Sweetpotato Research Trials

2002 Research Progress Report

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Sweetpotato Research Progress Report
2002

Merced and Madera Counties

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COLLABORATORS VARIETY TRIAL
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INTRODUCTION

This year's sweetpotato variety trial was with Bob Alvernaz, near Livingston. Soil type was Atwater loamy sand. As in the past, new lines from North Carolina, Louisiana, Mississippi, and South Carolina were evaluated. Included in this year's trial was a comparison of the California Beauregard to the clones from Louisiana (Beauregard clone #63, or just B-63) and North Carolina (B-14). This was done to see if the California Beauregard has changed, either positively or negatively, from the original line (B-63).

Because some varieties arrived late, the plants were bedded late this year after a short 3 day pre-sprout. All varieties except the California Beauregard were bedded April 1 and transplanted May 31, 2002. Plants were drip irrigated, with all nutrients through the drip line. Total nutrients applied were about 125-75-125 N-P_2O_5-K_2O. Plots were harvested October 24, 2002 using a one-row harvester.

RESULTS

Due to the lateness of the trial this year, plot establishment was poor and overall yield and quality were below average. Additionally, the plots were located in an area that had not been fumigated.

There were wide differences in sprout production between the varieties this year (Table 1). Best production was with W365 and W375. Poorest was with W372, which had obvious leaf curl, and MS K39, which started with compromised root stock.

Yield and grade results are presented in Table 2. 97-29 (South Carolina), NC 97-A04 (North Carolina), and MS-I52 had best #1 yield. NC 96-61 had the highest total market yield, at 825 boxes/A. No significant differences were found between the three Beauregard clones in this test. The California Beauregard tended to have the best yields, but it also had the best plant stand (plants were bigger at transplanting because the plants came from different hot beds).

Root descriptions at harvest are presented in Table 3. Best appearance scores went to NC 96-61 (note: this variety later developed prominent veins in storage and became very unattractive). 97-29 has good color, but skins easily and has prominent veins.

Weight loss in storage was measured for three months. Average cumulative weight loss was 6.64%. No differences were seen between varieties, however, NC 96-61 developed prominent veins during this time.

Taste test results are presented in Table 4. Tasting was done at the office on baked potatoes. Beauregard had by far the best flesh color, but NC 96-61 was ranked the best overall and had the best flavor of the group. Five of eight of the testers liked NC 96-61 the best. MS K39 had the most consistent, uniform, and smooth flesh. 97-29, which has done well in the taste test in the past because of good flavor, suffered from off-color and stringiness.

Dropped Lines. Based on the results of this data and other data from participating states, the following lines have been dropped out of this trial:

W365, W366, W370, W372: lack of performance, possible leaf curl virus
NC-97A-04, NC 96-61: too long, no russet crack resistance, plant bed vigor poor

ACKNOWLEDGEMENTS

Many thanks to Mr. Bob Alvernaz for his help and cooperation with planting, harvest, and storage for this trial; and thanks to Mr. Dave Souza for providing clean Beauregard plants. This trial would not be possible without the support of the plant breeders from Louisiana, Mississippi, North Carolina, and South Carolina.

Table 1. Score sheet for evaluation of sweet potato sprout production, 2002.

Date Bedded: April 1, 2002 **Location**: Livingston, CA

Date Evaluated: May 14, 2002 **Type of Bed**: Covered hot bed

Evaluated by: Scott 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)
CA Beauregard	Not evaluated, plants came from farmer's hotbed using G1 seed.					
B63 (LA)	Yes, short 3 day presprout	3.5	3	2		
B14 (NC)	Yes	3.0	3	2		
W366	Yes	3.0	3	2.5		Crinkle in leaves
W372	Yes	2.0	3	1		Leaf curl and cupping
W375	Yes	5.0	4	3		Robust, dk green
MS I52	Yes	4.0	3	2		
MS K39	Yes	1.0	1	1	1	Poor, decay
W 365	Yes	5.0	5	3		Best plant producer
W 370	Yes	4.0	4	2		Severe leaf curl
NC 97-A04	Yes	4.0	4	3		
97-29	Yes	5.0	5	2.5		Some crinkled lvs
NC 96-61	yes	2.0	2	1		Very slow

(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 2. National sweetpotato collaborators summary of yield data.
2002

STATE AND LOCATION REPORTING: Livingston, CA
DATE TRANSPLANTED: May 31. DATE HARVESTED: Oct. 24. No. GROWING DAYS: 146
DISTANCE BETEEN ROWS (in): 40. DISTANCE IN ROW (in): 9
PLOT SIZE: NO. OF ROWS: 1 LENGTH (ft): 30 NO. OF REPS: 4
IRRIGATION: drip irrigation. 1.5 to 2 inches per week during summer.
FERTILIZER: with the drip system. About 125-75-125 NPK

	……….. 40 lb boxes/A …………				MKT YLD	% US	Boxes/A
SELECTION	**US #1'S**	**CANNERS**	**JUMBOS**	**MKT YIELD**	**BINS/A**	**#1'S**	**CULLS**
97-29	390.35	112.61	270.41	773.37	30.93	49.66	57.76
NC 97-A04	363.56	143.13	269.71	776.40	31.06	47.11	100.83
MS-I52	349.89	85.94	330.63	766.46	30.66	45.48	191.08
NC - 96- 61	300.78	83.64	440.80	825.23	33.01	37.21	77.25
W 375	290.84	102.22	106.70	499.77	19.99	57.25	36.83
W-365	283.05	107.09	224.66	614.80	24.59	46.07	37.84
CA Beauregard	276.95	53.35	456.58	786.88	31.48	35.33	133.87
W 366**	267.55	123.86	36.58	427.99	17.12	62.62	39.68
B63-LA	247.21	77.24	428.75	753.21	30.13	32.80	84.15
B14-NC	243.37	121.35	267.08	631.80	25.27	38.79	114.54
W-370	138.56	203.83	25.85	368.24	14.73	38.05	74.45
MS K39*	133.82	27.03	239.02	399.86	15.99	33.99	179.89
W 372	131.01	71.54	22.48	225.04	9.00	61.00	64.38
Average	262.84	100.99	239.94	603.77	24.15	45.03	91.73
LSD 0.05	129.13	55.75	145.63	236.50	9.46	14.38	68.88
CV, %	34.1	11.9	42.2	27.2	27.2	17.7	27.9

US #1's	Roots 2 to 3.5 inches in diameter, length 3 to 9 inches, well shaped and free of defects.
Canners	Roots 1 to 2 in diameter, 2 to 7 inches in length.
Jumbos	Roots that exceed the diameter and length requirements of above grades, but are of marketable quality.
Mkt Yield	Total marketable yield is the sum of the above three categories. Bin weight = 1000 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.
*	MS K39 had only enough slips for 2 reps. Seed is compromised and should be replaced with breeder stock.
**	W366 had only 3 replications.
	CA Beauregard from 2001 virus tested seed.
LSD 0.05	Least significant difference. Means separated by less than this amount are not significantly different.
	Cull LSD performed on transformed data to assure homogeneity of variances.

Table 3. Sweetpotato Collaborators Trial, 2002. Root evaluation.
(Table continues next pg).

Merced County

This year's sweetpotato evaluation was with Bob Alvernaz, near Livingston, CA. Soil type was Atwater loamy sand.
All lines except #1 received a short 3 day pre-sprout, #1 slips came from different bed. Plant bed production was poor for MS K39
and NC 96-61. Plots were planted late and had higher transplant loss than normal. All water and nutrients using drip irrigation.
Disease pressure was low, but insect pressure included mites, armyworm, grubs, and wireworm.
Overall yield and quality less than average.

