Sweetpotato Research Progress Report 2018

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NOTE: Not all pesticides evaluated in these trials are registered for use in sweetpotatoes. The intent of the research is to evaluate efficacy of potentially new products relative to registered and/or standard methods of pest management.

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Sweetpotato Collaborators Trial -- 2018

Scott Stoddard, UCCE Merced County

The first of two screening trials. This location was with Quail H Farms, south of Livingston, CA. Soil type was Delhi sand, slightly saline (pH 6.7, EC 2.08, Na 8.3% base sat). Conventional field, fumigated with metam-K prior to planting. Drip irrigated, water quality marginal - high salts and alkalinity. Dry winter with delayed spring rains, very hot summer after mid-June with 29 days over 100 F.
Two row plots, machine harvested and sorted by grower crew. Nematode pressure reduced yields, high cull%; plots were rogued for Murasaki.

Rep	Var#	Variety Name	Skin Color	Skin Text	Flesh color	Eyes	Lents	Shape	Shape Uniform	Overall App	Comments
1	1	Beauregard	Rose	7	3	7	5	3, 5	7	7	some WW
2			Rose Cu	5	3	9	7	3, 8	7	5	Some RC
1	2	Covington	Rose	7	3	5	5	6	7	7	some wieworm, LG
2			Rose red	7	3	5	7	3, 6	7	8	smooth skin, little chunky, good color
1	3	Orleans	Rose	7	4	9	5	3	9	7	smoother, better look than Beauregard
2			Rose	8	3	9	7	3, 7	7	8	good shape
1	4	Burgundy	Maroon	7	5	9	7	2, 3	7	7	blocky and smooth skin
2			red-maroon	9	5	9	9	2, 5	7	7	some too round
1	5	Bellevue	Orange	9	4	9	7	3, 8	9	9	very smooth, nice shape
2			orange	9	4	9	7	2, 3	7	9	good flesh color
1	6	NC04-531 (G3	Red	5	4	5	5	2, 3	5	5	some veins, lents, eyes, nice color
2			Red to Cu	7	5	5	3	4, 5, 8	5	5	color not uniform - CV
1	7	Avery (G4)	Cu	7	4	7	5	3, 7	5	7	tip rot, some WW
2			Rose Cu	7	4	9	7	3, 7	6	8	mostly smooth, nice color
1	8	NC09-122 (G2	purple	7	5	7	3	3, 4	6	7	some tip rot, lents, veins
2			purple	9	5	9	5	3, 8	7	8	nice color, mostly smooth
1	9	L-13-81 (G3)	purple	7	5	5	7	2, 3	5	7	some WW, SG
2			red-purple	9	5	7	7	3	5	7	mostly smooth
1	10	L-13-84 (G3)	orange	9	4	7	7	3, 8	7	8	WW, very smooth
2			orange Cu	9	5	9	7	3	9	9	slightly darker color than Bellevue
1	11	Diane	Red	9	4	9	7	3, 4	7	7	tip rot, long
2			Red	9	4	9	7	3, 4	8	7	nice color, smooth
1	12	Bonita	tan	9	1	5	5	3, 4	7	5	some veins, pink zones
2			*tan*	9	1	7	7	8, 3	5	7	tip rot, long
1	13	L-11-119	red Cu	7	4	7	5	3, 4, 6	3	5	tip rot, CV
2			red Cu	7	4	5	5	4, 8	5	5	some LG, mostly long

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**

NATIONAL SWEETPOTATO COLLABORATORS SUMMARY OF DATA

2018

STATE AND LOCATION REPORTING: Livingston, CA
DATE TRANSPLANTED: 5/18/2018. DATE HARVESTED: 10/9/2018. No. GROWING DAYS: 144
DISTANCE BETEEN ROWS (in): 40. DISTANCE IN ROW (in): 9
PLOT SIZE: NO. OF ROWS: 2 LENGTH (ft): 40 NO. OF REPS: 4
IRRIGATION: drip irrigation. 1.5 to 2 inches per week during summer, total 30".
FERTILIZER: PPI 60 gpa 8-8-8 followed by drip applied 10-0-10. About 175-50-175 N-P2O5-K2O.

#	SELECTION	CLASS	------- US #1's	40 Medium	lb box/A Jumbo	------- MKT YIELD	BINS /A	% US #1's	% CULLS
1	Beauregard (G3)	yam	463	134	113	709	28.4	65.4%	22.0%
2	Covington (G4)	yam	460	255	96	812	32.5	56.6%	14.1%
3	Orleans (G4)	yam	385	190	89	664	26.6	57.8%	17.7%
4	Burgundy (G3)	red yam	450	154	136	740	29.6	60.3%	14.5%
5	Bellevue (G4)	yam	583	192	146	921	36.8	63.3%	13.1%
6	NC04-531 (G3)	red yam	498	164	118	780	31.2	63.4%	14.3%
7	Avery (G4)	yam	387	186	74	647	25.9	59.8%	12.5%
8	NC09-122 (G3)	red yam	369	201	147	718	28.7	51.2%	19.2%
9	L-13-81 (G4)	yam	295	179	75	548	21.9	53.1%	31.8%
10	L-13-84 (G4)	red yam	505	208	167	879	35.2	57.5%	13.0%
11	Diane (G2)	red yam	466	286	77	829	33.2	56.1%	15.7%
12	Bonita (G2)	sweet	363	190	108	661	26.4	54.1%	27.0%
13	L-11-119 (G5)	red yam	469	275	60	804	32.2	58.3%	14.3%
	Average		437.9	201.1	108.1	747.1	29.9	58.2%	17.7%
	LSD 0.05		125.4	55.1	ns	172.0	6.9	5.7	6.1
	CV, %		20.0	19.1	43.5	16.1	16.1	6.9	24.1

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

SCORE SHEET FOR EVALUATION OF SWEETPOTATO SPROUT PRODUCTION - NSPCG TRIAL

Date bedded:	2/15/18	Location:	North Ave, off Shanks Rd exit, near Delhi 3rd bed to east of house and shed
Date Evaluated:	4/10/18	Type:	cold bed (no gin trash)
Evaluated by:	S. Stoddard		Botran & Devrinol at bedding

	Selection	Roots presprouted yes/no	Plant Production 1-5 (1)	Uniformity of Emergence 1-5 (2)	Earliness 1-3 (3)	Root Conditions 1-5 (4)	Remarks (5)
1	Beauregard	yes	3	3	2	some rot	mostly 0-3"
2	Covington	yes	3	3	2	5	good emergence
3	Orleans	yes	4	3	2	5	deep green, just like Beauregard
4	Burgundy	yes	1.5	1	1	5	mostly no plants, starting to push
5	Bellevue	yes	2.5	3	1	5	better than #4 or #6, clumpy
6	NC04-531	yes	3	2	1	5	all green, few plants
7	Avery (NC05-198)	yes	5	4	3	5	lots of plants
8	NC09-122	yes	2.5	2	1	4	similar to #6
9	L-13-81	yes	4	3	2	5	mostly purple lvs, more plants than Bellevue
10	L-13-84	yes	2	2	1	5	similar to less than Bellevue
11	Diane	yes	4.5	3	3	5	3" tall
12	Bonita	yes	3	3	2	5	2-3" tall
13	L-11-119	yes	3	3	2	5	2-3", dark green to purple, clumpy

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

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

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

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

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

NATIONAL SWEETPOTATO COLLABORATORS SUMMARY OF DATA

2018

STATE AND LOCATION REPORTING: Bakersfield, CA

DATE TRANSPLANTED: 5/16/2018. DATE HARVESTED: 10/4/2018. No. GROWING DAYS: 141

DISTANCE BETEEN ROWS (in): 40. DISTANCE IN ROW (in): 10

PLOT SIZE: NO. OF ROWS: 1 LENGTH (ft): 40 NO. OF REPS: 4

IRRIGATION: sprinkler irrigation. 1.5 to 2 inches per week during summer, total 30".

