blight incidence as affected by fungicide treatment, Kandola Farms 202

		plot rating	5/7/21	5/14/21	5/25/21
#	hotbed treatments	score	green%	score	score
1	UTC (water only)	6.8	37.9	7.3	7.3
2	Kphite 2 qts/100 gals post emergence	5.8	46.3	6.8	7.3
3	Quadris Top 1 fl oz/1000 sq ft POST	6.0	39.7	6.5	6.3
4	Rhyme 22.7% 1 oz/1000 sq ft POST	4.5	54.1	5.0	4.0
5	Aprovia Top 18 fl oz/A POST	5.8	45.0	6.8	7.0
	Average	5.8	44.6	6.5	6.4
	LSD 0.05	ns	ns	ns	1.6
	CV, %	20.3	25.2	18.9	16.8

0 - 10 rating. Subjective scale. 0 = no disease, 1 = 2.5%, 2 = 10%, 3 = 21%, 4 = 35%, 5 = 50%, 6 = 65%, 7 = 79%, 8 = 90%, 9 = 97.5%, 10 = total crop loss
green% = green canopy cover, as estimated using the Canopeo app at 4 ft height

Performance of paraquat on sweetpotato propagation beds 2021
IR-4 Project: P12869 (continuation)

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Objectives:
The purpose of this research was to 1) collect data to support registration of paraquat on sweetpotato propagation beds for post-emergence weed control; and 2) evaluate herbicide impacts on transplant production and impacts on field production.

Introduction
Sweetpotatoes are vegetatively propagated, using plant cuttings from propagation beds, called hotbeds in California. Hotbeds are the nursery area where roots from the prior year are used to produce plants for the production fields. The installation of hotbeds typically begins in mid-February, when the roots are placed on the ground and then covered with a thin layer of soil. Plastic tunnels are used to provide warmth, and sprinklers are used for irrigation. Cuttings from the hotbeds are transplanted into prepared beds from mid-April through the end of June. Cuttings are typically 9 – 12" in length and require from 8 – 12 weeks to grow. Hotbeds are expensive, and therefore are carefully managed to maximize both transplant production and quality.

Hotbeds are a distinct and separate part of the whole production system in sweetpotatoes, and as such require different management techniques for weeds as compared to the production fields. Unless preventative measures are taken, weeds are the main pest in sweetpotato hotbeds. Weeds can be effectively controlled with the fumigant metam sodium or with the use of registered herbicides applied shortly after bedding the roots.

Pre-emergent herbicides offer the potential for improved weed control. Registered herbicides include napropamide (Devrinol) and flumioxazin (Valor/Chateau), applied pre-emergent to the weeds or crop after covering the roots, then incorporated with water. Pre-emergent herbicides are not widely used, however, presumably because growers assume they are not needed following metam, are concerned they may impact transplant production (reduce the number of plants per square foot), or the beds are for organic production where they not allowed.

Even with fumigation and herbicides, hand weeding remains an important component of hotbed weed management. Nonselective foliar herbicides (glyphosate, pelargonic acid) can be used postemergence on weeds before crop emergence, but great care should be exercised as there is a chance of leaching through the coarse shallow soil layer covering the roots, affecting sweetpotato plant production. Flaming is an option in organic systems. Annual grasses can be effectively controlled with postemergence grass herbicides such as fluazifop (Fusilade), sethyoxydim (Poast), and clethodim (Select).

Methods

This work was a repeat of the trial performed in 2020. The trial began 22-Mar-2021 in a commercial sweetpotato hotbed location near Atwater, CA. The beds were installed 12 days prior using sweetpotato cultivar 'Bellevue to a non-fumigated portion of the field and had received 1 irrigation. No pre-emergent herbicides or hand weeding had occurred prior to the initiation of this project. Treatments were Gramoxone (paraquat) herbicide applied at 0.25, 0.5, and 1.0 lbs a.i. per acre, plus an untreated control. Additional treatments also included for comparison were Rely 280 (glufosinate), Suppress (caprylic + capric acids), and Roundup (glyphosate). All treatments included 0.25% Latron-B 1956 non-ionic surfactant (NIS); the Roundup and Suppress treatments included 1% acidifier (50% citric acid) in addition to the NIS. The trial location and herbicide treatments are shown in Table 1.

All treatments were applied prior to crop emergence but post weed emergence. Most emerged weeds were at the cotyledon to 2-leaf stage at the time of application (Figure 1). Herbicides were applied with a CO_2 backpack sprayer at 40 psi with a 4-ft boom using two Tee Jet 8002 flat fan nozzles and two 8002 OC nozzles on the ends, calibrated to 55 gpa equivalent. Spray swath was 60" when measured ~24" above the soil surface.

In the hotbed, plot size was 4 ft wide x 10 ft long. Experimental design was a RCB with 4 replications; means separation was done using Fisher's Protected LSD at the 95% confidence level. Data collected included visual crop injury and weed control using a subjective scale (0 = no injury or no control, 10 = 100% crop death/complete weed control, determined at 7, 14, and 21 days after application. Weed counts were also taken using a 12" x 12" frame randomly placed within each plot. Weed control was also measured using Canopeo, a smart-phone based app that quantifies live green vegetation (figure 2). Canopeo images were taken of the whole plot from a height of ~4 ft at 21 days after treatment. Weed control was estimated as

%control = 1 – green%

Canopeo values were well correlated with the subjective scale readings used at the other evaluation dates (Figure 3).

Figure 1. Weed emergence at herbicide application. Main weeds were Bermudagrass, pigweed, and nutsedge

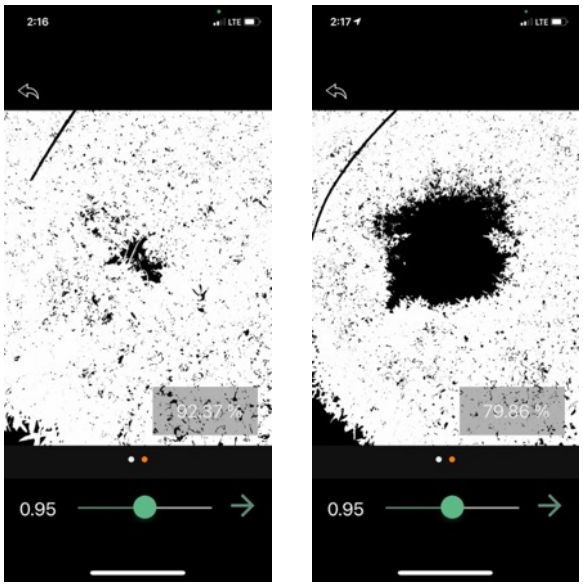


Figure 2. Example of Canopeo app green canopy measurement results. Green vegetation on the left fills 92% of the image space, whereas on the right it is 80%.

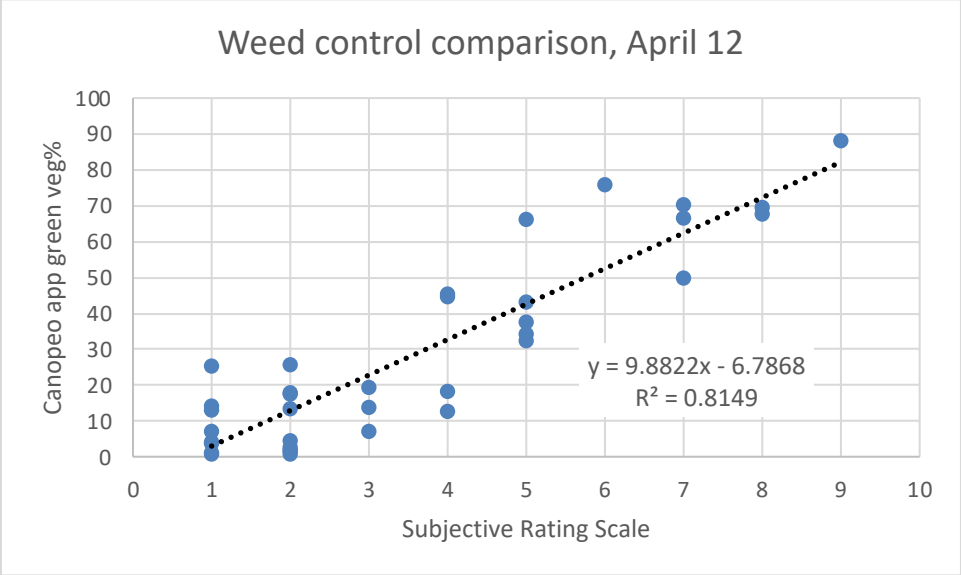


Figure 3. Comparison between the Canopeo results and subjective score readings taken on 12-April-2021 were significantly correlated.