Rep	Var	Variety Name	Skin Color	Skin Text	Flesh color	Eyes	Lents	Shape	Shape Uniform	Overall App	Comments
1	1	CA Beauregard	Rose-copper	5	4	9	7	3, 6	5	6	some veining, variable shape
2			Rose-copper	4	3	9	7	2, 5	7	7	fine white lines, cracking
1	2	B63 (LA)	Rose-copper	6	4	5	7	2, 3, 8, 6	4	4	some misshapen
2			copper	5	4	6	7	2, 6	7	6	some veins
1	3	B14 (NC)	copper	6	3	5	5	2, 3, 8	5	5	slightly rough, small veins
2			rose-copper	5	4	7	6	3, 5, 7	5	5	rough, long, lumpy
1	4	W366	Rose	3	3.5	9	9	2, 3	7	5	small, rough skin, some veins
2			rose-copper	3	3	7	7	3, 5	5	3	veins, splits
1	5	W372	Copper	5	3	7	7	3, 8	7	6	thin
2			Copper	5	3	7	5	3, 4, 8	5	5	some veins
1	6	W375	Rose-purple	7	3	8	6	1, 5	3	4	veins, bally, good color
2			Burgandy	7	2.5	7	3	2, 5	7	7	some veins
1	7	MS-152	Copper	7	3	7	7	2, 6, 7	3	4	variable shape, Pox
2			Copper	5	3	9	7	2, 3, 5	5	5	little rough, surface rot
1	8	MS-K39	Copper	5	3	9	8	2, 5, 6	5	5	russet crack, need new seed
2			Copper	3	3	5	5	6, 2, 7	4	3	rough looking

Rep	Var	Variety Name	Skin Color	Skin Text	Flesh color	Eyes	Lents	Shape	Shape Uniform	Overall App	Comments
1	9	W365	orange-copper	6	4	9	7	2, 8	5	5	bally, short
2			copper	7	3	9	7	6, 1	6	5	bally with a tail
1	10	W370	rose-copper	4	3	7	7	3, 6	5	5	some viens, fluting, long
2			rose-copper	7	4	9	9	3, 4	7	6	too thin, small, rough
1	11	NC 97-A04	rose-copper	5	4	9	5	2, 6	6	6	variable color, dark lents
2			copper	5	2.5	8	5	3, 6	7	6	raised lents, long
1	12	97-29	Burgandy	7	2	5	7	5, 3	7	6	veins, good color, bally
2			Purple	7	3	7	5	2, 5	7	7	veins, skins easily, Fusarium
1	13	NC 96-61	rose-copper	7	5	9	7	2, 3	7	8	some veins and lumps
2			rose-copper	8	4	8	8	6, 3, 5	7	7	some veins

Skin color:	**Skin Texture:**	**Flesh Color:**	**Eyes:**	**Lenticles:**
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-eliptical	3 = poor	3 = poor
3 = eliptic	5 = moderate	5 = moderate
4 = long eliptic	7 = good	7 = good
5 = ovoid	9 = excellent	9 = excellent
6 = blocky		
7 = irregular		
8 = asymmetric		

All ratings made on #1 roots.

Table 4. Sweetpotato Collaborators Trial 2002 taste test results.

Potato	*Flesh color*	*Texture*	*Moisture*	*Flavor*	*Total*	*Total 95%*	*# of "like best votes*
Beauregard	9.4	7.8	7.8	5.5	30.4	28-33	1
97-29	5.4	6.6	8.1	7.4	27.5	25-30	
MS I52	5.2	6.6	6.3	5.1	23.1	21-26	
MS K39	7.5	6.8	6.8	7.5	28.5	26-31	
NC 96-61	7.8	7.0	7.8	8.3	30.8	28-33	5
W375	5.4	6.5	7.4	5.8	25.0	22-27	
Average	6.75	6.9	7.3	6.6	27.5		
LSD 0.05	1.8	NS	NS	1.2	5.0		

Flesh color.	1 = light, 10 = darkest. The sample with the deepest orange is rated highest. Potatoes should be uniform and free from dark or light spots or streaks.
Texture	1 = stringy, 10 = smooth. Texture refers to both smoothness and coarseness of the flesh, and whether fiber can be detected.
Moisture	1 = dry, 10 = most moist.
Flavor	1 = bland, 10 = most sweet.
95%	spread in the results for the TOTAL category at the 95% confidence level.
LSD 0.05	least significant difference at the 95% confidence level. NS = not significant.

DRIP IRRIGATED FERTILIZER TRIAL

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Merced and Madera Counties

INTRODUCTION

2002 concluded fours years of evaluating N and K rates for drip irrigated Beauregard sweetpotatoes. Only a few tasks remain, such as the spring soil sampling, storage evaluation, and analysis of the results. Some of the important conclusions that have been made:

- Best overall nitrogen rate was found to be 125 – 175 lbs per acre, when injected through the drip line during rapid vine growth. This rate resulted in maximum yield with little residual N at the end of the season.
- There was little response to K fertilizer, even though the soil tested low (below 125 ppm exchangeable K). Because of some problems with the K results, the best recommendation that can be made at this time is to apply to meet nutrient removal (about 150 lbs K_2O per A).
- Petiole NO_3-N and K sufficiency ranges were developed for two different time periods of crop development, at rapid vine growth (about 4-6 weeks after transplanting) and root bulking (about 2 months after transplanting):
  vining: 3000 – 5000 ppm NO_3-N, 4.5 – 5.5% K
  root bulking: 2000 – 4000 ppm NO_3-N, 3.5 – 4.5% K
- Weight loss in storage was unaffected by potash treatment.
- Residual soil nitrate was very low (< 10 ppm) down to 3 feet. This indicates that most of the applied nitrogen is being used by the crop and is not being leached to groundwater.

The objectives of this trial were:

1. Determine the optimal rates of N and K fertilizer for best yield and quality in drip irrigated Beauregard sweetpotatoes.
2. Determine the effect of different rates of potash and nitrogen on moisture loss in storage.
3. Re-evaluate current fertilizer application tissue analysis guidelines.
4. Determine if applications of N with the drip system results in substantial leaching of nitrate beyond the root zone.

METHODS

As in the past, this trial was established in a commercial sweetpotato field. Nitrogen rates were 0, 50, 100, and 200 lbs N per acre, and potash rates were 0, 75, 150, and 300 lbs K_2O per acre. Part of the field was sectioned off from the main irrigation assembly so that the fertilizers could be applied independent of the grower's fertilization schedule. No preplant incorporated fertilizers were applied. Plots were 2 rows wide by 45 feet long and replicated four times. The field was planted with Beauregard cuttings on May 25, 2002 on 12" spacing.

Granular potassium sulfate and phosphorous were applied to the beds under the drip lines at transplanting. Phosphorous rates were 60 lbs P_2O_5 uniformly applied to all plots. Nitrogen treatments began June 26, 2002. CAN17 was injected on a 5 to 7 day schedule for a total of 7 applications. All nitrogen was applied through the drip tubes using a small battery operated piston pump. The nitrogen rate injection schedule is shown in Table 1.

Sampling: Soil samples were taken in April and late August. The August soil sampling occurred after all nitrogen treatments had been applied. Samples were taken in each plot to three feet and divided into one-foot increments, then analyzed for N (as NO_3-N) and K. Petiole samples were taken four times (June 17, July 25, Aug 15, and Sept 13). Moisture loss in storage measured each month from November to March on 40 lb samples from each plot. Plots were harvested using a commercial harvester on October 31 and November 1, 2002.

Table 1. N fertilizer injection schedule for 2002.

Application	*Date*	*Rate*	*50*	*100*	*200*
			Lbs N per week[2]		
1.	6/26	1/2 x	3.5	7.0	14.0
2.	7/5	1 x	7.0	14.0	28.0
3.	7/10	1 x	7.0	14.0	28.0
4.	7/16	1.5 x	10.5	21.0	42.0
5.	7/23	1.5 x	10.5	21.0	42.0
6.	7/29	1 x	7.0	14.0	28.0
7.	8/2	1 x	7.0	14.0	28.0
8.[1]	---				

1. The 8th application was not made in 2002; instead, rates were increased on the 7th application.
2. Due to rounding, actual total N applied was 5% greater than target rate.

RESULTS

Spring soil test results are shown in Table 2. Nitrate levels in the top foot were moderate, averaging 13.7 ppm (~ 54 lbs NO_3-N), and fairly low at the lower depths. Potassium was below 100 ppm at all depths, indicating that a response to potash fertilizer would be expected.

Petiole sampling results are shown in Table 3. As fertilizer rates increased, the amount of NO_3-N and K in the plants increased significantly at most sampling times.