FERTILIZER: PPI 60 gpa 8-8-8 followed by CAN17 sidedress. About 150-50-175 N-P2O5-K2O.

#	SELECTION	CLASS	------- 40 lb box/A ------- US #1's	Medium	Jumbo	MKT YIELD	BINS/A	% US #1's	% CULLS
1	Beauregard (G3)	yam	433	123	553	1109	44.4	38.7%	22.6%
2	Covington (G4)	yam	603	346	162	1111	44.5	54.2%	11.7%
3	Orleans (G4)	yam	584	270	120	974	38.9	59.6%	8.2%
4	Burgundy (G3)	red yam	502	185	164	851	34.0	59.2%	20.4%
5	Bellevue (G4)	yam	496	313	123	932	37.3	53.0%	18.0%
6	NC04-531 (G3)	red yam	236	267	49	552	22.1	42.7%	18.3%
7	Averre (G4)	yam	622	276	144	1042	41.7	59.7%	11.7%
8	NC09-122 (G3)	red yam	522	341	147	1009	40.4	51.8%	6.7%
9	L-13-81 (G4)	yam	293	201	58	552	22.1	52.8%	9.8%
10	L-13-84 (G4)	red yam	215	240	13	468	18.7	45.3%	12.4%
11	Diane (G2)	red yam	414	290	104	807	32.3	51.2%	20.4%
12	Bonita (G2)	sweet	476	336	122	934	37.3	50.8%	14.0%
13	L-11-119 (G5)	red yam	492	533	106	1130	45.2	43.8%	15.8%
14	L-16-283P	purple	362	348	108	817	32.7	44.1%	6.1%
15	L-16-298	Japanese	204	226	29	458	18.3	44.2%	6.9%
16	L-16-278	Japanese	244	304	47	594	23.8	41.3%	10.8%
	Average		418.6	287.2	127.9	833.8	33.4	49.5%	13.4%
	LSD 0.05		129.1	101.1	82.4	207.4	8.3	7.0	8.9
	CV, %		18.4	21.4	38.1	14.9	14.9	8.5	39.4

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

SCORE SHEET FOR EVALUATION OF SWEETPOTATO SPROUT PRODUCTION - ALT 2018

Date bedded: 2/16/18 Location: Cressy Ranch, near Atwater
Date Evaluated: 3/29 and 4/25, 2018 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)
1	L-16-132P	yes	2	2	1	5	all purple leaf
2	L-13-84	yes	3	3	2	5	purple new growth, then dark green
3	L-11-119	yes	3	4	2	5	deep green, sl. Purple new growth
4	L-15-39	yes	5	5	3	5	all green, best production
5	L-16-283P	yes	4	4	2	5	deep green, sl. Purple new growth
6	L-14-11	yes	2	2	1	5	mostly purple
7	L-15-57	yes	5	4	2	5	good plant production
8	L-13-81	yes	3.5	3	2	5	very similar to L-13-84
9	L-16-166	yes	3	4	2	5	all green, best production
10	L-16-278	yes	4	4	3	5	lacy, Diane leaf w/tinge of purple
11	L-14-31	yes	3.5	3	2	5	dk green
12	L-16-298	yes	4	4	2	5	med green
13	L-16-26P	yes	1	1	1	2	only 6 plants
14	NC-13-604	yes	5	5	3	5	all green, good production
15	NC-13-151	yes	5	4	3	5	dk green lots of plants

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

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

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

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

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

Table 1. Replicated lines in the 2018 Advanced Line Trial yield results (n = 4).

#	Var Name	market class	TMY lbs/A	40 lb box/A No. 1's	Meds	Jumbos	adjusted TMY box/A	bins/A	No. 1's #1%	Culls cull%	harvest comments
01ALT	Burgundy	red	41071	561	264	78	904	36.1	62.0%	1.2%	dull red
02ALT	Diane	red	45605	393	535	75	1003	40.1	39.0%	3.4%	
03ALT	L-13-81	red	62316	664	302	405	1371	54.8	48.5%	3.1%	good color
04ALT	L-13-84	yam	49181	591	269	222	1082	43.3	55.5%	3.9%	good shape
05ALT	L-11-119	red	40822	486	340	73	898	35.9	53.8%	1.2%	
06ALT	L-16-283P	purple	38768	382	279	192	853	34.1	45.0%	2.2%	P/P, long, grooves
	Average		46294	513	332	174	1018	40.7	50.6%	2.5%	
	LSD 0.05		13028	154.2	76.8	136.9	286.4	11.5	5.4	ns	
	CV, %		18.7	19.9	15.4	52.2	18.7	18.7	7.1	91.2	

Table 2. Advanced Line Trial (ALT) 2018 yield results (n = 2).

#	Var Name	market class	TMY lbs/A	40 lb box/A No. 1's	Meds	Jumbos	adjusted TMY box/A	bins/A	No. 1's #1%	Culls cull%	harvest comments
07ALT	NC-13-151	red	42689	570	241	129	939	37.6	60.6%	1.1%	P/O low jumbos
08ALT	L-16-26P	purple	39204	296	392	175	862	34.5	34.9%	1.6%	looks good
09ALT	L-16-132P	purple	38208	392	372	77	841	33.6	46.7%	3.5%	feeder roots
10ALT	L-14-31	red	44680	487	214	282	983	39.3	49.5%	1.4%	
11ALT	Bellevue	yam	70318	701	249	597	1547	61.9	45.4%	4.0%	
12ALT	L-14-11	red	36964	457	205	151	813	32.5	56.9%	3.3%	looks good
13ALT	L-15-39	Japanese	48040	539	181	337	1057	42.3	51.2%	4.7%	good shape
14ALT	L-15-57	yam	41071	416	178	309	904	36.1	47.0%	0.0%	blocky, jumbos
15ALT	L-16-278	Japanese	40200	353	178	353	884	35.4	42.0%	11.0%	
16ALT	L-16-298	Japanese	33230	389	307	36	731	29.2	53.1%	2.4%	
17ALT	NC-13-604	sweet	29372	271	350	25	646	25.8	41.9%	0.0%	latex, mostly meds
18ALT	L-16-166	Japanese	60486	868	246	216	1331	53.2	65.2%	3.9%	R/W, mostly smooth
	Average		43705	478	259	224	962	38.5	49.5%	3.1%	

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

Table 3. Average yield of L-13-81 and L-13-84 from 5 locations in California, 2018.

	Variety	40 lb box/A No. 1's	Meds	Jumbos	adjusted TMY box/A	bins/A	No. 1's #1%	Culls cull%	harvest comments	market class
Average	L-13-81	361	219	160	740	30	49.0%	14.9%	RKN side roots, misshape	red
	Diane	393	308	166	867	35	45.0%	11.8%		red
	L-13-84	428	228	128	784	31	53.9%	10.9%	RKN cracking	orange
	Bellevue*	593	251	288	1133	45	53.9%	11.7%		orange

Average yield includes strip trials and replicated trial data.
Bellevue data from 3 locations.

Sweetpotato Nematicide Trial 2018

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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), *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 can limit the amount of Telone used in any year to 17% - 50% of demand. Novel new nematicides offer the potential for effective alternatives for areas where Telone is restricted, and in buffer zones where no fumigation at all is allowed.

The objective of this trial was to evaluate nematode control and crop response to various nematicides and methods of application on sweetpotatoes grown in commercial fields in California.

Methods.