A nontreated weedy check and a hand-weeded weed-free check were included for comparison. Weed-free check plots were maintained weed free through light cultivation and hand removal, while the weedy check was hand weeded after the 21-day evaluation on April 12. Photos were taken of the plots at the evaluation dates. All plots were hand weeded after the final evaluation date and kept weed-free until transplanting. Plant production was measured by cutting plants at the soil line from a $2ft^2$ area from the center of each plot on June 8, 2021.

Unfortunately, the grower's plant harvest crew accidentally cut almost all the plots before plant production could be measured. Only 6 plots from one rep remained, which were transplanted into a commercial field on June 8 using the growers crew and equipment. Plot size was 1 row by 40 ft; in-row spacing was about 10" with between row spacing of 40", with no replication. Because of the lack of reps, no conclusions could be drawn on the impact of the herbicide treatments on plant production and potential carry-over impacts to the production field.

Table 1. Field site and herbicide treatments, IR-4 paraquat trial Merced County 2021.

Cooperator	Craig Arnold, Arnold Farms
hotbed location	SE corner of Grove and Fruitland, near Atwater, CA
field location	east of Winton Way between Cammelia and Gertrude
	37˚ 19' 56" N
Soil	Atwater loamy sand
Variety	Bellevue
Irrigation	Beds: microjet sprinklers
bedded	3/10/21
application	3/22/21
plant harvest	6/8/21
transplant	6/8/21
field harvest	11/3/21
days	148

			ai	Application
Treatments:	1	UTC	---	
(Hotbeds only)	2	Gramoxone 0.25 lbs ai/A + NIS	paraquat	3/22/21
	3	Gramoxone 0.5 lbs ai/A + NIS	paraquat	
10' x 4'	4	Gramoxone 1.0 lbs ai/A + NIS	paraquat	
	5	Suppress 9%	capric + caprilic acid	
	6	Rely 280; 48 oz/A + NIS	glufosinate	
	7	Glyphosate 2% + NIS	glyphosate	
	8	Shark 8 oz/A + NIS	carfentrazone	
	9	Hand Weed (ends only)	---	
		NIS at 0.25% Latron B-1956 at 3ml/40 fl oz		
		used T-jet 8002 nozzles at 40 psi		
		26 fl oz/4 plots = 55.3 gpa equivalent		

Results

There was no crop injury in any of the treatments at the first evaluation date, as there was no plant emergence at that time. At 14 days after treatment, crop emergence was about 5%, and some slight injury could be observed, mainly in the glyphosate treatment (Table 2). However, there was no consistent injury from any of the treatments, and injury faded after 21 days and did not appear to have any impact on plant production.

Weed control ratings are shown in Table 2. Weed pressure was very high in all untreated plots, and varied from broadleaf weeds dominating in some locations and grasses in others. The dominant weeds were pigweed (*Amaranthus* spp, most likely redroot pigweed), lambsquarters (*Chenopodium album*), puncture vine (*Tribulus terrestris*), and yellow nutsedge (*Cyperus esculentus*). The dominant grassy weed was barnyardgrass (*Echinochloa spp*), Bermudagrass (*Cynodon dactylon*), and sprangletop (*Leptochloa spp*). All herbicide treatments significantly reduced the number of weeds at 7, 14, and 21 days after application as compared to the untreated control. All three paraquat rates were equally effective, giving 77 – 91% weed control (Figure 4). Like last year, however, the highest rate of paraquat, 1.0 lbs ai/A or (2 pints/A) did not improve weed control compared to the lower rates.

The Shark or the Suppress treatments at 21 days after application had significant less weed control, at 37% to 52%, respectively, compared to the untreated control. The poor performance of Shark was due to the heavy grass pressure in some of these plots. Glyphosate had the highest weed control throughout this trial, at nearly 92%.

Plants counts for a limited number of treatments are also shown in Table 2. Because only 1 rep was counted, statistical analysis was not performed. Yield results are shown in Table 3. Yield impacts between treatments could not be made due to missing plots, but there were no obvious production issues that may have occurred due to plant quality.

Conclusions

Paraquat herbicide applied prior to crop emergence of sweetpotatoes in the hotbeds effectively controlled emerged broadleaf and grassy weeds for 21 days after application. The most effective rate at this location was 0.5 lbs a.i. per acre (about 1.0 pints/A Gramoxone 3SL) which had 90.6% weed control at 21 days after application. This is the same rate with the best weed control in the 2020 trial. Glyphosate also worked very well, with 92.4% control. Suppress, a contact-only OMRI approved herbicide, initially worked as well as all the other herbicides in this test, but had significantly less weed control after 21 days due to regrowth. Shark performed poorly as a result of high grass pressure in many plots. No significant crop injury was observed, and plant production appeared similar across all the treatments. Unfortunately, due to the beds being accidentally harvested before plant production could be measured, I was unable to evaluate Objective 2 in this trial.

Acknowledgements

Many thanks to Mr. Craig Arnold for his help and cooperation with this test. Funding for this project was provided by USDA-IR-4 program: IR-4 Project P12869.

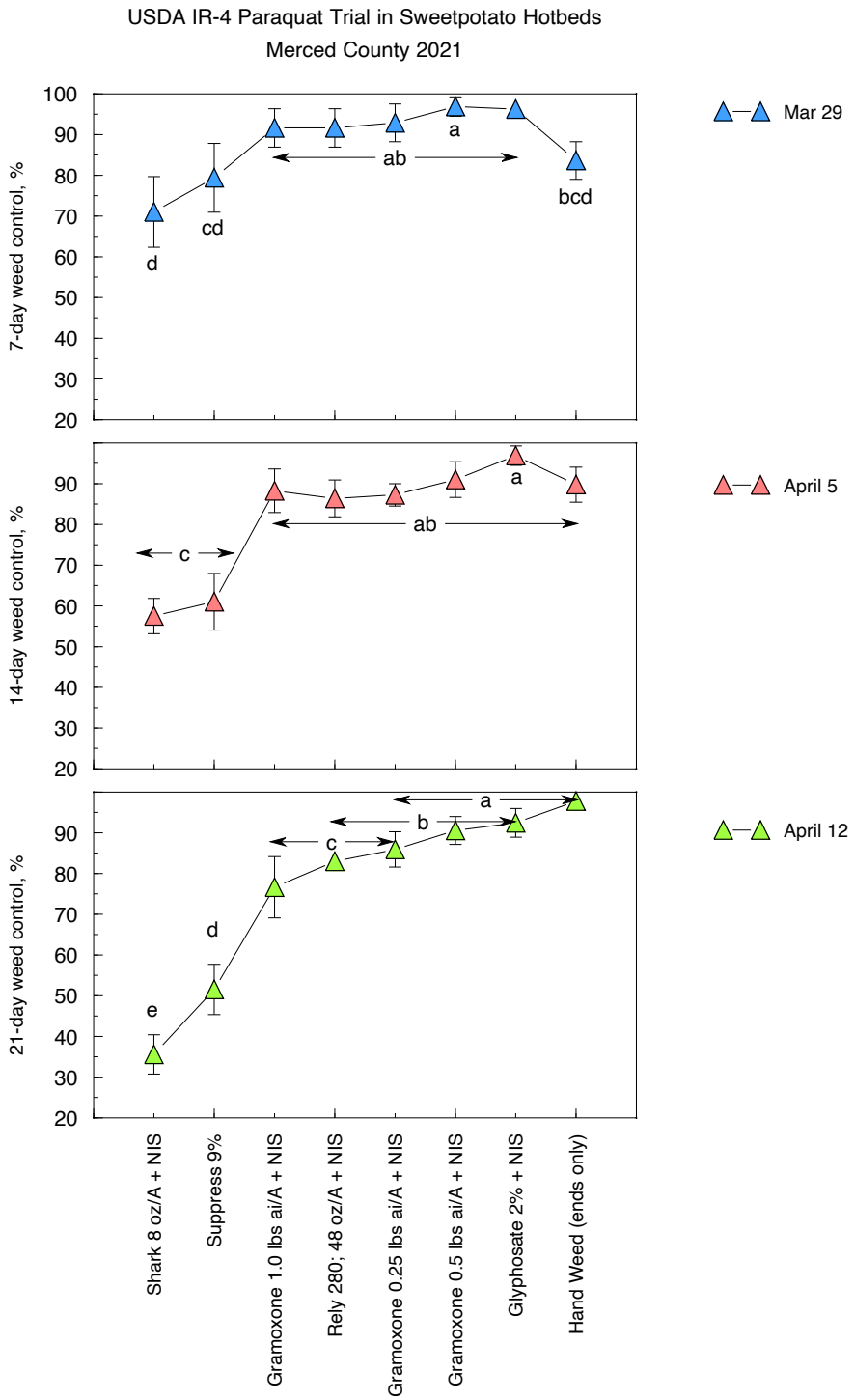


Figure 4. Weed control in the hotbed as affected by herbicide treatment.