Yield results are shown in Table 4. Yield of #1's, mediums, and total market yield (TMY) were significantly increased by additional N from fertilizer as compared to the check treatments. Best #1 and TMY occurred at 100 lbs N/A. TMY was significantly increased by K fertilizer, with best yields occurring at 150 lbs K_2O per acre. The N x K interaction was not significant for any size class.

Relative yields, where yields from the check plots are compared to the treated plots and expressed as a percent, can be used to compare treatment effects across all four years of this study. The relative yield chart for nitrogen is shown in Figure 1. Combining all years, best yields for #1's or TMY occurred at 125 – 175 lbs N per acre. Jumbo yields continued to increase as N fertilizer rates increased. A relative yield comparison was not done for potash because there was a response to fertilizer K in only one year of this study.

Soil samples from the spring and fall 2002 are shown in Figures 2 and 3. The spring results show a movement of N from the previous fall from the upper foot to the lower foot of the soil profile; however, the concentration is relatively low, below 10 ppm NO_3-N, even at the highest nitrogen rate. In the fall, soil NO_3-N values were very low for all treatments, at less than 5 ppm. Soil results are pending from the spring 2003 sampling.

Table 2. Spring initial soil samples, 2002.

Sample depth	*pH*	*EC mmhos/cm*	*CEC meq/100g*	*NO_3-N ppm*	*P ppm*	*Sol K ppm*	*Ca meq/L*
0 – 12"	4.7	0.89	3.0	21.5	58.1	51.0	3.5
12 – 24"	5.0	0.44		6.2	23.8	23.1	
24 – 36"	5.5	0.62		9.4	15.8	11.9	
	Low	Good	Low	High	High	Low	

EC = electrical conductivity, a measure of the salinity of the soil.
CEC = cation exchange capacity, a measure of base saturation of the soil.

Table 3. Leaf and petiole sample results, 2002.

N rate Lbs/A	*June 17*[1]	*July 25 NO_3-N ppm*	*Aug 15 NO_3-N ppm*	*Sept 12 NO_3-N ppm*
0		2381	1048	766
50		3436	1953	1393
100		4625	2373	1280
200		7462	7410	4863
LSD 0.10		450	668	1075
K rate Lbs/A	K%	K%	K %	K%
0	7.55	4.35	3.86	2.97
75	7.17	5.00	4.31	3.12
150	7.10	5.40	4.81	2.77
300	7.12	5.55	5.56	2.78
LSD 0.10	NS	0.26	0.39	NS

1. At June 17 sampling, nitrogen treatments had not started. Average petiole sap nitrate was 23,500 ppm.
2. LSD = least significant difference at the 90% confidence level. NS = not significant.

Table 4. Main effect of nitrogen and potash rate on yield and grade of Beauregard sweetpotatoes in 2002.

Treatment	*#1's*	*Jumbos*	*Mediums*	*Total Market Yield*	*% #1's*	*Culls*
N rate	--------- 40 lb boxes/A --------				%	BINS/A
0	559	336	168	1063	52.7	1.04
50	590	335	180	1105	53.8	1.38
100	629	318	213	1160	53.5	1.14
200	579	324	208	1112	52.1	1.34
LSD 0.10	39.0	NS	25.1	45.4	NS	NS
K rate 0	580	311	185	1076	53.9	1.31
75	594	306	183	1083	55.1	1.00
150	590	347	198	1135	52.1	1.08
300	591	350	203	1145	50.9	1.52
LSD 0.10	NS	36.0	NS	38.4	2.5	NS
N x K LSD	NS	NS	NS	NS	NS	NS
CV, %	8.3	18.3	19.0	5.8	8.0	76.0

US #1's: Roots 2 – 3.5" in diameter, 3 – 9" in length, must be well shaped and free of defects.
Mediums: Roots 1 – 2" diameter, 3 – 7" in length.
Jumbos: Roots that exceed the diameter and length requirements of the above two grades, but are of marketable quality.
% US #1's: Wt. of US #1's divided by the total marketable wt (culls not included).
Culls: Roots >1" in diameter and so misshapen or unattractive as to be unmarketable.
LSD 0.10: Least significant difference at the 90% probability level. NS = not significant.
CV Coefficient of variation, a measure of variability in the experiment.

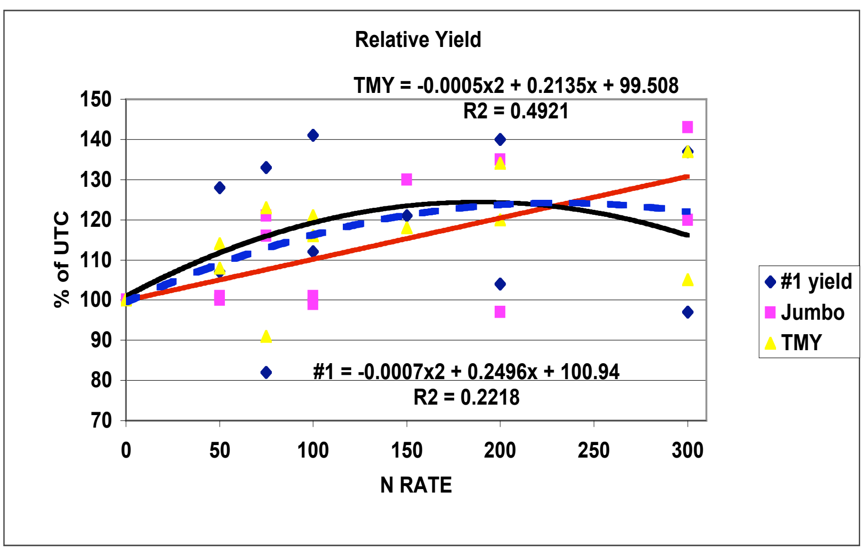

Figure 1. Relative sweetpotato yield response over 4 years, % increase as compared to untreated control. Best overall yields occurred at 125 – 175 lbs N/A.

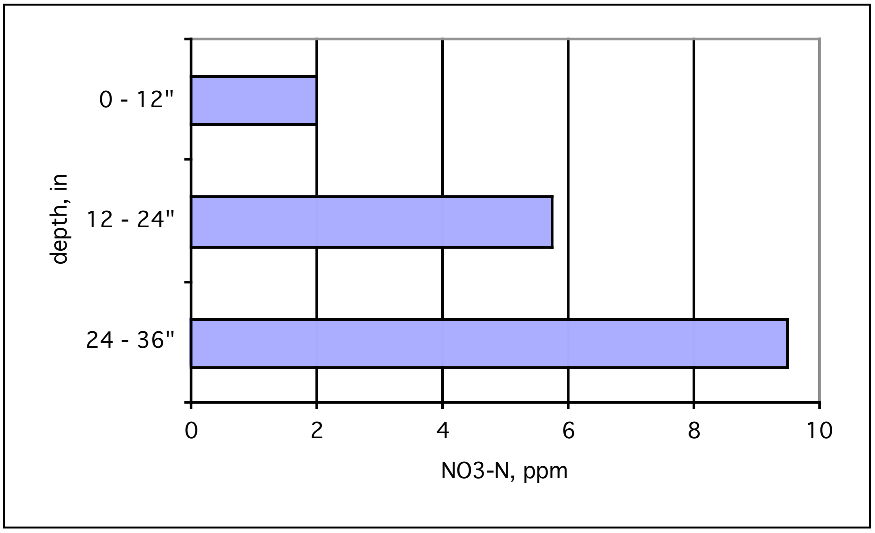

Figure 2. Spring 2002 soil samples NO_3-N results in the soil profile for the 200 lbs/A nitrogen treatments. LSD 0.05 = 3.1 ppm.