This trial was conducted in 2018 within the buffer zone in commercial sweetpotato field in Merced County, CA, evaluating Nimitz (fluensulfone, Adama), Velum (fluopyram, Bayer Crop Science), Salibro (fluazaindolizine, Dow-duPont), and Majestine (*Burkholderia* spp., Marrone Bio Innovations) nematicides on RKN control and sweetpotato yield and quality. Treatments were designed to test different methods of application, timing, and rates. Telone (1,3-D) and untreated control plots were used for comparison. The field had been in continuous sweetpotato production for several years; outside of the buffer zone Telone soil fumigant was applied at 10 gpa via shank by Simplot. The nematicides were evaluated at different treatment timings (pre-plant, at-plant, 4 – 6 weeks post plant), rates, and methods of application (with transplant water, surface band, and drip). Pre plant applications were incorporated mechanically to about 2" and also with 4 gallons of water per plot, equivalent to ~900 gallons/A (Figure 1). At-plant treatments were made by pre-mixing the products into 2 L of water, then running that into the transplant water stream during transplanting (Figure 2). Applications made after transplanting were through a secondary drip tape while the field was being irrigated (Figure 3). Sweetpotato variety Diane (root knot nematode susceptible) was transplanted on May 1 and harvested on September 18. RKN sampling was performed in early July using composite samples from each plot, and again at the end of August using duplicate samples. Samples were taken from the center of each bed to 12", 4 cores per plot. Treatment design was a randomized block with four replications. Means separation was performed using Fisher's protected LSD at *P*=0.05.

Treatment details and site information is shown in Table 1.

Results

Unlike in 2017, all of the treatments evaluated were safe to the crop and caused no loss of stand or crop phytotoxicity.

Soil nematode samples were composited for each treatment, and therefore no statistical analysis could be performed. RKN counts from the early July sampling ranged from 0 per 500 g soil in the Telone treated area, to almost 2000 in one of the Nimitz treatments, however, by the end of the growing season all treatments had similar nematode counts (Table 2). Average RKN was 502 per 500 g soil, which would be considered "high" and well above any thresholds for which control measures are warranted.

Yield results by size and total marketable yield are shown in Table 3 and Figure 4. The outside plots of this trial were unfortunately located within the Telone fumigation zone. These data were removed before running the ANOVA. The best yielding treatment was Telone, which had significantly better total marketable yield than all the other treatments. Amongst the nematicides evaluated, Salibro (Q-80) applied via drip at 4 and 6 weeks after transplanting, MBI-304, Nimitz 3.5 pts POST, and Nimitz 5.0 pts POST gave the best overall yields of 34 – 41 bins per acre. In general, the POST treatments performed better than those applied PRE or at planting. All of the treatments yielded better than the untreated control (UTC).

The percentage of culled roots was not significantly different among treatments, but the UTC had the highest number of culls, at nearly 27%. MBI-304 and Telone had the least, at 13.8% and 14.8% respectively. Culled roots were mostly a result of nematode damage, which was easily evident at harvest (Figure 5). Furthermore, the overall quality of roots was reduced in the UTC plots: many roots were off-color (not as red as desired for this variety) and had rough skin texture.

Summary.
2018 results with new nematicides showed significantly increased sweetpotato root yield and quality with pre-plant, at-plant, and post plant applications, however, post-plant applications performed better in this trial location. Previous trials in Merced County have shown that Nimitz is most effective at 5 pints/A when applied as a shank treatment 10 – 14 days before application, but that treatments 1 day before or at planting can cause significant crop injury. However, in 2018 no crop injury was observed. Velum, Salibro, and new MBI products appear to have a high levels of crop safety and have the potential to be applied in the drip system.

Table 1. Nematicide trial site and treatment information.

Location:	Just south of Target, off Applegate Rd, in Atwater, CA				
	Continuous sweetpotatoes >5 years, buffer zone no fumigation				
Soil:	Atwater sand				
Cooperator:	Robert Silveria, Classic Yam, and Lonnie Slaton, Simplot				
Variety:	Diane				
Transplant:	1-May-18				
Irrigation:	surface drip				
Harvest:	17-Sep-18 139 growing days		Application dates:		
Treatments:	1	UTC	---		
	2	MB1-601 250 lbs/A 5 days PPI	27-Apr		
	3	Majestene 2 gla/A 1 day PPI + 21 days by drip	30-Apr	2-Jun	
	4	MBI-304 4 lbs/A 1 day PPI + 21 + 42 days by drip	30-Apr	2-Jun	22-Jun
	5	Nimitz 3.5 pts/A 5 days PPI	27-Apr		
	6	Nimitz 3.5 pts/A surface band at 1st irrig.	11-May		
	7	Nimitz 5.0 pts/A surface band at 1st irrig.	11-May		
	8	Q-80 31 fl oz/A at plant in transplant water	1-May		
	9	Q-80 62 fl oz at plant in transplant water	1-May		
	10	Q-80 31 fl oz/A by drip at 4 & 6 weeks	2-Jun	22-Jun	
	11	Velum Prime 14 fl oz/A at plant in transplant water	1-May		
	12	Velum Prime 6.84 fl oz/A at planting and 6 weeks by drip	1-May	22-Jun	
	13	Telone 10 gpa (standard field treatment), PPI	5-Apr		

PPI: hand incorporated to 2" plus 4 gallon water per plot
at planting treatments: product applied in transplant water
plot size: 1 bed x 30 ft replicated 4x in RCBD
RKN sampling on July 6 and Aug 31, 2018
Harvest: 1 row digger, field separation by size and culls

Figure 1. Preplant applications were broadcast or sprayed onto the surface of clean, cultivated beds and incorporated to about 2".

Figure 2. At plant applications were done while on the transplanter.

Figure 3. Nematicide injections through surface drip tape.

Figure 5. Galling on sweetpotato roots (left) and overall quality improvement in the Salibro treatment as compared to the untreated control (UTC).

Table 2. Nematode analyses, early July and end of August.

treatment	7/6/18 # per 500 g Root Knot *Meloidogyne*	Stubby Root *Paratrichodorus*	Ring *Mesocriconema*	8/31/18 # per 500 g Root Knot *Meloidogyne*	Stubby Root *Paratrichodorus*	Ring *Mesocriconema*
1 UTC	510	28	732	290	0	332
2 MBI-601	366	52	376	528	18	244
3 Majestene	494	10	20	254	6	88
4 MB1-304	138	62	0	410	0	372
5 Nimitz 3.5 pts PPI	570	120	304	842	9	1876
6 Nimitz 3.5 pts POST	662	36	176	322	0	544
7 Nimitz 5.0 pts POST	1996	8	44	436	0	248
8 Q80 31 oz	152	10	56	454	0	116
9 Q80 62 oz	48	0	156	418	0	315
10 Q80 drip	314	18	28	742	34	592
11 Velum 14 oz	206	136	608	358	9	152
12 Velum 6.84 & POST	246	60	32	940	0	332
13 Telone std	0	132	0	542	22	428

July 16 sampling: composite of all 4 plots

Aug 31 sampling: average of samples from reps 1 & 3. 0 - 12", middle of plot, 4 cores per plot

Analyzed by Nematodes Inc., Selma, CA

Table 3. Sweetpotato (cv 'Diane') yield and root L:W ratio as affected by nematicide treatment, Merced County 2018.