Table 2. Weed control, crop phyto, and plant production in sweetpotato hotbeds as affected by herbicide treatment. IR-4 paraquat trial, Merced County 2021.

treatment	3/29/21 # weeds per sq ft			Weed Score (0-	Crop Phyto	4/5/21 # weeds per sq ft	Weed Score (0-10)	Crop Phyto	(2.5 ft) Phone App (%)	4/12/21 # weeds per sq ft	Weed Score (0-	Crop Phyto	(**whole plot**) Phone App (%)	12-Apr weed control, %	harvest plants/ sq ft
1 UTC	35.8	a		4.3	0	36.3	5.8	0	34.9	51.8	6.8	0	68.5	---	38.7
2 Gramoxone 0.25 lbs ai/A + NIS	3.8	b	c	1.5	0	8.0	2.3	0	1.2	23.3	2.5	0.5	14.1	85.9	42.7
3 Gramoxone 0.5 lbs ai/A + NIS	2.3		c	0.8	0	9.8	1.8	0	0.5	18.3	2.0	0	9.5	90.6	32.0
4 Gramoxone 1.0 lbs ai/A + NIS	8.0	b	c	1.5	0	17.0	2.0	0.25	0.4	24.8	3.3	0.5	23.4	76.6	30.0
5 Suppress 9%	7.8	b	c	2.8	0	18.8	4.3	0.5	4.1	27.3	4.5	0.75	48.5	51.5	35.3
6 Rely 280; 48 oz/A + NIS	4.0		c	1.5	0	6.8	2.3	0.5	0.3	18.3	2.8	0.75	17.0	83.0	---
7 Glyphosate 2% + NIS	3.8	b	c	1.0	0	3.8	0.8	1.25	0.0	3.8	1.3	0.25	7.6	92.4	---
8 Shark 8 oz/A + NIS	34.8	a		3.5	0	53.0	4.5	0.5	24.8	54.3	7.5	0	64.4	35.6	---
9 Hand Weed*	12.8	b		2.5	0	27.0	1.8	0	0.0	18.8	1.5	0	2.3	97.8	38.7
Average	12.5			2.1	0.0	20.0	2.8	0.3	7.3	26.7	3.6	0.3	28.4	76.7	36.2
LSD 0.05	use letters			1.3	---	22.2	1.1	ns	---	23.3	1.2	ns	17.6	13.5	---
CV, %	39.8			42.9	---	76.1	28.1	236	---	59.7	22.7	163	41.2	11.9	---

Untreated control plots (UTC) were hand weeded after the 1-Apr evaluation. All other treatments hand weeded after 7-Apr evaluation.

* Hand weeded control plots were weeded weekly.

0 - 10 scale. Subjective scale. 0 = no weeds/no crop phytotoxicity, 1 = 2.5%, 2 = 10%, 3 = 21%, 4 = 35%, 5 = 50%, 6 = 65%, 7 = 79%, 8 = 90%, 9 = 97.5%, 10 = all weeds or total crop loss

Canopeo app is a phone based application used to quantify live green vegetation. 0 - 100%, where low % indicates little green vegetation detected. Low scores indicate good weed control.

Weed control relative to UTC. High weed scores indicate high weed pressure and therefore little control.

Main grass weed: barnyardgrass, Bermuda, and sprangletop

Main broadleaf (BL) weeds: pigweed, lambsquarter, puncturevine, and nutsedge

Sweetpotato plant harvest on June 8, number of good transplants per sq ft. Not all plots could be harvested.

LSD 0.05 = Least significant difference at the 95% confidence level. Means within each evaluation date separrated by less than this amount are not significantly different (ns). --- = insufficient data for analysis.

3/29 weed counts performed on square root transformed data

CV% = coefficient of variation

Table 3. Sweetpotato (cv 'Bellevue') root yield for select hotbed herbicide treatments, IR-4 herbicide trial 2021.

		40 lb box/A			adjusted TMY		No. 1's	Culls
treatment		No. 1's	Meds	Jumbos	box/A	bins/A	#1%	cull%
1	UTC	933	172	135	1239	62.0	75.3%	9.5%
2	Gramoxone 0.25 lbs ai/A + NIS	688	234	104	1026	51.3	67.0%	9.0%
3	Gramoxone 0.5 lbs ai/A + NIS	670	66	150	887	44.3	75.6%	17.3%
4	Gramoxone 1.0 lbs ai/A + NIS	997	221	109	1327	66.4	75.1%	7.7%
5	Suppress 9%	825	145	103	1073	53.6	76.9%	11.5%
6	Rely 280; 48 oz/A + NIS	897	224	179	1300	65.0	69.0%	2.8%
7	Glyphosate 2% + NIS	---	---	---	---	---	---	---
8	Shank 8 oz/A + NIS	831	230	115	1177	58.8	70.7%	9.0%
9	Hand Weed (ends only)	782	176	109	1067	53.4	73.3%	11.9%
	Average	828	184	126	1137	56.8	72.9%	9.9%

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 20 boxes 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.
---	Not determined

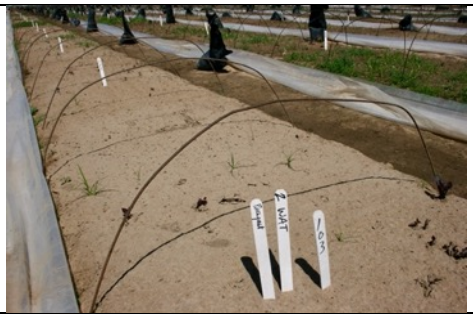
Appendix 1. Weed control at 7 days after treatment.

		
Treatment 1: UTC	**Treatment 2: Gramoxone 0.25**	**Treatment 3: Gramoxone 0.5**
		
Treatment 4: Gramoxone 1.0	**Treatment 5. Suppress 9%**	**Treatment 6: Rely 280 48 oz**
		
Treatment 7: Glyphosate 2%	**Treatment 8: Shark 8 oz/A**	

Appendix 2. Weed control 14 days after treatment photos.

Treatment 1: UTC

Treatment 2: Gramoxone 0.25



Treatment 3: Gramoxone 0.5

Treatment 4: Gramoxone 1.0

Treatment 5. Suppress 9%

Treatment 6: Rely 280 48 oz

Treatment 7: Glyphosate 2%

Treatment 8: Shark 8 oz/A

Appendix 3. Weed control 21 days after treatment photos.

Treatment 1: UTC

Treatment 2: Gramoxone 0.25

Treatment 3: Gramoxone 0.5

Treatment 4: Gramoxone 1.0

Treatment 5. Suppress 9%

Treatment 6: Rely 280 48 oz

Treatment 7: Glyphosate 2%

Treatment 8: Shark 8 oz/A

Treatment 9. Hand weed

Performance of post emergence broadcast herbicides on sweetpotatoes
IR-4 Project: IS00383

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Objective:
The purpose of this research was to collect crop safety and weed control data to support registration of postemergence broadcast herbicides on sweetpotatoes.

Introduction
Typical weed management practices in commercial sweetpotatoes in California include the use of pre-plant weed management coupled with a limited number of registered herbicides, cultivation, and hand hoeing when appropriate. Registered pre-emergence herbicides include Devrinol (napropamide), Dacthal (DCPA), and Chateau/Valor (flumioxazin), however, because they require sprinkler irrigation or rainfall to incorporate, they are rarely used. Post emergence herbicides, cultivation, and hand hoeing are the main methods used to control weeds. Post-plant herbicide applications are limited to glyphosate (Roundup) with hooded sprayers, used after transplanting and before canopy closure. Other herbicides include the OMRI certified organic burndown product Suppress (capric + caprylic acid).

Except for yellow nutsedge, annual weeds dominate in production sweetpotato fields, especially *Amaranthus* species. The main method of irrigating sweetpotatoes is with surface drip tape placed between the plant rows. While very effective in providing uniform water and fertilizer delivery, this practice also creates a near ideal environment for summer annual weeds. Sweetpotatoes compete poorly with the vertical growing habit of pigweeds, lambsquarters, and nightshades, and if left unmanaged, will quickly outgrow and shade the crop, causing significant yield losses. Based on IR-4 trials in 2016, I reported yield declines of 75% when pigweeds were left unmanaged for the first 60 days after transplanting. In 2017, additional weed management trials showed yield losses up to 25% when weeds were not controlled at 6 weeks after transplanting. In 2018, pre-plant applications of Rely herbicide at 24 & 48 fl oz/A provided poor weed control and yields were reduced 36% in these treatments compared to the hand weeded treatments.