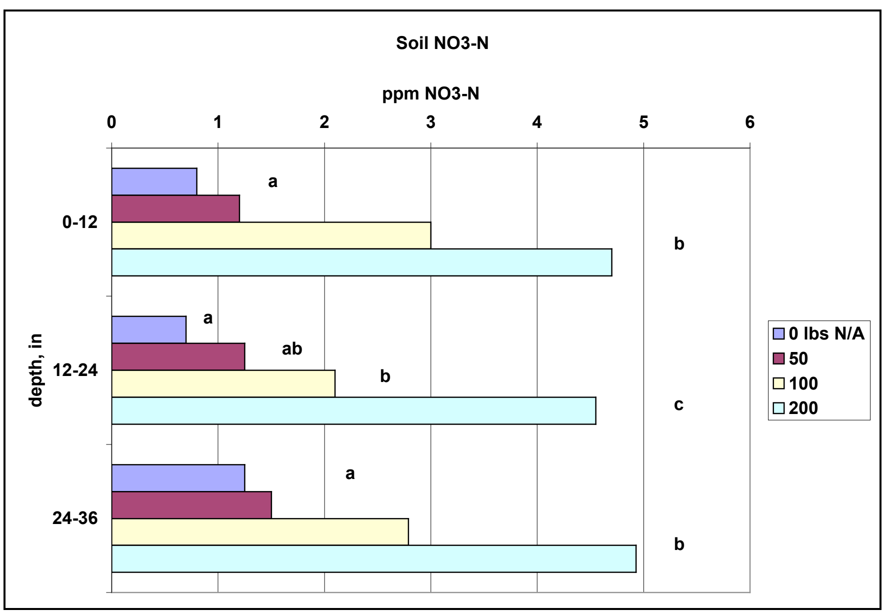

Figure 3. Fall 2002 soil sample NO_3-N results at 1, 2, and 3 feet for the various nitrogen treatments. LSD 0.05 performed on log-transformed data. Bars with the same letter are not significantly different.

Soil sample results for K are shown in Figure 4. In general, K increased with depth and as fertilizer K increased. Soil test K never exceeded 70 ppm, even at the 300 lbs K_2O per acre fertilizer rate. Regression analysis showed a significant positive linear response in soil test K as fertilizer K increased ($p < 0.01$, $R^2 = 15\%$), however, there was no significant correlation between fall soil test K and yield. The lack of yield response to added K and no correlation in any year for this trial, combined with low soil test values, suggest that 1) the soil test guidelines need to be revised for sweetpotatoes; or 2) the soil has high K fixation potential. This soil's K fixation potential ranged from 11 to 36%, which is considered low (Dr. Stu Pettygrove, personal communication), and therefore unlikely to explain the lack of K response in this trial. This suggests that hypothesis #1 is correct, but I have little data to show this is true. Current UCCE guidelines state that fertilizer should be applied if the soil K is less than 150 ppm. My data suggest that soil K levels > 70 ppm are adequate. Even with these low values, the cumulative K_2O content in the soil (from 0 – 3 feet) exceeded 695 lbs per acre.

Very little relationship was found between the petiole N and K analyses and yield. There was a slight positive relationship with both petiole NO_3-N and K to yield at the July sampling, but none with the August plant sampling. Nonetheless, the significant response curves to fertilizer rate suggest zones where levels are sufficient. Using these curves and others from previous years (Figures 5 and 6), new guidelines are listed in Table 5.

Storage weight losses were measured after the 2001 and 2002 seasons (Tables 6 & 7). There was essentially no significant effect from either N or K fertilizer rate on moisture loss, or shrinkage, for a four to six month period. In general, the potatoes lost 3.5% of their weight in the first 6 weeks after harvest, and then 1 – 2% each month after that.

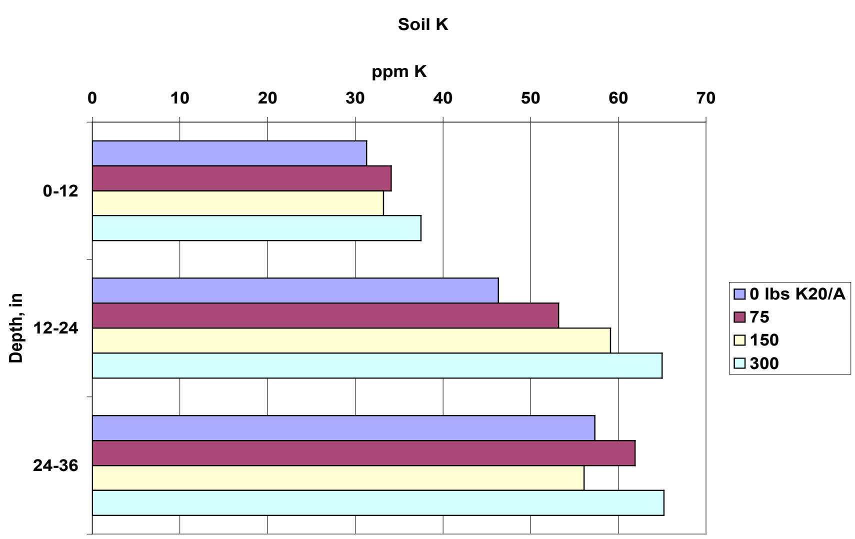

Figure 4. Soil K levels for different depths as affected by potash treatment, fall 2002. LSD 0.10 for 1, 2, and 3 feet are NS, 10 ppm, and NS, respectively (means separation performed on log-transformed data).

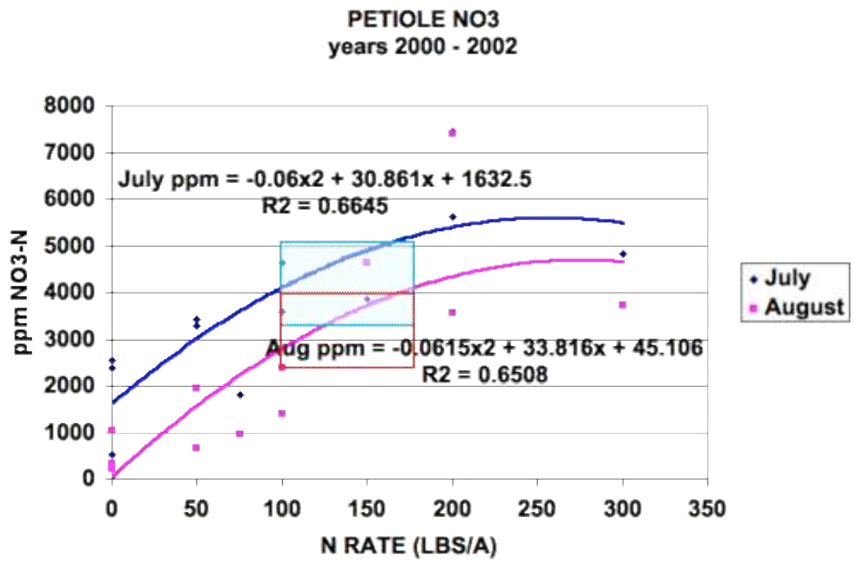

Figure 5. Correlation between petiole NO_3-N and N rate for July (top line) and August (bottom line) for years 2000 – 2002. Boxes correspond to that area where yield was maximized (125 to 175 lbs N/A).

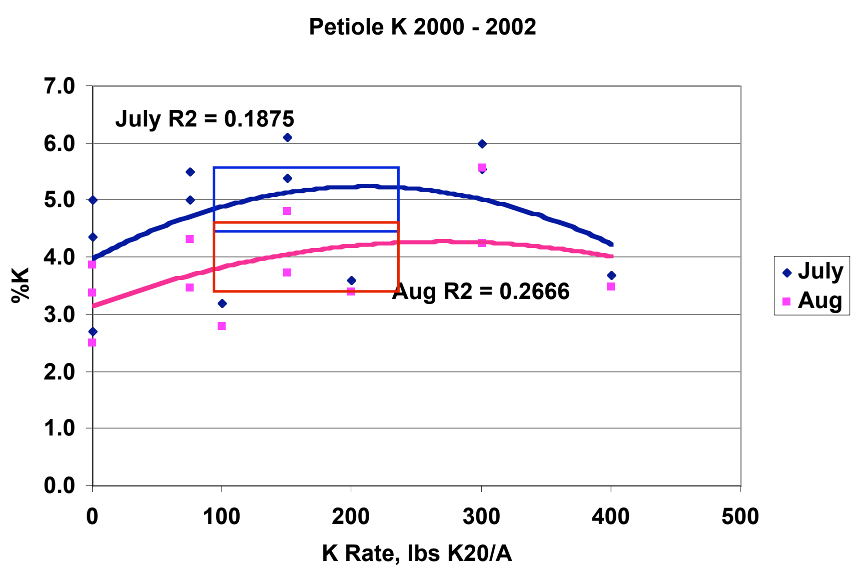

Figure 6. Correlation between petiole K and potash rate as measured in July (top line) and August (bottom line) from 2000 – 2002.