Treatment	TMY lbs/A	40 lb box/A No. 1's	Mediums	Jumbos	adjusted TMY boxes/A	bins/A	No. 1's #1%	Culls cull%	Root L:W ratio
1 UTC	29245	225	318	100	643	25.7	36.5%	26.6%	2.53
2 MB1-601 250 lbs/A 5 days PPI	33838	375	295	75	744	29.8	49.9%	24.1%	2.50
3 Majestene 2 gla/A 1 day PPI + 21 days by drip	31316	307	309	73	689	27.6	43.5%	23.5%	2.59
4 MBI-304 4 lbs/A 1 day PPI + 21 + 42 days by drip	42874	461	364	118	943	37.7	48.9%	13.8%	2.92
5 Nimitz 3.5 pts/A 5 days PPI	34601	337	338	87	761	30.4	43.8%	23.3%	2.58
6 Nimitz 3.5 pts/A surface band at 1st irrig.	41395	452	339	120	911	36.4	48.9%	18.2%	2.67
7 Nimitz 5.0 pts/A surface band at 1st irrig.	39041	412	340	107	859	34.4	47.9%	20.2%	2.62
8 Q-80 31 fl oz/A at plant in transplant water	32644	278	358	83	718	28.7	37.9%	24.7%	2.79
9 Q-80 62 fl oz at plant in transplant water	34729	309	353	102	764	30.6	40.3%	21.2%	2.55
10 Q-80 31 fl oz/A by drip at 4 & 6 weeks	46654	383	414	229	1026	41.1	37.1%	17.5%	3.01
11 Velum Prime 14 fl oz/A at plant in transplant water	29790	268	310	77	655	26.2	39.2%	23.3%	2.76
12 Velum Prime 6.84 fl oz/A at planting and 6 weeks by drip	36351	338	350	112	800	32.0	41.9%	17.3%	2.48
13 Telone 10 gpa (standard field treatment), PPI	57334	529	514	217	1261	50.5	42.0%	14.8%	---
Average	37678	360	354	115	829	33.2	42.9%	20.7%	2.67
LSD 0.05	10114	142.4	84.9	78.5	222.6	8.9	ns	ns	---
CV, %	18.7	27.6	16.7	47.4	18.7	18.7	16.6	41.8	---

US #1's	Roots 2 to 3.5 inches in diameter, length 3 to 9 inches, well shaped and free of defects.
Mediums	Roots 1 to 2 in diameter, 2 to 7 inches in length.
Jumbos	Roots that exceed the size requirements of above grades, but are marketable quality.
Mkt Yield	Total marketable yield is the sum of the above three categories.
bins/A	bins/A are estimated based on market box yield assuming 22 boxes 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.
L:W ratio	Ratio of the root length to the width, average of 10 roots/plot

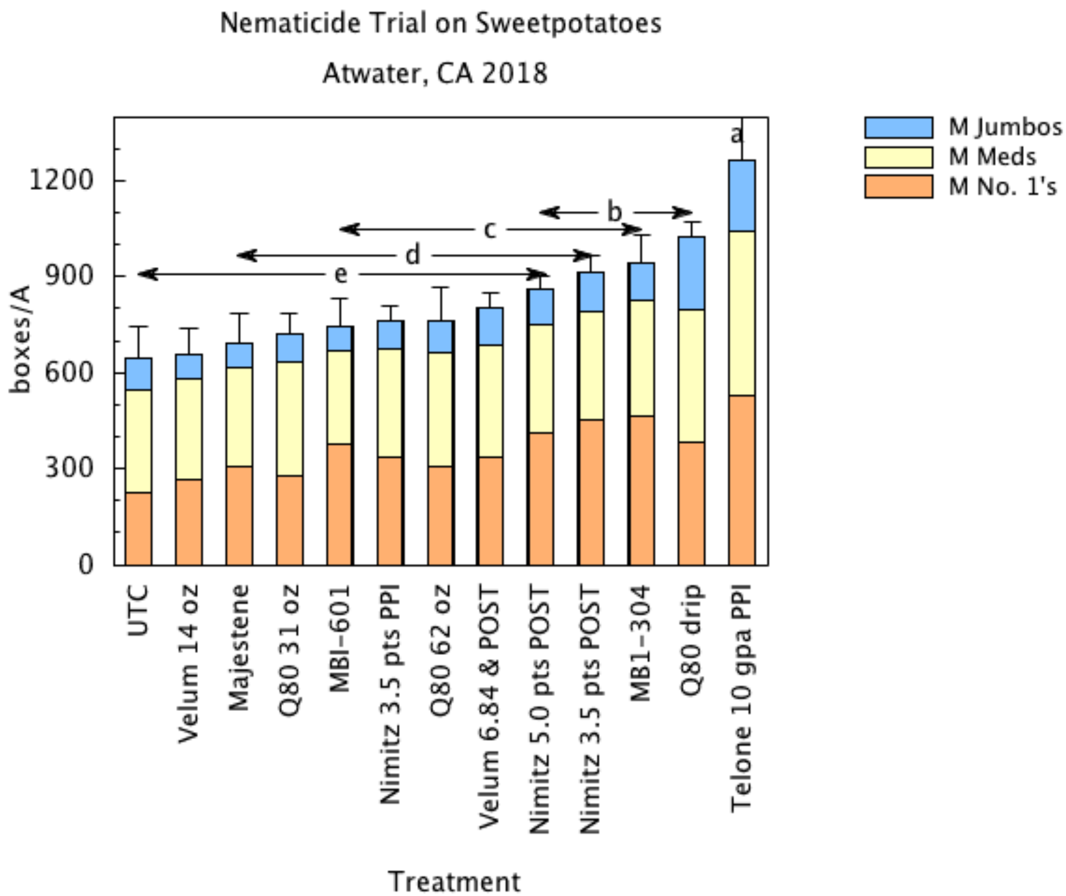

Figure 4. Marketable yield results for each nematicide treatment in 2018.

Shank application of nematicides on sweetpotatoes 2018

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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), *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 can limit the amount of Telone used in any year to 136,000 lbs a.i per township (640 acres), which is only 17% - 50% of demand where most sweetpotatoes are grown in the Merced County area. Novel new nematicides offer the potential for effective alternatives for areas where Telone is restricted, and in buffer zones where no fumigation at all is allowed.

Currently, the Merced County Agriculture Commissioner allows metam sodium (Vapam) and metam potassium (K-Pam) to be applied as a shank application prior to transplanting. The material is applied at 3", 6", and 9" depth on 9" centers to a clean, cultivated field with good soil moisture (Figure 1). Typical volumes are 42 – 46 gallons product per acre, and the soil surface is sealed with a ring roller to minimize off-gassing. Since its adaption nearly a decade ago, this method of application has become the main way to apply metam products for sweetpotatoes.

Figure 1. Emitters within each shank were at 3, 6, and 9 inches.

Metam potassium is used primarily to control RKN, however, it will also help control wireworms. The nematicides Nimitz and Velum have minimal effect on soil insects, and therefore Lorsban (chlorpyrifos) insecticide applied at the same time may be needed to control these insects. Chlorpyrifos is currently registered on sweetpotatoes, applied pre-plant incorporated to the soil. Therefore, the application of chlorpyrifos matches well with the suggested use pattern for Nimitz (10 days pre-plant incorporated), and a tankmix of these two products should suppress both nematodes and wireworms.

The objective of this trial was to evaluate nematode control and crop response to pre-plant, shank applied Nimitz and Velum nematicides combined with Lorsban on sweetpotatoes in California.

Methods.
A trial was conducted in 2018 in a commercial sweetpotato field in Merced County, CA, evaluating Nimitz (fluensulfone, Adama), and Velum (fluopyram, Bayer Crop Science) nematicides on RKN control and sweetpotato yield and quality. Treatments were designed to test different rates and application volume with the addition of chlorpyrifos (Lorsban). Metam (as metam K or metam Na) and untreated control plots were used for comparison. Nimitz and Vellum were tested at 3.5 and 5 pints/A with a shank application to a depth of 9" on 9" centers 14 days before planting using the same application equipment to apply metam potassium by Crop Production Services. The metam tanks were drained, filled with water, and then Nimitz or Velum was added. The target application rate was 42 gpa and controlled by a Raven unit in the cab. Treatment design was a randomized block with four replications. Means separation was performed using Fisher's protected LSD at P=0.05. Nematode samples were taken in early July and again at the end of the season in early October. The variety used was Covington, a dominant variety in California with moderate nematode resistance. Plots were 3 – 4 beds wide x 100 ft in length; only the middle bed from each plot (2 rows) was harvested to evaluate treatment effects. Plots were dug using the growers commercial harvesting equipment and graded by the growers crew into No. 1's, mediums, and jumbos. Culled product, which includes unmarketable roots as a result of nematodes or insect damage, was also weighed.