While still effective, concerns about weed resistance to glyphosate, especially with *Amaranthus* species, necessitate continual evaluation of weed management options in sweetpotatoes. The purpose of this research was to collect performance data in California to support registration of various post emergence herbicides on sweetpotatoes.

Methods. Site 1
This field site was established June 21, 2021, on a commercial field that had not received any additional cultivation since it was transplanted. All herbicide applications were made using a hand-held CO2 backpack sprayer with T-Jet 8002 nozzles on a 5 ft boom calibrated at 30 gpa equivalent. Spray swath width at 2 feet above the soil surface was 6.67 feet. Plot size was 1 bed (2 rows) 6.67 ft wide x 40 ft long. Experimental design was a RCB with 4 replications; means separation was done using Fisher's Protected LSD at 95% confidence level. Data collected included weed counts per 4 ft^2 and weed and crop injury using a subjective scale (0 = no injury or no control, 10 = 100% crop death), determined at 7, 14, and 21, days after treatment. Weed count data were transformed using the square root transformation to improve the homogeneity of variance. A nontreated check was included for comparison. Photos were taken of the plots at the evaluation dates. Treatments and surfactants that were used as shown in treatment protocol (Table 1).

Results. Weed and crop injury ratings made at 9, 14, and 21 days after treatment are shown in Table 2. The number of weeds were significant reduced in many of the herbicide treatments at 7 and 14 days after treatment. Specifically, Devrinol and the high rates of Linex, Sencor, and Shieldex were all statistically similar to the hand weeded treatment (Figure 1). Unfortunately, this test site was located directly down wind of a commercial weed management company's storage and mixing yard, and within 2 weeks after treatment it was apparent that herbicide drift had caused extensive crop injury to the field where this trial was located. Most of the treatment plots were completely compromised -- it was impossible to tell the difference between crop injury caused by the experimental herbicides and that caused by drift (Figure 2). Weed evaluations were also compromised. Therefore, after 3 evaluations this site was abandoned on July 15, 2021, and a second location was started on the same day. This portion of the field was disked up by the grower prior to harvest.

Appendix 1 shows photos taken of each treatment at the last evaluation date.

Table 1. Field site #1 location and herbicide treatments, IR-4 postemergence trial on sweetpotatoes Merced County 2021.

Cooperator	Lester Koehn
field location	corner of Cressey and Liberty Rds, near Livingston, CA
	Latitude: 37° 22' 32.28" N Longitude: 120° 40' 13.15" W
Soil	Atwater Sand
Variety	Covington
Transplant	6/7/21
harvest	**not harvested. This trial was dropped due to herbicide drift**
Treatment	6/21/21
evaluation	July 1, 6, and 15

			ai	rate	adjuvant
Treatments:	1	UTC weed-free	---	---	no
	2	UTC weedy	---	---	no
	3	Linex 4F	lineron	0.5 pt	none
	4	Linex 4F	lineron	1.0 pt	none
	5	Linex 4F	lineron	2.0 pt	none
	6	Sencor 75	metribuzin	4 oz	none
	7	Sencor 75	metribuzin	6 oz	none
	8	Sencor 75	metribuzin	8 oz	none
	9	Shieldex 400	tolpyralate	0.67 oz	MSO 1.0% v/v
	10	Shieldex 400	tolpyralate	1.0 oz	MSO 1.0% v/v
	11	Shieldex 400	tolpyralate	1.35 oz	MSO 1.0% v/v
	12	Tough 30WG	pyridate	1.57 lb	NIS 0.25%
	13	Tough 30WG	pyridate	2.07 lb	NIS 0.25%
	14	Tough 30WG	pyridate	3.13 lb	NIS 0.25%
	15	Devrinol DF	napropamide	4 lbs	none

T-jet 8002 nozzles on 5 ft boom, spray swath 6'8"
50 psi and 40 gpa equivalent
RCBD with 4 replications
plots 1 bed x 40 ft
MSO: Helena Dyne-Amic modified vegetable oil surfactant blend
NIS: Helena Induce nonionic wetter/spreader surfactant

Table 2. Weed pressure as affected by herbicide treatment at the first trial location, Merced County 2021.

Treatment	rate	adjuvant	7/1/21 # weeds/4 sq ft	# weeds sq rt corr	7/6/21 0-10 scale	7/15/21 0-10 scale	predominant weed spp
1 UTC weed-free	---	no	1.8	1.38	0.0	0.5	---
2 UTC weedy	---	no	28.3	5.10	5.3	6.5	nutsedge, puncture vine, goosefoot, chickweed
3 Linex 4F	0.5 pt	none	23.0	4.73	4.8	5.0	groundsel
4 Linex 4F	1.0 pt	none	12.3	3.21	3.5	4.5	nutsedge and puncture vine
5 Linex 4F	2.0 pt	none	10.8	3.09	2.5	3.0	nutsedge
6 Sencor 75	4 oz	none	19.3	4.42	5.5	6.3	nutsedge and puncture vine
7 Sencor 75	6 oz	none	25.5	4.69	4.0	5.0	nutsedge
8 Sencor 75	8 oz	none	5.3	2.30	1.8	2.3	puncture vine
9 Shieldex 400	0.67 oz	MSO 1.0% v/v	15.5	3.94	3.0	4.0	nutsedge and puncture vine
10 Shieldex 400	1.0 oz	MSO 1.0% v/v	12.8	3.50	3.3	4.3	nutsedge and puncture vine
11 Shieldex 400	1.35 oz	MSO 1.0% v/v	9.8	3.08	2.0	3.0	puncture vine
12 Tough 30WG	1.57 lb	NIS 0.25%	22.3	4.56	4.0	3.8	puncture vine
13 Tough 30WG	2.07 lb	NIS 0.25%	26.8	4.89	4.3	4.8	nutsedge, groundsel, and puncture vine
14 Tough 30WG	3.13 lb	NIS 0.25%	32.0	5.69	5.8	6.5	chickweed, puncture vine, nutsedge
15 Devrinol DF	4 lbs	none	17.0	4.02	1.3	2.3	nutsedge, filleree, purslane
		Average	17.5	3.91	3.6	4.4	
		LSD 0.05	---	1.77	2.5	2.8	
		CV, %	---	31.7	48.6	45.4	

* Hand weeded control plots were weeded weekly.

0 - 10 scale. Subjective scale. 0 = no weeds/no crop phytotoxicity, 1 = 2.5%, 2 = 10%, 3 = 21%, 4 = 35%, 5 = 50%, 6 = 65%, 7 = 79%, 8 = 90%, 9 = 97.5%, 10 = all weeds or total crop loss

LSD 0.05 = Least significant difference at the 95% confidence level. Means within each evaluation date separrated by less than this amount are not significantly different (ns).

Weed count data were square root transformed to improve homogeneity of variance.

July 6 and 15 weed evaluations do not include treatment #1 (UTC) in statistical analysis.