Using the data from plant analyses, yield, and soil results, a nitrogen balance was calculated for this system. About 235 lbs N/A was found in the treatments receiving 50 and 100 lbs of N, and 360 lbs N/A at the 200 lb fertilizer rate (Table 8). It has already been shown that the best rate was 125 – 175 lbs N/A for maximum yield; this table shows that nitrogen fertilizer rates over 175 lbs per acre increase vine weight, leaf N, root N, and the amount of NO_3-N in the soil, but do not consistently increase yield.

It is interesting to note that even in the plots that received no nitrogen fertilizer, nearly 163 lbs N/A was accounted for. Much of this no doubt came from residual N in the soil profile—based on the soil sample data in Table 2 the 0 – 3 ft profile contained 165 lbs of N (as NO_3-N). While this is not necessarily all available for the subsequent crop, mineralization of soil organic matter would have contributed another 30 – 60 lbs (SOM in these sandy soil is typically very low, < 1%).

In summary, there was a significant yield response to N and K in 2002 as compared to the unfertilized check. Best #1 and TMY yields occurred at 100 lbs N/A and 150 lbs K_2O/A. Significant responses were found for nitrate and potassium in the plant tissue and soil. In general, as N and K rates increased, so did the amount in the plant and soil. However, there was little correlation between plant and soil analyses and yield. Varying N and K rates had no significant effect on weight loss in storage for a period of 4 – 6 months. Little evidence was found that soil nitrate levels were building up in the lower soil profile, even at high nitrogen fertilizer rates.

Based on the results of four years of study, new fertilizer rates for nitrogen are suggested with the cultivar Beauregard grown with drip irrigation. These fertilizer rates are 125 – 175 lbs N per acre. Because a significant response to potassium was observed in only one year, no recommendation is made other than to supply what is removed by the crop. A 30 bin/A yield will remove about 150 lbs K_2O per acre (5 lbs K_2O per 1000 lbs potatoes). Refined tissue analysis guidelines are also suggested that are slightly higher earlier in the season and slightly lower later in the growing season than was previously recommended.

Table 5. Suggested petiole nitrate and potassium sufficiency ranges as developed from the drip fertilizer trial, 1999 – 2002.

Sampling period	*Petiole NO_3-N*	*Petiole K*
	Sufficiency ranges	
Vining (4 – 6 weeks post transplant)	3,000 – 5,000 ppm	4.5 – 5.5%
Root bulking (8 – 10 weeks post transplant)	2,000 – 4,000 ppm	3.5 – 4.5%

UCCE guidelines currently advise 2500 ppm NO_3-N, and 5% K at mid-growth. Petioles should be taken 6^{th} leaf from the growing tip, with the leaf blade removed (inclusion of the leaf blade dilutes the sample). A minimum of 30 petioles should be collected for a good sample.

Table 6. Storage weight loss for sweetpotatoes as affected by fertilizer treatment for the period November 2001 to May, 2002.

N rate Lbs/A	*K_2O rate Lbs/A*	*6 weeks*	*12 weeks*	*18 weeks*	*24 weeks*	*30 weeks*	*Cumulative*
		Post Harvest Weight Loss, %					
0		3.9	2.3	2.6	1.3	1.9	12.0
50		3.3	2.0	2.5	1.5	1.9	11.1
100		3.6	2.4	2.9	1.6	2.2	12.7
200		3.3	1.8	2.3	1.3	2.0	10.7
LSD 0.10		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
	0	3.5	2.0	2.1	1.4	1.9	11.0
	75	3.5	2.2	2.7	1.4	1.8	11.6
	150	3.8	2.2	2.8	1.6	2.2	12.7
	300	3.2	2.1	2.7	1.3	1.9	11.1
	LSD	**NS**	**NS**	**0.5**	**NS**	**NS**	**1.3**

LSD = Least significant difference at the 90% confidence level. NS = not significant.

Table 7. Storage weight loss for sweetpotatoes as affected by fertilizer treatment for the period November 2002 to March, 2003.

N rate Lbs/A	*K_2O rate Lbs/A*	*8 weeks*	*18 weeks*	*Cumulative*
		Weight loss, %		
0		4.9	5.1	9.7
50		4.7	4.6	9.6
100		5.0	4.9	10.0
200		5.4	5.6	10.7
LSD 0.10		**NS**	**NS**	**NS**
	0	4.8	4.7	9.3
	75	5.0	5.5	10.8
	150	4.8	5.2	10.1
	300	5.3	4.6	9.8
	LSD 0.10	**NS**	**NS**	**NS**

LSD = Least significant difference at the 90% confidence level. NS = not significant.

Table 8. Partial N partitioning based on vine weight, roots, and soil, 2002.

N rate Lbs/A	*Vine wt Lbs/A*[1]	*Vine N %*	*Vine N Lbs/A*	*Root wt Lbs/*[2]*A*	*Root N %*[3]	*Root N Lbs/A*	*Soil N Lbs/A*[4]	*TOTAL N Lbs/A*
0	1883	2.29	43.1	12,760	0.85	108	11.7	162.8
50	2459	2.61	64.2	13,270	1.15	153	17.1	234.3
100	2600	2.36	61.4	13,920	1.01	141	40.0	242.4
200	3048	3.15	96.0	13,340	1.50	200	61.5	357.5
LSD 0.1	385	0.28	12.0	545	---	---	10.0	---

1. Vine weight is the total dry weight (12.5% D.M.) of the vine plus leaves at the end of the season (September sampling).
2. Root weights are at 30% D.M. of TMY.
3. Root N% based on 2001 data.
4. Soil N is the sum of N (as NO_3) in the upper 3 feet of soil based on soil bulk density of 1.7, 1.6, and 1.5 g cm^{-3} for the 1st, 2nd, and 3rd foot in the profile, respectively (soil BD values based on USDA NRCS soil survey data). LSD value determined on natural log adjusted values and converted back for this table.
5. LSD 0.10 = least significant difference at the 90% confidence level. Means separated by less than this amount are not significantly different.

ACKNOWLEDGEMENTS

Many thanks to Mr. Bob Weimer for his cooperation and help with irrigation set-up, planting and harvesting this test, and to Larry Burrow, County Ag Technician for all his help with sampling. This project was funded in part by a grant from the Fertilizer Research and Education program (FREP), California Dept of Food and Ag and the Fertilizer Inspection Advisory Board. FREP provides funding to conduct research and education projects to advance the environmentally safe and agronomically sound use and handling of fertilizer materials.

SWEETPOTATO WORM CONTROL TRIAL
2002 Research Progress Report
Scott Stoddard, Assistant Farm Advisor
Merced and Madera County

INTRODUCTION

OBJECTIVE: Evaluate different insecticide materials and rates for control of Beet Armyworm and Western Yellowstripe Armyworms in Beauregard sweetpotatoes.

SITE LOCATION AND COOPERATOR: Field site located on the corner of Robin and Rose Rds, near Livingston, in Merced County. Bob Weimer cooperating.

TREATMENTS:

1. UTC
2. Success (Spinosad) at 4 fl oz product/Acre
3. Success at 6 fl oz/Acre
4. Intrepid at (methoxyfenozide) 4 fl oz/Acre
5. Intrepid at 6 fl oz/Acre
6. Confirm (tebufenozide) at 6 fl oz/Acre
7. Confirm at 8 fl oz/Acre
8. Dipel (*Bacillus thuringiensis var kurstaki*) at 1 lb product/Acre
9. Dipel at 2 lbs/Acre
10. Lannate (methomyl) at 1 lb/A (grower standard)

****** NOTE: Treatments 4 – 7 crop destruct ******

Treatments applied 8/21/2002 & 9/4/2002 in 50 gal/A equivalent

FIELD TREATMENT RANDOMIZATION

			CD					*CD*		*CD*		*CD*
Rep4	10	9	7	8	3	2	1	6		4		5
Rep3	8	9	6	10	1	3	2	4		5		7
Rep2	3	8	5	2	10	9	1	7		4		6
Rep1	1	2	4	3	8	9	10	5		6		7

CD = Crop Destruct
Plot size: 6 rows (20 ft) by 40 ft

PROTOCOL:

- ✓ Apply when signs of heavy feeding occur. Re-apply after 14 days.
- ✓ Take counts of live lepidopterous larvae and phytotoxicity ratings 7 & 14 days after each application. Readings taken from middle 2 rows of plot.
- ✓ File RA and NOI with agriculture commissioner and confirm crop destruct.
- ✓ Field not sprayed by grower.
- ✓ Yield data for crop destruct compensation will come from Telone trial harvest.
- ✓ No adjuvants added.