Table 1. Plot background information for the Merced County shank nematicide trial.

Sweetpotato Shank Nematicide Trial 2018		
Scott Stoddard, UCCE Merced County		
Location:	Just east of Griffith Ave, between Bel and Longview Avenues, near Stevinson in Merced County	
	Continuous sweetpotatoes >4 years, previously fumigated	
	Delhi sand. 37 21'06" N 120 48'50" W	
Soil:	Atwater sand	
Cooperator:	Aaron Silva, Doreva Produce; Rodney Ratzlaff, Crop Production Services	
Variety:	Covington	
Transplant:	7-Jun-18	
Irrigation:	surface drip	
Harvest:	15-Nov-18	161 growing days
Treatments:	1	UTC
	2	Nimitz 3.5 pts/A shanked 42 gpa
	3	Nimitz 3.5 pts/A + Lorsban 2 pts/A in 42 gpa
	4	Nimitz 5.0 pts/A + Lorsban 2 pts/A in 62 gpa
	5	Nimitz 5.0 pts/A + Lorsban 2 pts/A in 42 gpa
	6	Velum Prime 14 oz/A + Lorsban 2 pts/A in 42 gpa
		Applied May 24, 2018
		field fumigated with K-Pam @ 44 gpa
		plot size 25 ft x 100 ft replicated 4x in RCBD
		RKN sampling July 5 and Oct 4
		Harvest 1-row digger crew sort from middle bed of each plot

Results

Applications of Nimitz at 3.5 pints/A and Velum Prime slightly improved total yield compared to the untreated control; Nimitz at 5.0 pints/A rate combined with Lorsban had reduced total marketable yield (yield from areas of the field where metam potassium was applied outside of the test plot area was not determined). (Table 2). However, there was no statistical difference between any of the nematicide treatments and the untreated control for any of the variables measured in this test. Overall about 7% of the roots were culled, nearly all as a result of RKN damage. Overall, yields were low for this test plot, only 23.8 bins/A, about half what would be expected for this variety. Very little RKN was found in the July samples, and while RKN numbers were very high in the fall, > 1500 J2's per 500 g soil, there was no correlation with soil RKN counts to the treatments at the October sampling (Table 3).

Over three years, Nimitz applied via shank has given mixed to somewhat positive results, usually providing a slight yield increase in total marketable yield (Fig 2). Only in 2016 was this significant, however. Velum was evaluated with this method in 2017 and 2018, with no significant difference in total marketable yield as compared to Nimitz or the untreated control in both years. As compared with water incorporation methods (sprinkler irrigation), shank applications of nematicides may not have enough water, or may be too shallow, or require further mechanical incorporation, to be as effective.

Acknowledgements: Many thanks to Aaron Silva, Doreva Produce Company, and Rodney Ratzlaff, Crop Production Services, for their help and cooperation with this trial.

Table 2. Sweetpotato (cv 'Covington') yield as affected by shank nematicide treatment, Merced County 2018.

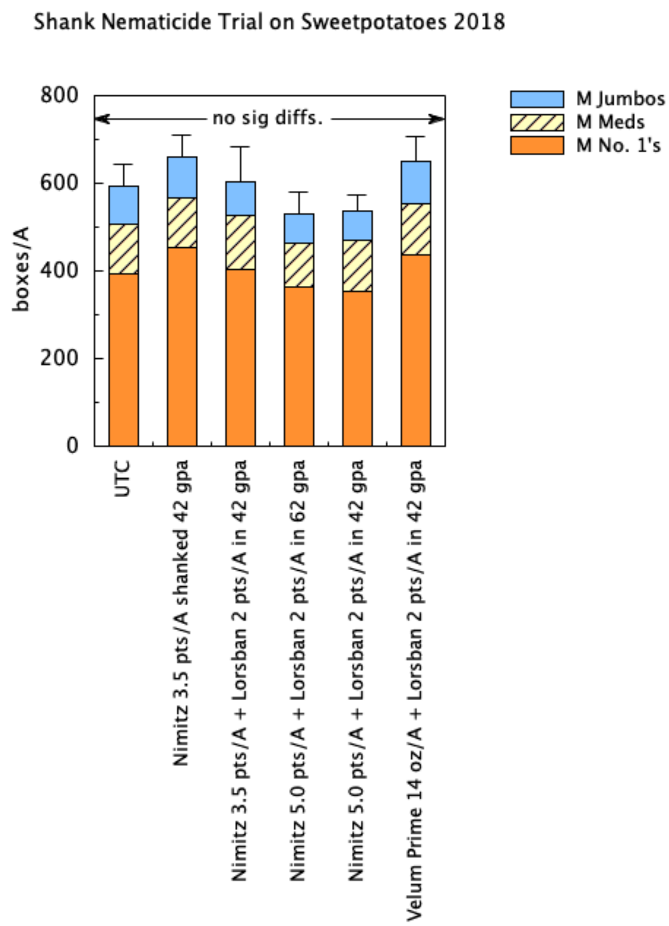
		TMY	40 lb box/A			adjusted TMY		No. 1's	Culls
	Treatment	**lbs/A**	**No. 1's**	**Mediums**	**Jumbos**	**boxes/A**	**bins/A**	**#1%**	**cull%**
1	UTC	26887	393	113	86	592	23.7	66.3%	6.9%
2	Nimitz 3.5 pts/A shanked 42 gpa	29949	453	113	92	659	26.4	68.9%	3.5%
3	Nimitz 3.5 pts/A + Lorsban 2 pts/A in 42 gpa	27429	403	124	77	603	24.1	66.9%	7.8%
4	Nimitz 5.0 pts/A + Lorsban 2 pts/A in 62 gpa	23963	363	99	65	527	21.1	69.1%	9.1%
5	Nimitz 5.0 pts/A + Lorsban 2 pts/A in 42 gpa	24331	352	118	65	535	21.4	65.6%	5.0%
6	Velum Prime 14 oz/A + Lorsban 2 pts/A in 42 gpa	29449	434	117	97	648	25.9	67.1%	5.6%
	Average	27002	400	114	80	594	23.8	67.3%	6.3%
	LSD 0.05	ns	ns	ns	ns	ns	ns	ns	ns
	CV, %	20.0	19.8	16.3	49.5	20.1	20.1	4.6	54.0