CV% = coefficient of variation

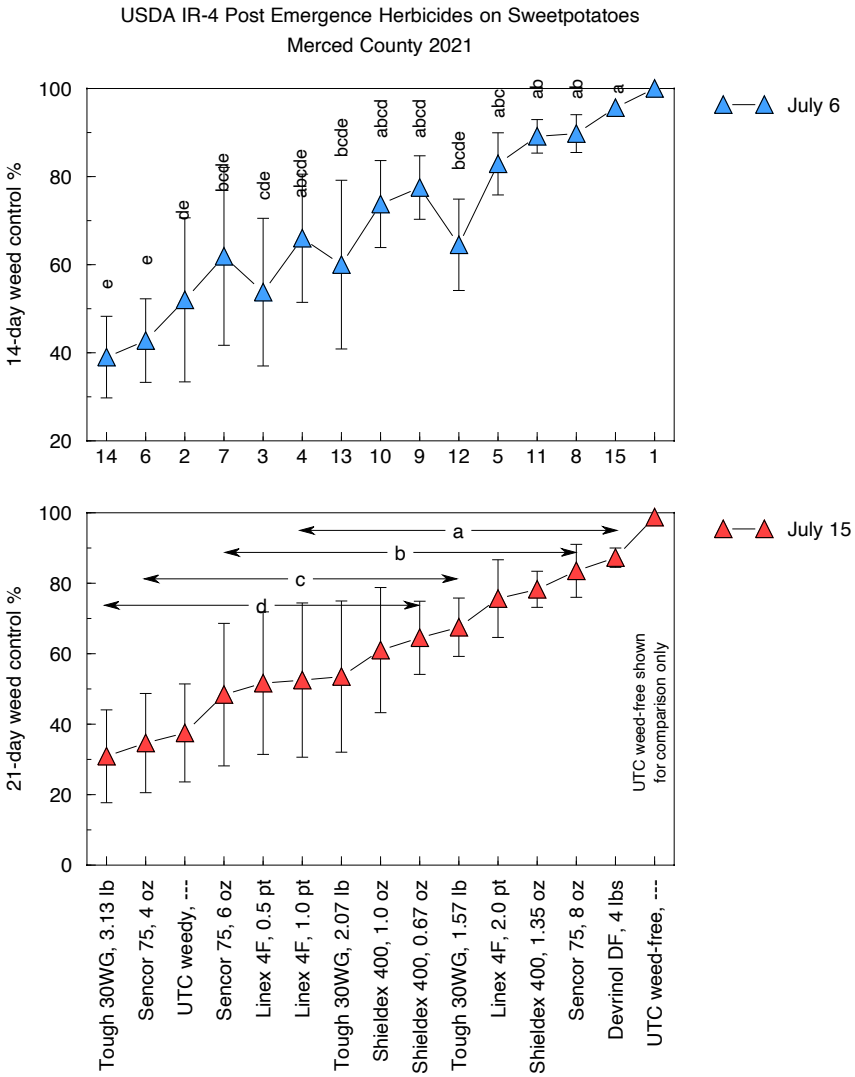


Figure 1. Weed control at 14 and 21 days after treatment.

Figure 2. Extensive herbicide drift from an adjacent weed management company prevented growth of crop and weeds similarly.

Methods site 2

This field site was established July 15, 2021, on a commercial field that had not received any additional cultivation since it was transplanted. All herbicide applications were made using a hand-held CO_2 backpack sprayer with T-Jet 8002 nozzles on a 5 ft boom calibrated at 40 gpa equivalent at 50 psi. Herbicides were applied with surfactants as shown in Table 3 over the top of the sweetpotato plants. Spray swath was 6.67 ft when measured ~24" above the bed. Most emerged weeds were at the cotyledon to 4 leaf stage at the time of application (Figure 3), and varied from mostly broadleaf weeds in some plots, and a mix of barnyardgrass and broadleaf weeds in others. Plot size was 1 bed (2 rows) 6.67 ft wide x 40 ft long. Data collected included weed counts per 4 ft^2 and weed and crop injury using a subjective scale (0 = no injury or no control, 10 = 100% crop death), determined at 7, 14, and 39, days after treatment. Weed count data were transformed using the square root transformation to improve the homogeneity of variance. Weed control was estimated from the subjective scale rating using the arcsin transformation, where the hand weeded plots were considered 100% control. A nontreated weedy check and a hand-weeded weed-free check were included for comparison. Weed-free check plots were maintained weed-free through light cultivation and hand removal, while the weedy check was hand weeded after the last evaluation on 23-Aug.

Most of the herbicide treatments had poor suppression of grassy weeds. Therefore, an application of clethodim (8 oz/A + 1% COC in 40 gpa equivalent) was applied to all treatments on Aug 4.

Experimental design was a RCB with 4 replications; means separation was done using Fisher's Protected LSD at 95% confidence level. The analysis of variance was performed two ways, both as a RBD for each treatment, and as a two-way factorial design with herbicide (Linex, Sencor, Shieldex, and Tough) and rate (high, medium, and

Figure 3. Weed size at time of herbicide application was usually 2-4 true leaves. Weed species included both broadleaf (primarily nightshade and pigweed) and grasses (barnyardgrass).

low) were the main factors. Photos were taken of the plots at the evaluation dates. Treatments and surfactants that were used as shown in treatment protocol (Table 3). All plots were hand weeded after the final evaluation date and kept weed-free until harvest.

Yields were measured using a commercial 2-row harvester and hand graded by the harvest crew into standard size grades (No. 1's, mediums, and jumbos). Cull roots were also weighed. Marketable yield was calculated as the sum of No. 1, mediums, and jumbos grades. Whole plot yields were taken for this trial, and the herbicide treatments were separated into their own bins and later destroyed.

Table 3. Field site #2 location and herbicide treatments, IR-4 postemergence trial on sweetpotatoes Merced County 2021.

Cooperator	Bob Weimer					
field location	corner of Cressey and Longview Rds, near Livingston, CA					
	Latitude: 37° 21' 12.222" N		Longitude: 120° 40' 4.218" W			
Soil	Atwater Sand					
Variety	Bonita					
Irrigation:	drip					
Transplant	7/1/21	Harvest	11/8/21	Days:	130	
Treatment app	7/15/21					
evaluations	July 22, 28, and Aug 23					

		Product	ai	rate	adjuvant	
Treatments:	1	UTC weed-free	---	---	no	
	2	UTC weedy	---	---	no	
	3	Linex 4F	lineron	0.5 pt	none	
	4	Linex 4F	lineron	1.0 pt	none	
	5	Linex 4F	lineron	2.0 pt	none	
	6	Sencor 75	metribuzin	4 oz	none	
	7	Sencor 75	metribuzin	6 oz	none	
	8	Sencor 75	metribuzin	8 oz	none	
	9	Shieldex 400	tolpyralate	0.67 oz	MSO 1.0% v/v	Dyne-Amic
	10	Shieldex 400	tolpyralate	1.0 oz	MSO 1.0% v/v	
	11	Shieldex 400	tolpyralate	1.35 oz	MSO 1.0% v/v	
	12	Tough 30WG	pyridate	1.57 lb	NIS 0.25%	Induce
	13	Tough 30WG	pyridate	2.07 lb	NIS 0.25%	
	14	Tough 30WG	pyridate	3.13 lb	NIS 0.25%	
	15	Devrinol DF	napropamide	4 lbs	none	incorporated

T-jet 8002 nozzles on 5 ft boom, spray swath 6'8"
50 psi and 40 gpa equivalent
91 F and 24% RH on day of application, 8 mph wind WNW
Clethodim application to all plots: Aug 4

Results. Weed and crop injury ratings made at 9, 14, and 39 days after treatment are shown in Table 4. Weed pressure and diversity were very good in this field, though grassy weeds dominated in some plots, whereas broadleaf weeds were more common in others. Common weed species included nightshades (especially groundcherry), pigweed, puncture vine, nettleleaf goosefoot, spurge, purslane, barnyardgrass, and nutsedge. Some of the plots also had annual morningglory, a rare weed to find in California production fields (Figure 4).

Figure 4. Morningglory was the only weed escape in the Shieldex plots.

Weed control at the Aug 23 evaluation ranged from a low of 7.5% for Sencor at 4 oz/A to 98.8% for the 1.35 oz of Shieldex 400 (statistically similar to the hand weeded control). Weed control was quite remarkable for all Shieldex treatments at this location: one application (plus a clethodim spray) provided season-long weed control for all weeds except morningglory.

The factorial analysis results are shown in Table 5, comparing the main effects of herbicide and rate. Shieldex 400 had significantly better weed control than the other herbicide treatments (excluding Devrinol, which also provided excellent weed control but was not included in the factorial analysis). Linex was second best, at 81%. Sencor faired poorly at this location, probably because it does not suppress nightshades, which were a major weed at this test site. Indeed, Sencor seemed to select for nightshades, as it was the dominant weed in these treatments by the last evaluation date (Figure 5).

Figure 5. Sencor 6 oz/A. All metribuzin treatments resulted in weed suppression of most weeds except nightshades, which quickly outgrew the sweetpotatoes.

Averaged across rate, there was significantly more weed control at the highest rate of each herbicide. The rate x herbicide interaction was significant for weed control on 23-Aug: Linex, Sencor, and Tough improved weed control as rate increased, but Shieldex did not (Figure 6).

All the herbicide treatments except Devrinol caused significant crop injury by 2 weeks after application (Table 4). Injury was greatest in the Sencor treatments, and least with Tough, and generally increased as rate increased for all herbicides (Table 5 and Figure 6). Typical injury symptoms were stunting, leaf marginal chlorosis and necrosis, and leaf spotting (Figure 7). By Aug 23, most of the plants had recovered and crop injury scores were very low (Figure 6). Only in the Sencor 8 oz/A treatment was crop injury significantly more than Devrinol.