RESULTS

This trial was put into place about 10 days after armyworm pressure had achieved levels high enough that significant defoliation was occurring in the field. Prior to the end of August, worm pressure had been very light on sweetpotatoes in the county and no control measures were necessary. Around the time of August 20, western yellowstripe armyworm populations suddenly took off, and fields were sprayed. The field where this trial was located was not treated because it was scheduled to be harvested soon.

Table 1 shows the effect of the various insecticide treatments on worm counts 1, 2, and 3 weeks after the first application. All treatments were applied again 2 weeks after the first application, however, worm counts were much lower at this time even in the unsprayed plots. Due to the high variability that is inherent with insect counts, the data were transformed using the function $\sqrt{(x + 0.5)}$. Worms were counted by two methods: shaking the foliage onto cafeteria trays at 4 locations per plot, and using a sweep net in the middle two rows of the plot for 25 sweeps.

At one week post application, Intrepid, Confirm, Lannate, and the high rate of Dipel significantly reduced worm counts over the untreated control (Fig. 1). Success and the low rate of Dipel offered little control. Best control was achieved with Lannate (grower standard) and the high rate of Intrepid. These treatments continued to perform well at 2 weeks post application, especially Confirm, though overall insect counts were not as high then (Fig. 2). By 3 weeks, most of the treatments performed slightly better than the check plots, but insect counts were very low at this time due to the natural cycling out of the armyworms.

A factorial analysis of the one week post application data showed that worm control was significantly increased at the higher rate for all products (Lannate was not included in this analysis since it was applied at only one rate). Intrepid and Confirm reduced worm counts significantly better than Dipel or Success.

Beneficial insects were observed lower in the Lannate treatments at one week post application, however, no counts were taken at this time. Beneficial insect counts were recorded at 2 and 3 weeks after application, but there was no difference in the numbers because of treatments (Table 1).

No phytotoxicity on the sweetpotato crop was seen with any of the treatments.

Of all the treatments observed in this test, Intrepid appears to have the most promise as a potential alternative to Lannate. Control was quick and effective, and given its low mammalian toxicity rating, very easy to work with. This product would have an excellent fit in sweetpotato production in California, as western yellowstripe armyworms are the main Lepidoptera pest that growers have to control. One of the negatives about Lannate is that it has a 30 day PHI, which restricts its use for late season pest flare-ups. This may be one of the places where Intrepid would have potential use.

ACKNOWLEDGEMENTS

Many thanks to Mr. Bob Weimer for his cooperation with this trial and following through with the crop destruct part of the trial. Also, many thanks to Mr. Lonnie Slayton, with Simplot, for providing Lannate, and Dr. Jim Mueller, with Dow AgroScience, for production and financial support.

Table 1. Summary of worm and beneficial insect counts as affected by insecticide treatment on sweetpotatoes. Merced County, 2002.

Treatment	*8/21 pre-app larvae*		*8/28 1 week post larvae*		*9/4 2 weeks post application*		*9/11 post 2nd application*	
	Tray[1], √x	Net[2], √x	Tray, √x	Net, √x	Net, √larvae	Net, # beneficials[3]	Net, √larvae	Net, # beneficials
1. UTC	5.4	4.0	4.00	3.38	2.64	2.0	1.54	1.8
2. Success 4 oz			3.82	2.73	2.00	2.3	0.84	0.5
3. Success 6 oz			3.65	3.19	2.35	4.5	0.84	1.3
4. Intrepid 4 oz			2.18	1.64	1.13	3.5	0.71	0.5
5. Intrepid 6 oz			1.52	1.48	0.97	1.3	0.71	0.25
6. Confirm 6 oz			2.82	1.75	1.19	1.8	0.84	1.0
7. Confirm 8 oz			2.03	0.97	0.71	4.5	0.71	1.5
8. Dipel 1 lb			3.78	3.21	1.85	4.8	1.18	2.25
9. Dipel 2 lbs			2.69	2.09	1.26	3.8	1.10	0.75
10. Lannate 1 lb			0.84	0.84	1.31	3.3	0.97	1.25
Average	5.4	4.0	2.73	2.13	1.54	3.2	0.94	1.1
LSD 0.05*	---	---	0.92	0.94	0.83	NS	0.39	NS

1. Square root of the number of live *Lepidoptera* larvae per 8 cafeteria trays (19.5 ft^2). Predominant species was Western Yellowstripe Armyworm (*Spodoptera ornithogalli*).
2. Square root of the number of live *Lepidoptera* larvae per 25 sweeps.
3. Number of beneficial insects per 25 sweeps. Typical beneficial insects were big-eyed bugs, lady bugs and larvae, minute pirate bug, assassin bugs, and spiders. Counts were not made prior to September 4. Transformation of data did not improve analysis, and values are averages of raw data.

* LSD 0.05 = Least Significant Difference. Means separated by more than this amount are not significantly different at the 95% confidence level. Analysis was performed on transformed data to assure homogeneity of variances (square root transformation used).

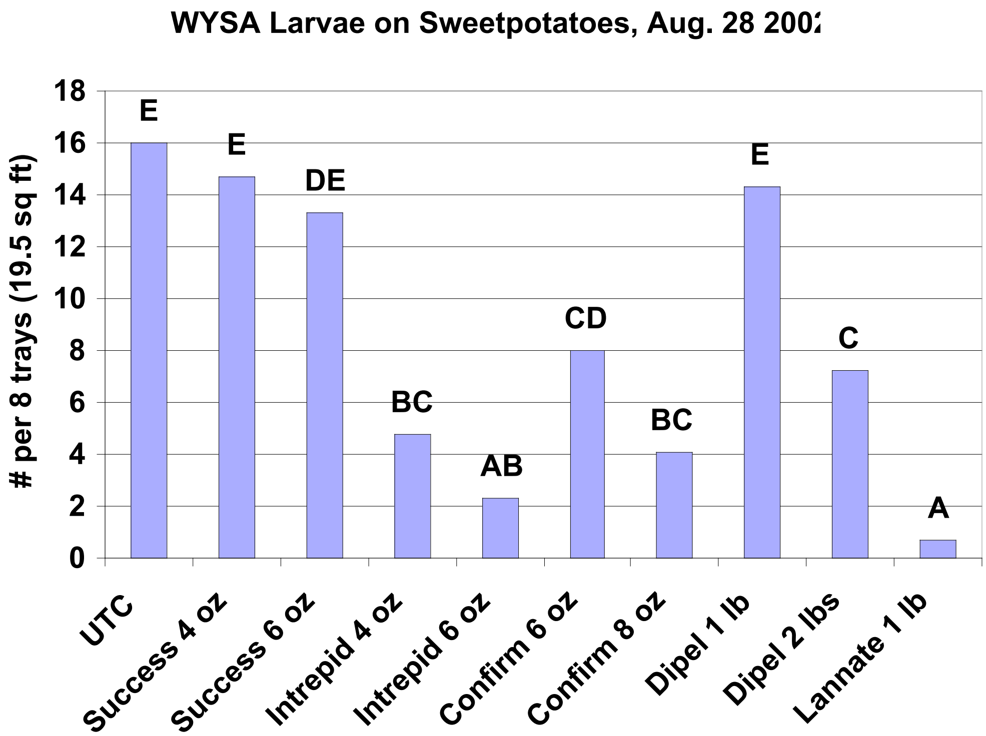

Figure 1. Tray counts for live *Lepidopterous* larvae (primarily western yellowstripe armyworm) on sweetpotatoes on August 28, one week after initial application of insecticides. Columns with the same letter are not significantly different at the 95% confidence level (LSD determined on transformed data).