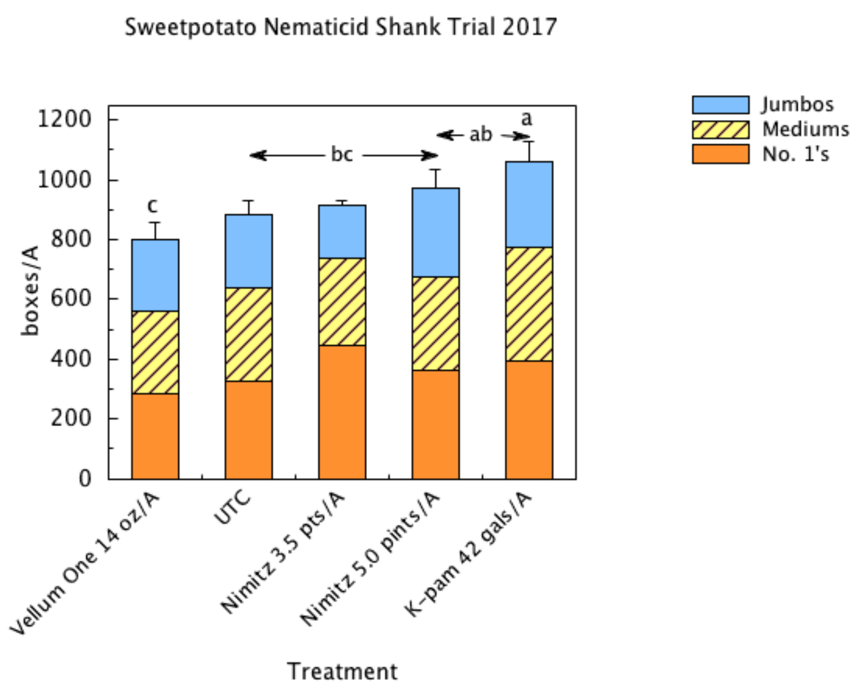
US #1's	Roots 2 to 3.5 inches in diameter, length 3 to 9 inches, well shaped and free of defects.
Mediums	Roots 1 to 2 in diameter, 2 to 7 inches in length.
Jumbos	Roots that exceed the size requirements of above grades, but are marketable quality.
Mkt Yield	Total marketable yield is the sum of the above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

Table 3. Nematode counts in soil on July 6 and Oct 5, 2018.

Date	treatment	# per 500 g soil (3) Root Knot (1)	Stubby Root (2)
6-Jul-18	UTC	0	4
	Nimitz 3.5 pts/A shanked 42 gpa	54	6
	Nimitz 3.5 pts/A + Lorsban 2 pts/A in 42 gpa	0	18
	Nimitz 5.0 pts/A + Lorsban 2 pts/A in 62 gpa	4	12
	Nimitz 5.0 pts/A + Lorsban 2 pts/A in 42 gpa	5	68
	Velum Prime 14 oz/A + Lorsban 2 pts/A in 42 gpa	6	134
	Grower (K-Pam)	10	0
	Average	11	35
5-Oct-18			
1	UTC	1977	73
2	Nimitz 3.5 pts/A shanked 42 gpa	1635	41
3	Nimitz 3.5 pts/A + Lorsban 2 pts/A in 42 gpa	1641	51
4	Nimitz 5.0 pts/A + Lorsban 2 pts/A in 62 gpa	1520	42
5	Nimitz 5.0 pts/A + Lorsban 2 pts/A in 42 gpa	2179	66
6	Velum Prime 14 oz/A + Lorsban 2 pts/A in 42 gpa	2423	74
	Average	1896	58
	LSD 0.05	ns	ns
	CV, %	27.9	38.1

1) Root knot nematode, Meloidagyne spp.
2) Stubby root, Paratrichodorus spp.
3) 0 - 12" soil sample from the center of plots/ 10 cores per sample
LSD 0.05 Least significant difference. NS = not significantly different.
CV % Coefficient of variation, a measure of variability in the experiment.


Shank Nematicide Trial on Sweetpotatoes 2018
M Jumbos
M Meds
M No. 1's
no sig diffs.
boxes/A
800
600
400
200
0
UTC
Nimitz 3.5 pts/A shanked 42 gpa
Nimitz 3.5 pts/A + Lorsban 2 pts/A in 42 gpa
Nimitz 5.0 pts/A + Lorsban 2 pts/A in 62 gpa
Nimitz 5.0 pts/A + Lorsban 2 pts/A in 42 gpa
Velum Prime 14 oz/A + Lorsban 2 pts/A in 42 gpa


Sweetpotato Nematicid Shank Trial 2017
Jumbos
Mediums
No. 1's
c
bc
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1200
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Vellum One 14 oz/A
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Nimitz 3.5 pts/A
Nimitz 5.0 pints/A
K-pam 42 gals/A
Treatment

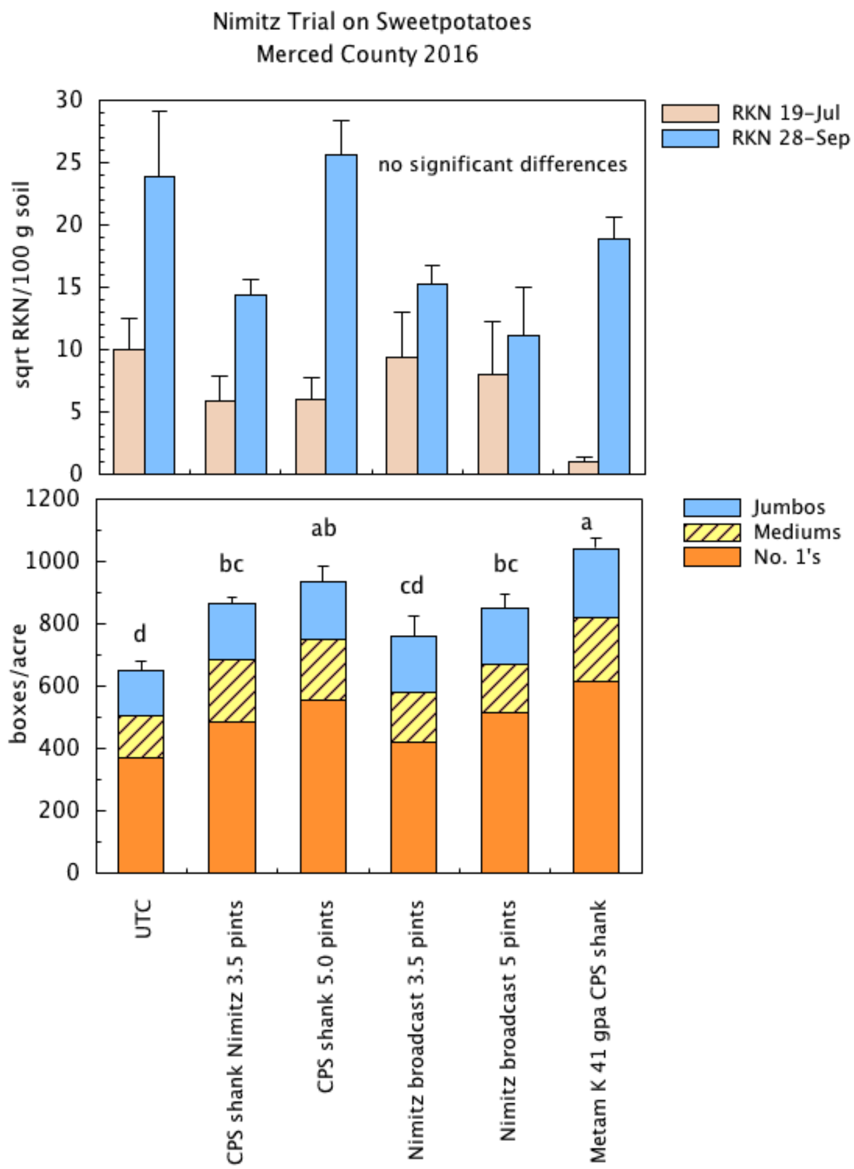


Figure 2. Sweetpotato yield results to preplant, shank applied treatments of Nimitz and Velum, 2016 – 2018.