Yield results are shown in Table 6 and in Figure 8. Because this was a seed field and planted very late, yields were moderate for all treatments – there were almost no jumbo size roots, which require additional degree-days to develop -- and ranged from 190 to 477 boxes/A. All rates of Sencor had significantly less total marketable yield (TMY) than the other herbicide treatments, and numerically less yield than even the weedy check plot (Figure 8). This implies that crop injury impacted root production in addition to competition from weeds. Overall, Shieldex at 0.67 oz/A, Tough at 3.13

lbs/A, and Devrinol had the best yields at >394 boxes/A, though these treatments were all numerically less than the weed-free control. Cull% also increased in all herbicide treatments as compared to the untreated, though this was not significant. There was no significant impact of herbicide rate on root size or TMY, and the herbicide x rate interaction was not significant for any measured yield component (Table 7). When averaged across rate, only Sencor was significantly less than the other herbicide treatments.

Summary: This trial was conducted in a late season sweetpotato field to measure the effects of 4 different post-emergence herbicides (lineron, metribuzin, tolpyralate, and pyridate) at 3 different rates (low, medium, and high) on weed control, crop injury, and root yield. Napropamide and both weedy and weed-free treatments were included for comparison. Applications were made over the top of the plants at 2 weeks after transplanting and when emerged weeds were at 2 – 4 true leaves. Plot size was 1 bed (2 rows) 6.67 ft wide x 40 ft long. Experimental design was a RCB with 4 replications; means separations were done using Fisher's Protected LSD at 95% confidence level. Data collected included weed counts per 4 ft^2 and weed and crop injury using a subjective scale (0 = no injury or no control, 10 = 100% crop death), and root yield. All 4 herbicides caused significant ($p<0.05$) crop injury at 2 weeks after treatment, however, symptoms were mostly gone by 6 weeks after treatment and no longer significantly different than the untreated controls. Except for pyridate, crop injury increased as rate increased. Metribuzin caused the most crop injury in this trial, while also showing the poorest weed control, at only 35%. The poor weed control was a result of heavy nightshade growth, which was a major weed at this location. Best weed control occurred with all rates of tolpyralate, followed by lineron. All herbicide treatments had less yield than the weed-free control, however, yields were least impacted in the tolpyralate and pyridate treatments; yields were reduced more than 50% in the metribuzin treatments. Results from this trial suggest that at proper rates, lineron, tolpyralate, and pyridate have the potential for effective post emergence weed control in sweetpotatoes. Crop injury impacts from these herbicides on crop yield needs additional investigation.

Acknowledgements
Many thanks to Mr. Lester Koehn and Mr. Bob Weimer for their help and cooperation with this project. Funding for this project was provided by USDA-IR-4 program: IR-4 Project IS00383.

Table 4. Weed control results as affected by herbicide treatment at the second trial location, Merced County 2021.

Treatment	rate	adjuvant	7/22/21 # weeds/4 sq ft	corrected sq root	weed 0-10 score	28-Jul crop phyto	weed 0-10 score	23-Aug crop phyto	% control	crop phyto symptoms	predominant weed spp
1 UTC weed-free	---	no	4.3	2.03	0.3	0.0	0.0	0.0	100.0	none	grass and broadleaf
2 UTC weedy	---	no	46.8	6.21	8.5	0.0	8.8	0.0	0.0	none	grass
3 Linex 4F	0.5 pt	none	9.0	2.99	3.3	2.5	4.5	0.5	56.5		barnyardgrass, nightshade, sedg
4 Linex 4F	1.0 pt	none	4.8	1.74	2.3	4.0	1.5	0.5	93.8	stunting	mix
5 Linex 4F	2.0 pt	none	3.0	1.76	1.8	5.8	1.5	0.5	92.5	leaf marginal necrosis	grass
6 Sencor 75	4 oz	none	8.5	2.78	5.8	4.0	8.5	0.0	7.5	stunting	nightshade
7 Sencor 75	6 oz	none	12.0	2.74	4.0	6.3	6.5	1.3	30.0	stunting	htshade, pigweed, puncture v
8 Sencor 75	8 oz	none	12.8	3.47	4.8	6.5	3.8	2.3	67.3	stunting	morningglory
9 Shieldex 400	0.67 oz	MSO 1.0% v/v	21.3	4.27	2.3	4.0	0.8	1.0	98.1	white spots on leaves	mix
10 Shieldex 400	1.0 oz	MSO 1.0% v/v	11.0	2.68	1.0	4.5	1.3	0.8	95.6	slight stunting	morningglory
11 Shieldex 400	1.35 oz	MSO 1.0% v/v	15.5	3.68	0.5	4.3	0.5	1.5	98.8	stunting and white leaves	morningglory
12 Tough 30WG	1.57 lb	NIS 0.25%	22.5	4.76	3.8	3.3	4.5	0.5	57.3		grass
13 Tough 30WG	2.07 lb	NIS 0.25%	8.8	2.62	3.5	2.3	4.8	0.5	53.8	slight stunting	mix
14 Tough 30WG	3.13 lb	NIS 0.25%	4.8	2.24	3.8	3.5	2.5	0.8	83.8	stunting	pigweeds and grass
15 Devrinol DF	4 lbs	none	4.3	2.12	1.0	0.3	2.3	0.0	86.4	none	nightshade
		Average	12.6	3.1	3.3	3.9	3.7	0.8	70.9		
		LSD 0.05	---	2.39	2.63	2.1	1.91	1.16	25.9		
		CV, %	---	54.4	55.9	36.7	36.3	104.9	25.5		

* Hand weeded control plots were weeded weekly.

0 - 10 scale. Subjective scale. 0 = no weeds/no crop phytotoxicity, 1 = 2.5%, 2 = 10%, 3 = 21%, 4 = 35%, 5 = 50%, 6 = 65%, 7 = 79%, 8 = 90%, 9 = 97.5%, 10 = all weeds or total crop loss

Weed control% based on Aug 23 evaluation

LSD 0.05 = Least significant difference at the 95% confidence level. Means within each evaluation date separrated by less than this amount are not significantly different (ns).

Weed count data were square root transformed to improve homogeneity of variance. Crop phyto ratings do not include treatments 1 and 2.

July 28 and Aug 23 weed evaluations do not include treatment #1 (UTC) in statistical analysis; % control analysis excludes both treatments 1 and 2.

CV% = coefficient of variation

Table 5. Weed control results as affected by main effects of herbicide and rate at the second trial location, Merced County 2021.

Treatment	rate	adjuvant	7/22/21 # weeds/4 sq ft	corrected sq root	weed 0-10 score	28-Jul crop phyto	weed 0-10 score	23-Aug crop phyto	% control	crop phyto symptoms	predominant weed spp
1 UTC weed-free	---	no	4.3	2.0	0.3	0.0	0.0	0.0	100.0	none	grass and broadleaf
2 UTC weedy	---	no	46.8	6.2	8.5	0.0	8.8	0.0	0.0	none	grass
15 Devrinol DF	4 lbs	none	4.3	2.1	1.0	0.3	2.3	0.0	86.4	none	nightshade
Linex 4F		none	5.6	2.2	2.4	4.1	2.5	0.5	80.9	stunting	mix
Sencor 75		none	11.1	3.0	4.8	5.6	6.3	1.2	34.9	stunting	nightshade
Shieldex 400		MSO 1.0% v/v	15.9	3.5	1.3	4.3	0.8	1.1	97.5	white spotting	mix + morningglory
Tough 30WG		NIS 0.25%	12.0	3.2	3.7	3.0	3.9	0.6	64.9	slight stunting	pigweeds and grass
		LSD 0.05	ns	ns	1.6	1.2	1.2	ns	15.6		
	low		15.3	3.7	3.8	3.4	4.6	0.5	54.8		
	medium		9.1	2.4	2.7	4.3	3.5	0.8	68.3		
	high		9.0	2.8	2.7	5.0	2.1	1.3	85.6		
		LSD 0.05	ns	ns	ns	1.1	1.0	0.6	13.5		
		herbicide X rate p-test	ns	ns	ns	ns	*	ns	*		
		CV, %	101.1	50.1	63.2	35.4	42.0	100.9	27.0		

treatments 1, 2, and 15 shown for comparison only and are not included in statistical analysis.
0 - 10 scale. Subjective scale. 0 = no weeds/no crop phytotoxicity, 1 = 2.5%, 2 = 10%, 3 = 21%, 4 = 35%, 5 = 50%, 6 = 65%, 7 = 79%, 8 = 90%, 9 = 97.5%, 10 = all weeds or total crop loss
Weed control% based on Aug 23 evaluation
LSD 0.05 = Least significant difference at the 95% confidence level. Means within each evaluation date separrated by less than this amount are not significantly different (ns).
Weed count data were square root transformed to improve homogeneity of variance. Crop phyto ratings do not include treatments 1 and 2.
CV% = coefficient of variation