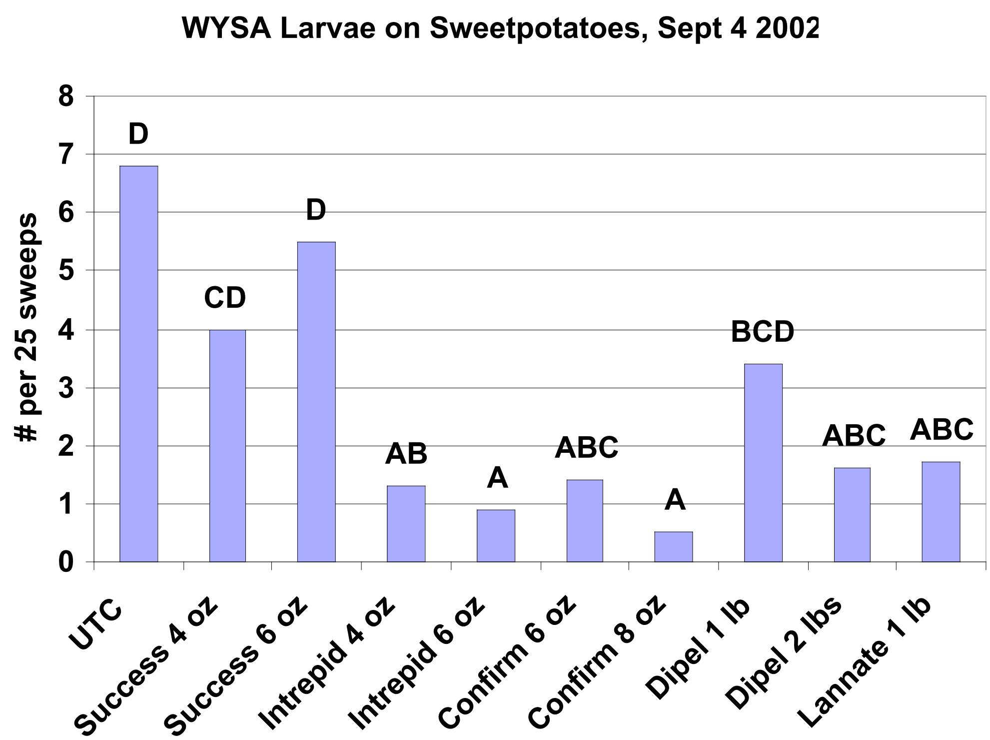

Figure 2. Number of western yellowstripe armyworm per 25 sweeps 2 weeks after insecticide treatments. Columns with the same letter are not significantly different at the 95% confidence level (LSD determined on transformed data).

DITERA ON SWEETPOTATOES
2002 Research Progress Report
Scott Stoddard, Assistant Farm Advisor
Merced and Madera County

OBJECTIVE: To evaluate the Valent nematicide Ditera for control of root knot nematodes in Beauregard sweetpotatoes.

SITE LOCATION AND COOPERATOR: Bob Weimer. Field test located in Merced County on the SW corner of Robin and Rose. Test plots were within larger fumigation test plot. Soil type is Hilmar loamy sand.

TREATMENTS:

1. UTC
2. Ditera at 2 gal/A apply 4 times
3. Ditera at 3 gal/A apply 4 times

NOTE: all treatments in areas of field that had not been fumigated.

FIELD TREATMENT RANDOMIZATION:

D1	**D2**		**D1**			**D2**			**D1**			**D2**
Rep 1			Rep 2						Rep 3			

Plot layout: Completely randomized design with 3 replications. Plots were one bed (2 rows, 80") by 300 ft. Plots were drip irrigated using surface applied drip tape, 1 line per bed.

Variety: Beauregard sweetpotatoes (nematode susceptible) transplanted May 25, 2002.

PROTOCOL:
- Nematode samples taken on June 6, and July 1, 2002 from 0 – 16"
- Injections. Injection ports were added to each irrigation line. Ditera was mixed with water and injected while field was being irrigated. Injected using piston pump for 15 minutes per line.
- 1st application on 6/12/2002
- 2nd application on 6/18/2002
- 3rd application on 7/11/2002
- 4th application on 7/24/2002

- Plots harvested on September 17, 2002 by mechanically digging 30 ft of row at two locations within the plot (total 60 ft of harvest).

RESULTS

Trial was initiated shortly after field was transplanted. Since this trial was located within a larger fumigation study, the plots were placed where the ground had not been fumigated the previous fall. This field had been an old Thompson seedless vineyard and fallowed one summer before planting to potatoes. Soil type was Hilmar loamy sand—deep, well drained, and well suited for nematodes.

An injection port was added to the beginning of each irrigation line, and the Ditera was injected by first premixing it with water, then slowly adding it to the irrigation line using a battery operated piston pump. Injection times were about 15 minutes per line, and were done when the grower was near the end of his irrigation set. The drip line went down the middle of an 80” raised bed and irrigated two rows of sweetpotatoes. Distance from the drip line to the potatoes is about 12-15”. The Ditera was injected every 2 weeks for a total of 4 applications.

Nematode samples were taken in June and July. A composite sample was taken from multiple soil cores in the untreated areas and sent to Western Diagnostic Labs for analysis. Initial nematode samples found no root knot nematodes in the upper 12” of the soil. (Table 1). A second July sampling was performed sampling to a deeper depth (16”) and with a greater number of samples. Again, no plant parasitic samples were recovered. This was surprising, given the fact that this was unfumigated ground following an old vineyard without nematode resistant rootstock.

Yield and grade results are shown in Table 2 and graphically in Figure 1. No significant differences were found in total market yield or any yield category between the Ditera plots and the untreated control. Best yields occurred in the Ditera 2 gallon treatment, at about 27.5 bins per acre. While there was no difference in total culls in this trial (the majority of culls were a result of grub and wireworm damage), cull potatoes as a result of nematode damage were significantly less ($p = 0.10$) in the Ditera treatments as compared to the untreated check (about 2 bins/A vs 6 bins/A in the check plots). Overall, however, nematode damage was very light in this field, which resulted in a high coefficient of variation.

Table 1. Nematode sample results for Merced County Ditera sweetpotato trial.

Nematode sample June 12, 2002	*# RKN per 500 cc soil*	*Nematode sample July 1, 2002*	*# RKN per 500 cc soil*
1	0	1	0
2	0	2	0
3	0		

RKN = root knot nematodes (*Meloidigyne incognita*) in upper 12” for June sampling, 16” in July sampling.

Table 2. Yield and cull weights as affected by Ditera treatment.

Treatment	*#1's*	*Jumbo*	*Mediums*	*TMY*	*Culls*	*Nematode culls*	*Cull %*
	1000 lb bins per acre						
1. UTC	10.8	7.2	6.8	24.75	12.0	6.2	42.3
2. Ditera 2 gpa	11.4	8.9	7.0	27.37	8.7	2.2	28.55
3. Ditera 3 gpa	8.1	5.8	7.0	20.85	10.7	1.6	37.0
LSD 0.10	NS	NS	NS	NS	NS	3.36	NS
CV, %	28.8	33.0	29.0	23.0	61.1	78.8	53.1

TMY = Total marketable yield, the sum of #1's, Jumbos, and medium size potatoes.
Nematode culls are those potatoes culled because of nematode damage.
LSD = least significant difference at the 90% level of confidence.
CV = coefficient of variation.