USDA IR-4 Performance of Glufosinate Herbicide on Sweetpotatoes 2018

Scott Stoddard
UC Cooperative Extension, Merced County

Summary: In 2018, USDA IR-4 field trials evaluated the herbicide Rely (glufosinate) applied prior to and after transplanting in a commercial sweetpotato field for weed control and crop safety. Pre-plant glufosinate at 24 and 48 fl oz/A was applied to a clean, pre-formed bed 0 to 2 days before transplanting, then incorporated with water equivalent to 0.4". Post-plant glufosinate at 32 fl oz/A was banded 4 weeks after transplanting down the center of bed using a shielded sprayer to minimize contact with the crop. Both weedy and hand-weeded controls were used for comparison. Sweetpotato cultivar 'Murasaki' was mechanically transplanted 31-May-2018 using standard equipment and practices. The experimental design was a randomized complete block (RCB) with 4 replications, and plot size was 2 rows by 30 feet. Data collected included visual crop injury, weed control, and yield. The sweetpotatoes were drip irrigated throughout the season, and grower managed irrigation, fertilizers, and pest management with the exception of weed control. Pre-plant applications of glufosinate had minimal efficacy, with no significant difference in weed control as compared to the weedy check. The post-plant application of glufosinate at 4 weeks after transplanting significantly reduced broadleaf weeds as compared to pre-plant treatments, and had the highest weed control, approximately 83% for both broadleaf and grassy weeds combined. Neither the pre nor the post-plant applications of glufosinate caused crop injury. Crop yields were reduced in those treatments with poor weed control. As compared to the hand weeded check, all treatments reduced yield, however, the post application of glufosinate had significantly higher yields than the weedy checks or the pre-plant herbicide treatments.

Introduction

Weed control methods in commercial sweetpotatoes in California are characterized by the use of pre-plant weed management coupled with a limited number of registered herbicides, cultivation, and hand hoeing when appropriate. Post emergence herbicides, cultivation, and hand hoeing are the main methods used to control weeds. Post-plant applications of glyphosate (Roundup) with hooded sprayers are commonly used after transplanting and before canopy closure, usually 2 – 4 weeks after transplanting.

With the exception of yellow nutsedge, annual weeds dominate in production sweetpotato fields, especially *Amaranthus* species (e.g., redroot pigweed and Palmer amaranth). 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, 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.

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 glufosinate herbicide on sweetpotatoes.

Methods

One study was conducted in a commercial sweetpotato field near Livingston, CA, during the 2018 growing season to evaluate different rates (0, 32, 48 fl oz/A) and timings (pre-plant and 30 days post plant) of glufosinate (Rely 280). Roundup (glyphosate) amd Success (capric+caprylic acids) were originally to be included for comparison, but were not applied and instead these plots were treated as weedy checks (too much vine cover at the time of application). Trial locations and herbicide treatments are listed in Table 1.

Pre-plant glufosinate herbicide treatments were applied to clean, cultivated plots 0 - 2 days before transplanting with a CO_2 backpack sprayer at 40 psi with a 4-ft boom using 4 TeeJet 8004 flat fan nozzles and calibrated to 50 gpa equivalent (Figure 1). Spray swath was measured at 78” when held ~ 18” above the soil surface at the time of application. The herbicide was incorporated with ~0.40” water by applying 25 gallons of water per plot before and after transplanting on May 29 and June 7, using watering cans to deliver water over the plants and down the plant row.

Post-emergence applications of glufosinate were made using the same CO_2 backpack sprayer, but with a hand-held wand with 1 TeeJet 8004 flat fan nozzle to spray between the plant rows (center of double-row bed) to simulate a banded application. The herbicides were applied by banding the product between plant rows and shielding the plants on both sides to minimize drift and overspray contact to the crop (Figure 1). The band width was 2 feet, and therefore rates were adjusted accordingly for the width of the band relative to a broadcast application (24”/80” = 0.30).

Sweetpotato cultivar ‘Murasaki’ was transplanted May 31 using the grower’s mechanical transplanter at 9” in-row spacing with between row spacing of 40”. Plants were set with transplanter water (3000 gpa) and then irrigated using surface drip tape for the remainder of the season. Irrigation, fertilizer, and pest management other than weed control were performed by the grower.

Plot size was 1 bed (2 rows) 6.67 ft wide x 30 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 visual crop injury and weed control using a subjective scale (0 = no injury or no control, 5 = 100% crop death and complete weed control, determined at 4 and 8 weeks after planting (WAP). 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. Photos were taken of the plots at the evaluation dates. All plots were hand weeded after the final evaluation date approximately 10 WAT. Yields were measured using a commercial 1-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 glufosinate treatments were separated into their own bins and later destroyed.

Results

Weed control ratings are shown in Table 2. Weed pressure was erratic at this location, with plots having low to moderate levels of grass pressure and varying degrees of redroot pigweed. While redroot pigweed dominated, other weeds included purslane, pigweed, nightshade, nutsedge, lambsquarters, barnyardgrass, and volunteer oats. Grassy weed control was not significantly different between any of the treatments at either the July 3 or Aug 13 evaluation dates (note that the hand weeded check plot was not included in the comparison tests and that the post-transplant application of glufosinate was applied on July 3). Pre-emergent glufosinate showed no difference in weed pressure as compared to the weedy check plots on either date. The post-transplant application of glufosinate significantly reduced the number of broadleaf and grassy weeds 42 days after treatment. Broadleaf and grassy weed control for this treatment was 73% - 93% for broadleaf and grass weeds, respectively (Figure 2). Crop injury was not observed in any of the glufosinate treatments at this location.

Table 1. Field site and herbicide treatments, sweetpotato IR4 Rely 280 Herbicide Trial 2018			
Location:	south of Livingston of Atwater Jordan Rd between Weir and Howard Rds		
	37 19'52" N	120 47'14" W	
Soil:	Hilmar sand, slightly saline alkalai		pH 5.4 & EC 3.0
Cooperator:	Jason Tucker, Tucker Farms		
Variety:	Murasaki 29		
Transplant:	31-May-18		
Irrigation:	surface drip		
Harvest:	1-Nov-18	154 growing days	
			application dates
Treatments:	1	UTC hand weeded	---
	2	Rely 280 24 oz/A PRE	5/29/18
	3	Rely 280 48 oz/A PRE	5/31/18
	4	Rely 280 32 oz POST	7/3/18
	5	Roundup 2% POST (weedy ck)	---
	6	Suppress 5% POST (weedy ck)	---
	RCBD with 4 reps, plots 1 bed x 30 ft		
	Treatments 2 & 3 followed by 25 gallons water per plot on May 29 & June 7		
	POST treatments shielded		
	Roundup and Suppress not applied, treated as weedy checks		
	all plots hand weeded on Aug 13		

Figure 1. Pre-plant glufosinate applications were broadcast across the entire bed with a 4-nozzle boom (left); POST glufosinate was applied as a banded application between the rows using a single nozzle wand (right). Sweetpotatoes were shielded to minimize contact from drift.

Yield results are shown in Table 3. Best #1 and total marketable yield occurred in the hand weeded plot with 36.9 bins per acre – excellent for this variety. Statistically similar was the 32 oz/A post-transplant glufosinate treatment, with 31.8 bins per acre (Figure 2). Glufosinate pre-plant applied had similar yields as the weedy checks with 22.1 bins. These same treatments had an average of 50.2% total weed control compared to the hand weeded plots, indicating that the increased yield in the post application of glufosinate was a result of improved weed control. There was no significant difference in the percentage of culled roots among the treatments, however, both pre-plant applications of glufosinate had increased culls (11.4 – 13.7%) as compared to all other treatments.

Conclusions

Pre-plant applications of glufosinate had minimal efficacy for post-plant weed control in sweetpotatoes, and no crop injury was noted even when watered into the soil after application. The post-plant applications of glufosinate at 4 weeks after transplanting significantly reduced both grassy and broadleaf weeds as compared to the untreated control plots, and had the highest average weed control, 83.1%, of all the treatments. No crop phytotoxicity was observed for POST applied glufosinate at this location and year. The results of these trials show glufosinate to be an effective post-plant, post emergence herbicide in sweetpotatoes when properly applied.