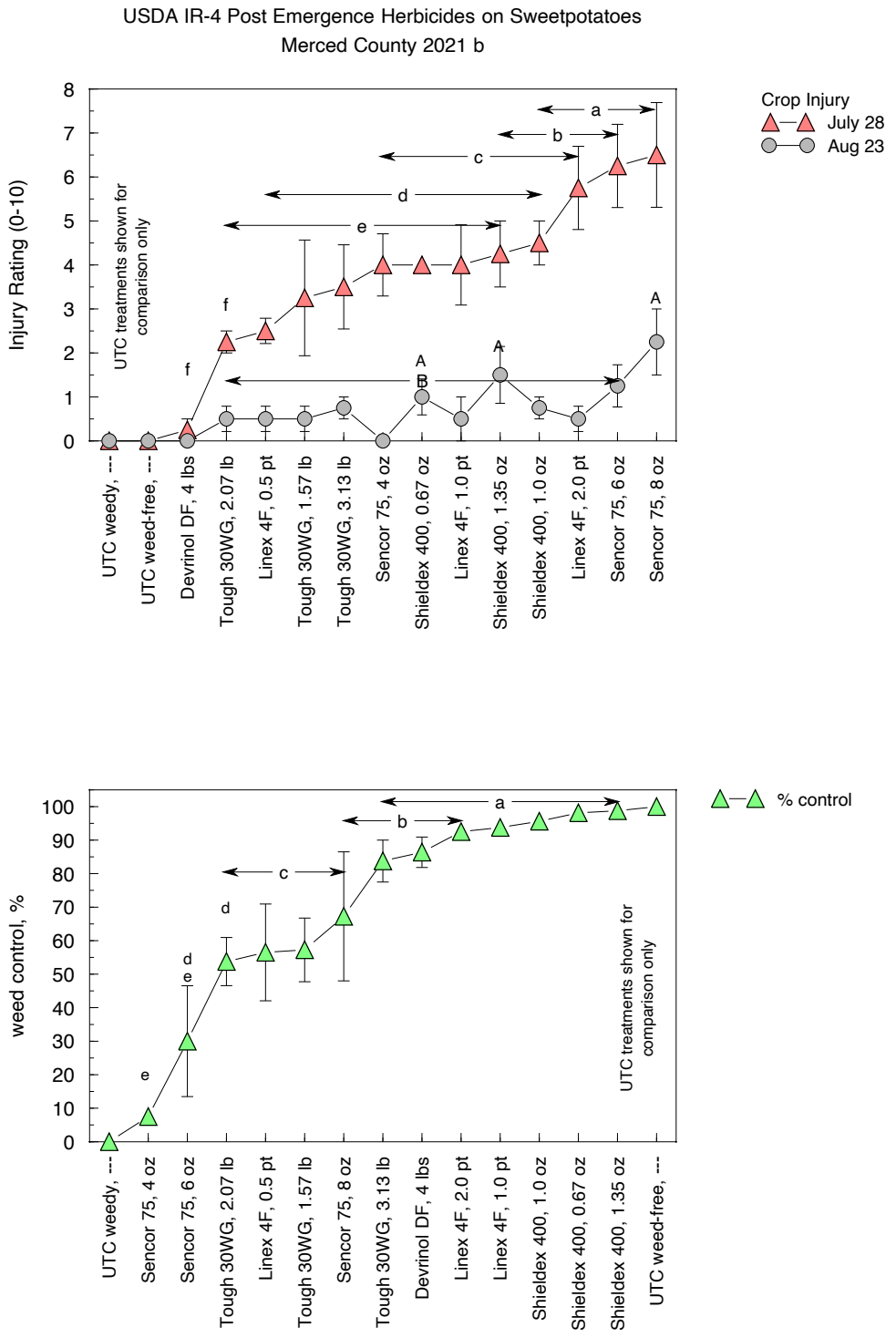


Figure 6. Sweetpotato crop injury at 2 and 6 weeks (top) and weed control at 6 weeks after treatment as affected by herbicide treatment. Merced County site #2.

Table 6. Sweetpotato yield and grade results as affected by herbicide treatment at the second trial location, Merced County 2021.

Treatment		rate	adjuvant	TMY lbs/A	40 lb box/A adj No. 1's	Jumbos	Mediums	adj TMY box/A	total bins/A	No. 1's #1%	Culls cull%
1	UTC weed-free	---	no	23837	258	7	212	477	23.8	53.8%	8.8%
2	UTC weedy	---	no	12082	92	0	149	242	12.1	37.1%	10.6%
3	Linex 4F	0.5 pt	none	16449	139	0	190	329	16.4	42.3%	17.9%
4	Linex 4F	1.0 pt	none	17715	142	2	210	354	17.7	39.1%	14.5%
5	Linex 4F	2.0 pt	none	15959	131	1	188	319	16.0	40.3%	17.5%
6	Sencor 75	4 oz	none	11837	84	0	153	237	11.8	35.1%	17.4%
7	Sencor 75	6 oz	none	11143	61	2	160	223	11.1	26.9%	16.1%
8	Sencor 75	8 oz	none	9510	75	2	113	190	9.5	39.4%	10.4%
9	Shieldex 400	0.67 oz	MSO 1.0% v/v	20082	199	9	193	402	20.1	49.8%	14.6%
10	Shieldex 400	1.0 oz	MSO 1.0% v/v	18653	186	0	187	373	18.7	49.3%	14.7%
11	Shieldex 400	1.35 oz	MSO 1.0% v/v	18123	168	2	192	362	18.1	45.8%	13.3%
12	Tough 30WG	1.57 lb	NIS 0.25%	17184	157	2	185	344	17.2	45.8%	15.5%
13	Tough 30WG	2.07 lb	NIS 0.25%	17388	156	5	187	348	17.4	44.7%	15.9%
14	Tough 30WG	3.13 lb	NIS 0.25%	20134	188	2	213	403	20.1	46.7%	12.2%
15	Devrinol DF	4 lbs	none	19715	219	3	172	394	19.7	54.8%	12.4%
			Average	16654.2	150.3	2.4	180.3	333.1	16.7	43.4%	14.1%
			LSD 0.05	2506	59.8	ns	46.1	97	4.8	7.9	ns
			CV, %	20.4	27.9	202	17.9	20.4	20.4	12.7	31.5

TMY = total marketable yield. 1 box = 40 lbs
% 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 7. Sweetpotato yield and grade results as affected by the main effect of herbicide and rate, Merced County 2021.

Treatment		rate	adjuvant	TMY lbs/A	40 lb box/A adj No. 1's	Jumbos	Mediums	adj TMY box/A	total bins/A	No. 1's #1%	Culls cull%
1	UTC weed-free	---	no	23837	258	7	212	477	23.8	53.8%	8.8%
2	UTC weedy	---	no	12082	92	0	149	242	12.1	37.1%	10.6%
15	Devrinol DF	4 lbs	none	19715	219	3	172	394	19.7	54.8%	12.4%
	Linex 4F		none	16708	137	1	196	334	16.7	40.6%	16.6%
	Sencor 75		none	10830	73	1	142	217	10.8	33.8%	14.6%
	Shieldex 400		MSO 1.0% v/v	18953	184	4	191	379	19.0	48.3%	14.2%
	Tough 30WG		NIS 0.25%	18236	167	3	195	365	18.2	45.7%	14.5%
			LSD 0.05	2807	33.4	ns	27.7	56.1	2.8	4.5	ns
		low		16388	145	2.7	181	328	16.4	43.2	16.3
		medium		16224	136	2.3	186	325	16.2	40.0	15.3
		high		15931	141	1.7	177	319	15.9	43.1	13.4
			LSD 0.05	ns	ns	ns	ns	ns	ns	ns	ns
			herbicide X rate p-test	ns	ns	ns	ns	ns	ns	ns	ns
			CV, %	20.9	28.6	225	18.4	20.9	20.9	13.1	26.1

treatments 1, 2, and 15 shown for comparison only and are not included in statistical analysis.
TMY = total marketable yield. 1 box = 40 lbs
% 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.

Figure 7. Typical crop injury symptoms included stunting (left), chlorotic spots (center) and marginal necrosis (right). Treatments are Sencor, Shieldex, and Linex, respectively. Photos taken 14 days after treatment.

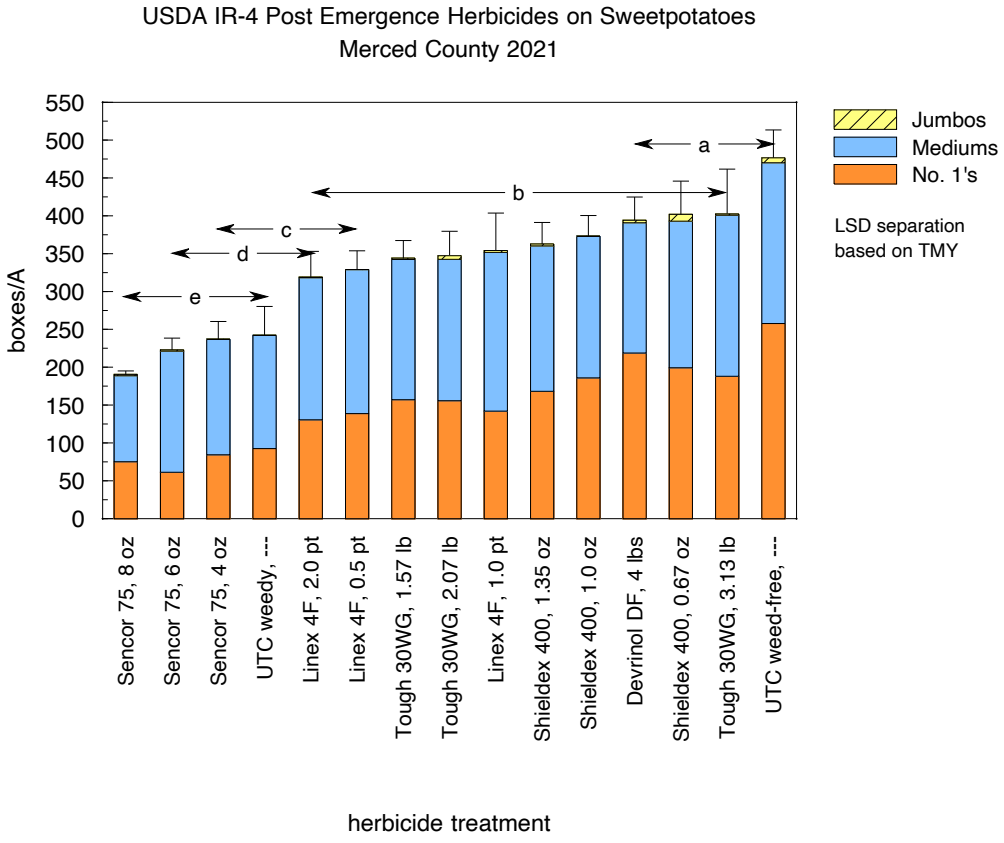


Figure 8. Sweetpotato yield by herbicide and rate. Merced County 2021.

Appendix 1. Treatment photos, Site #1, July 15, 2021.

1. Hand weed UTC

2. Weedy check UTC

15. Devrinol 4lbs/A

3. Linex 4F 0.5 pt/A

4. Linex 4F 1.0 pt/A

5. Linex 4F 2.0 pt/A

Appendix 1. Treatment photos, Site #1, July 15, 2021.

6. Sencor 4 oz/A

7. Sencor 6 oz/A

Missing photo

8. Sencor 8 oz/A

9. Shieldex 400 0.67 oz/A

10. Shieldex 400 1.0 os/A

11. Shieldex 400 1.35 oz/A

Appendix 1. Treatment photos, Site #1, July 15, 2021.

12. Tough 30 WG 1.57 lbs/A

13. Tough 30 WG 2.07 lbs/A

14. Tough 30 WG 3.13 lbs/A

Appendix 2. Test site location #2 treatment photos, July 28, 2021.

1. Hand weed UTC

2. Weedy check UTC

15. Devrinol 4lbs/A

Appendix 2. Test site location #2 treatment photos, July 28, 2021.

3. Linex 4F 0.5 pt/A

4. Linex 4F 1.0 pt/A

5. Linex 4F 2.0 pt/A

6. Sencor 4 oz/A

7. Sencor 6 oz/A

8. Sencor 8 oz/A

Appendix 2. Test site location #2 treatment photos, July 28, 2021.

9. Shieldex 400 0.67 oz/A

10. Shieldex 400 1.0 os/A

11. Shieldex 400 1.35 oz/A

12. Tough 30 WG 1.57 lbs/A

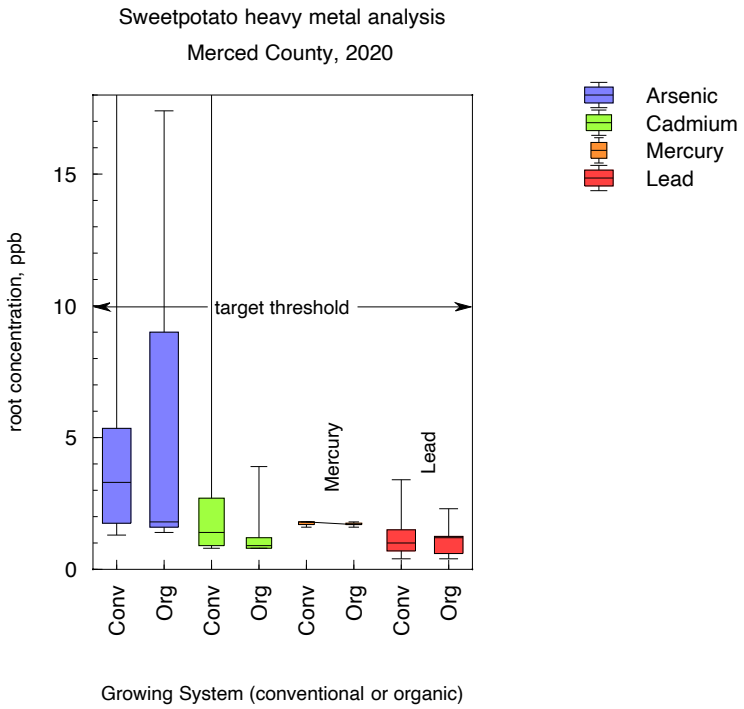
13. Tough 30 WG 2.07 lbs/A

14. Tough 30 WG 3.13 lbs/A

Appendix 3. Test site location #2 treatment photos, Aug 23, 2021.		
		
1. Hand weed UTC	2. Weedy check UTC	15. Devrinol 4lbs/A
		
4. Linex 1 pt/A	7. Sencor 75 6 oz/A	9. Shieldex 0.67 oz
	No other photos	No other photos
13. Tough 2.07 lbs/A		

Sweetpotato heavy metal sampling: Year 1
Scott Stoddard, UCCE Merced County

This project was initiated at the request of the U.S. Sweet Potato Council and the Sweetpotato Council of California in response to a national report of the finding of elevated levels of lead, cadmium, arsenic, and mercury in some baby foods made from sweetpotatoes. The purpose of the risk assessment to the industry was to determine if the metals were a result of the roots or the manufacturing process. A survey was conducted by sampling 30 roots in storage from different fields and growers from the 2020 crop. One root was randomly taken from a #1 bin in March of 2021, coded for anonymity, and submitted to Brooks Applied Labs in Bothell, Washington. While these data were part of a national project, only California results are reported here.



Sweetpotato storage samples from 2020 crop. Each data point represents one (1) root randomly selected from a #1 bin in Feb - March, 2021. Total samples = 30 and represent both organic (11) and coventional (19) growing systems. Only orange-flesh were sampled (Diane, Bellevue, and Vermillion cultivars).

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Many thanks to the many cooperators, including growers, PCA's, Agriculture Commissioner, and company development reps, for help with conducting these projects, without which these would not have been possible. Special thanks to the following men for putting in extra time and trouble:

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- Dave Souza, D&S Farms. Advanced Line Trial.
- Jed Kruppa, Kruppa Farms. POLY-4 potassium trials..
- Robert Silveira and foreman Flocco, Target nematicide trial.
- Bob Weimer, Weimer Farms, and Pete Kandola, Kandola Farms. Southern Blight Trial.
- Bob Weimer, Weimer Farms. IR-4 post herbicide efficacy trail.
- Randy Jantz, Jantz Farms. IR-4 glufosinate trial.
- Craig Arnold, Arnold Farms. IR-4 paraquat hotbed trial.

Scott Stoddard, Farm Advisor

In memoriam:
This report is dedicated to the memory of Mr. Bob Weimer, long-time collaborator and contributor to my sweetpotato program since 1998. Bob was a farmer, an engineer, an irrigation specialist, a plant pathologist, a businessman, and a philanthropist who was always trying to improve sweetpotato production in California. A farmer until the very end, Bob passed away in the summer of 2021 and never saw his last crop. It was a nice one, Bob. You will be missed.