Acknowledgements

Many thanks to Mr. Jason Tucker for their help and cooperation with this test. Funding for this project was provided by USDA-IR-4 program: IR-4 Project P10558.

Table 2. Broadleaf (BL) and grassy weed control in sweetpotatoes at 4 and 10 weeks after planting, Merced County 2018.

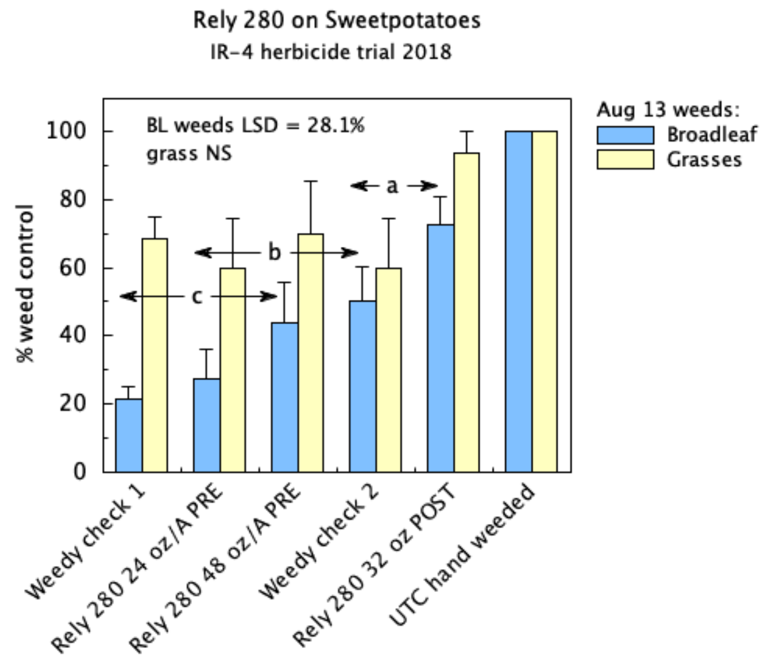
	treatment	7/3/18 BL weeds	grasses	crop phyto	8/13/18 BL weeds	grasses	crop phyto	BL % control	grass % control
1	UTC hand weeded	0	0	0	0	0	0	100.0	100.0
2	Rely 280 24 oz/A PRE	2.00	0.25	0	4.00	2.50	0	27.5	60.0
3	Rely 280 48 oz/A PRE	1.50	0.25	0	3.25	2.00	0	43.8	70.0
4	Rely 280 32 oz POST directed	2.25	0.75	0	2.00	0.50	0	72.5	93.8
5	Weedy check 1*	1.25	0.50	0	4.25	2.25	0	21.3	68.8
6	Weedy check 2*	1.25	0.50	0	3.00	2.50	0	50.0	60.0
	Average	1.65	0.45	0	3.30	1.95	0	43.0	70.5
	LSD 0.05	ns	ns	---	1.3	ns	---	28.1	ns
	CV, %	50.4	153.2	---	25.5	64.9	---	42.4	36.9

*	* Planned Roundup and Suppress treatments were dropped because of canopy closure.
Herbicides:	Preplant on May 29 & 31, POST on July 3 using shielded spray down center of bed. PRE followed by water to incorporate into soil.
Weeds:	BL = broadleaf weeds: purslane, pigweed, nightshade, nutsedge, and lambsquarters
	Grass = barnyard grass, oats
Scale:	Severity scores based on a 1 - 6 scale: 0 = no phyto or weeds, 1 = <10%, 2 = 25%, 3 = 50%, 4 = 75%, 5 = 90%, 6 > 90% weeds/crop p
LSD 0.05	Least significant difference. Means separated by less than this amount are not significantly different (ns). Treatment #1 not included in
	--- = not enough data to calculate
CV, %	Coefficient of variation, a measure of variability in the experiment.

Table 3. Sweetpotato ('Murasaki') yield results as affeced by herbicide treatment, Merced County 2018.

Treatment	TMY lbs/A	40 lb box/A No. 1's	Mediums	Jumbos	adjusted TMY box/A	bins/A	%No. 1's	%culls
1 UTC hand weeded	41943	679.2	101.1	142.4	922.7	36.9	73.6%	5.4%
2 Rely 280 24 oz/A PRE	23463	397.7	90.3	28.2	516.2	20.6	77.1%	11.4%
3 Rely 280 48 oz/A PRE	29430	468.4	145.2	33.9	647.5	25.9	72.7%	13.7%
4 Rely 280 32 oz POST	36160	625.3	87.9	82.3	795.5	31.8	78.6%	7.7%
5 Roundup 2% POST (weedy ck 1)	20608	356.4	83.0	14.0	453.4	18.1	78.8%	9.8%
6 Suppress 5% POST (weedy ck 2)	26795	485.1	91.6	12.7	589.5	23.6	82.4%	9.3%
Average	29733	502	100	52	654	26.2	77.2%	9.5%
LSD 0.05	9179	164.5	ns	37.6	201.9	8.1	ns	ns
CV, %	20.5	21.7	54.9	47.7	20.5	20.5	7.5	65.1

No. 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 22 boxes per bin.
% No. 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.



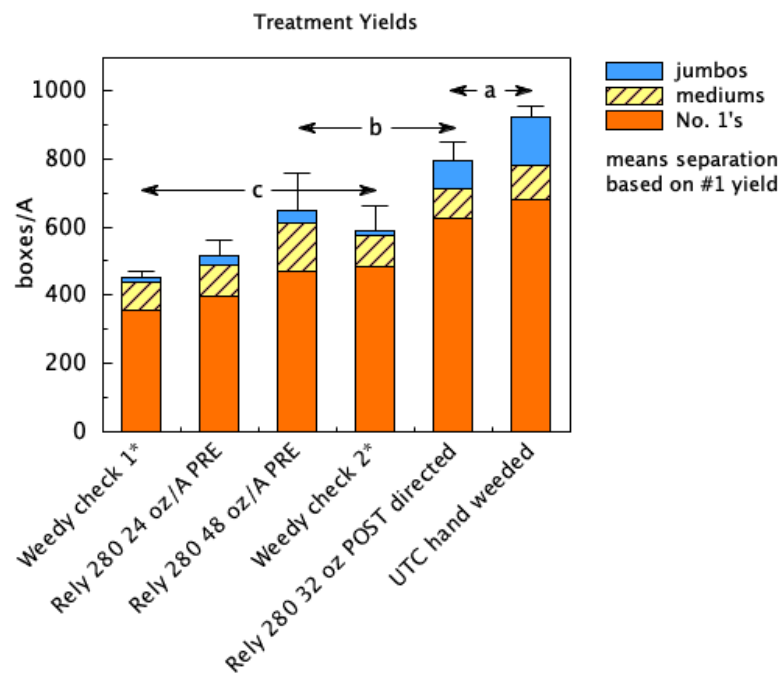


Figure 2. Weed control as a percentage of the weed-free plots (top) and marketable yields (bottom).

Acknowledgements:

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 cooperators & growers for putting in extra time and trouble:

- Jack Smith and Adam Shaner, Quail H Farms. Collaborators Trial.
- Rick and Tito Martinez, Country Sweet, Bakersfield. Collaborators Trial 2nd location.
- Dave Souza, D&S Farms. Advanced Line Trial.
- Robert Silveira, Classic Yam, and Lonnie Slaton, Simplot. Nematicide trial.
- Aaron Silva, Doreva Produce, and Rodney Ratzlaff, Crop Production Services. Nimitz shank nematicide trial.
- Jason Tucker, Tucker Farms. USDA IR4 glufosinate herbicide trial.

Scott Stoddard, Farm Advisor