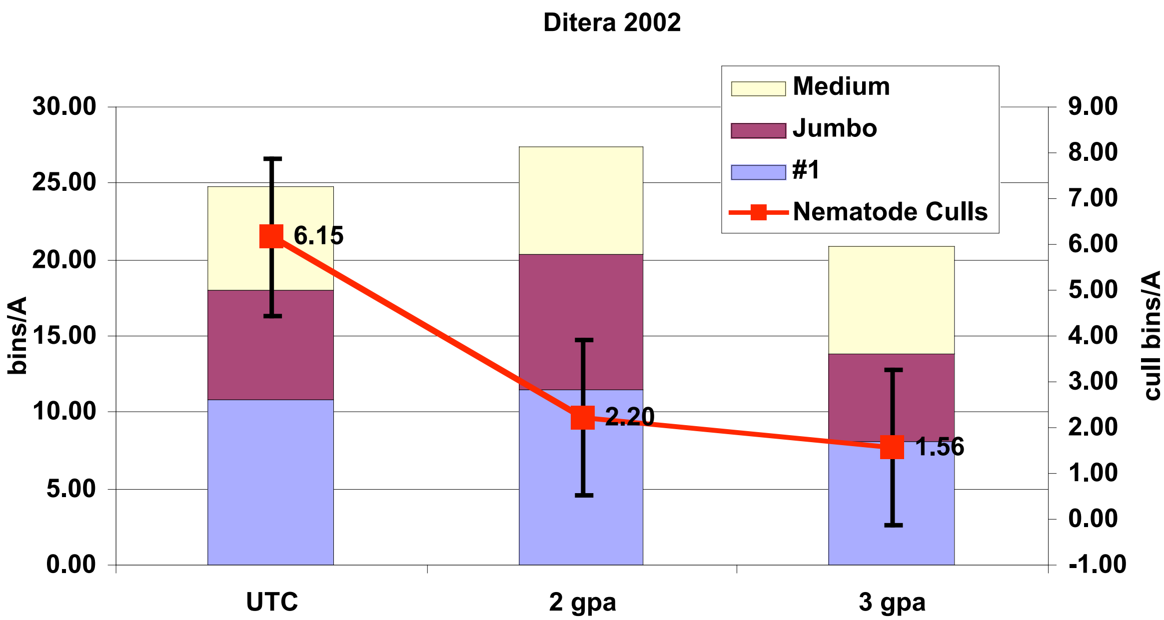

Figure 1. Yield and cull weights of Beauregard sweetpotatoes, in bins per acre (one bin = 1000 lbs). The height of each bar represents total marketable yield broken up into its three components. The red line corresponds to the y axis on the right side of the chart, and is the average weight of cull potatoes from nematode damage.

FUMIGATION AND COVER CROP TRIAL ON SWEETPOTATOES

2002 Research Progress Report

Scott Stoddard, Assistant Farm Advisor
Merced and Madera County

INTRODUCTION

Considering the restrictions from Telone caps, finding fumigation alternatives or ways to extend the cap has become the number one issue facing sweetpotato growers in California. In 2000, we conducted a small "exploration" trial to look at the affect of fumigation and a cabbage cover crop on sweetpotato yield. The set up was very simple: cabbage was planted in an area of the field with and without Telone (1,3-D). This was compared to the standard forage mix cover crop with and without Telone. The results suggested there may be a benefit to combining a Brassica cover crop, such as cabbage, with Telone for improved performance.

Consequently, a test plot was established in the fall of 2001 to explore this is greater detail. Vapam, Mocap, and Telone were combined with different cover crops in a large scale, completely randomized test plot. The ultimate goal is to try and find a method or treatment combination that will provide satisfactory control of soil pests while extending the Telone that can be used within a township.

The objective if this trial was to evaluate different rates of Telone, Vapam, and Mocap combined with different cover crops on Beauregard sweetpotato yield and quality.

METHODS

Field site was located on corner of Rose and Robin Roads, near Livingston, CA. Previous crop was an old Thompson seedless vineyard that had been fallowed for one summer. Fumigation treatments were applied on December 20, 2001, using two fumigation rigs from Western Farm Service. Vapam (metam sodium) and Mocap (ethoprop) were applied using a John Deere T-track 8000 series tractor equipped with a GPS guidance system. The Telone was shanked in to 18" deep on 18" centers. The Vapam and mocap were also shanked in at three levels (6, 12 and 18"), but on 9" centers. Since the shanks on the tool bar were set up on 18" centers, this required going across the plots twice, with the second round nudged over 9". The GPS system was instrumental in accomplishing this.

Both the Vapam and Mocap needed to be shanked on the closer spacing because they do not fume like Telone. Note: the Mocap shank application is slightly off-label (label states to spray on surface and then roller incorporate to 6-8").

The following treatments were used:

1. UTC
2. Vapam at 75 gals/A
3. Vapam at 60 gals/A

4. Mocap 1 gal/A shanked in to 18"
5. Telone 10 gals/A
6. Telone 7 gals/A

The following cover crops were planted January 3, 2002 over the top of the fumigation treatments:

1. no cover (winter weeds)
2. Fodder radish cv "Adagio"
3. White vetch cv "Cahaba"
4. Barley

Fumigation treatments were 20 ft wide (3 beds) by 300 feet long.

Nematode samples were taken before fumigation in December, then again in May 2002 before transplanting, July 2002 at vining, and in October at harvest. Beauregard sweetpotatoes were transplanted May 25, 2002 and harvested September 17. Plots were harvested with a mechanical harvester and crew sorted in the field. Two, 30' lengths of one row (total 60 ft) from the middle plot was used for analysis.

RESULTS

Because of the lateness of the cover crop planting and the dry winter, cover crop growth was negligible for this trial and was not considered in the data analysis. Therefore, this summary only deals with the main effects of the chemical treatments.

Nematode results are shown in Table 1. Despite this being an old Thompson vineyard that was not on nematode resistant rootstock, no root knot nematodes (*Meloidigyne spp*) were found at any sampling date prior to harvest. Dr. Tom Trout, at the USDA-ARS research station in Parlier, has found that summer fallow can be an effective way to eliminate nematode problems, provided weeds are controlled. He has found that usually 2 or more years are required, however, to get economical control. It is possible that the one summer fallow in this field resulted in enough nematode kill to last the following season.

Yield and grade results are shown in Table 2 and graphically in Figure 1. Number 1 yield was significantly increased over the check treatment for both Telone treatments and the 75 gal/A rate of Vapam. Total market yield was highest in the Mocap plots, though this was not significantly more than Telone or the high rate of Vapam.

Culls were classified as being from nematode or insect damage. While nematodes were not found in the soil samples, some nematode damage was found on the potatoes, though the amount was low (between 1 and 5 bins per acre) and not significantly different among treatments. Large differences were found, however, in the amount of grub and wireworm damage between treatments. Significantly more damage occurred in the UTC and Vapam 60 gpa plots. Combining all cull damage, culls accounted for 35% of the total production in the check plot, while only about 10% in the Mocap and Telone treatments (Fig. 1).

Disease was not a problem in the trial this year and culls were not segregated by disease problems.

The performance of Mocap in this trial, essentially equivalent to Telone, was surprising, as previous experience with this material has shown only marginal effectiveness. So surprising, in fact, that the grower kept separate the different treatments when he harvested the rest of the plots. He found the same result. This could be an affect of the application method: Mocap was shanked, which has not been evaluated before. However, this is only one year's data, and therefore this could also just be an anomaly. There was a strong block effect in the trial, and the Mocap treatments may have occurred by chance in those areas where there was little insect pressure. These treatments are being evaluated again in 2002. If the effect turns out to be real, this treatment would be a big improvement in the buffer areas where Telone is not allowed.

ACKNOWLEDGEMENTS

Many thanks to the many cooperators who helped with this trial, especially Mr. Bob Weimer for growing and harvesting the crop, Larry Beckstead with Western Farm Service for applying the fumigation treatments, and Dr. Becky Westerdahl, UC Davis Nematologist, for running the nematode analyses.

Table 1. Nematode analysis results.

Treatment	*Dec., 2001*	*May 2002*	*June*	*July*	*Sept (harvest)*
	----	---- # per 500 cc soil ----			----
1. UTC	100 ring[1]	0	0	0	4320 rkn[3]
2. Vapam 75		50 spiral			0
3. Vapam 60		0			338
4. Mocap		0			360
5. Telone 10		0			0
6. Telone 7		0			43

1. Ring nematode = *Cricomanella spp,* at the 6 – 18" depth. Sample taken before treatments imposed.
2. Only the UTC plots were sampled in June and July. Composite sample to 18".
3. RKN = root knot nematode, *Meloidigyne spp*. All counts at the September sampling were rkn.

Table 2. Yield and grade results from the sweetpotato fumigation trial, 2002.

						Culls:		
		#1's	*Jumbo*	*Medium*	*TMY*	*grubs*	*nematode*	*Culls*
plot	*treatment*	---	---	---	*bins/A*	---	---	*%*
1	UTC	10.22	8.58	7.16	25.96	9.57	5.15	34.97
2	Vapam 75 gals/A	14.88	10.59	9.55	35.01	4.44	1.92	15.44
3	Vapam 60 gals/A	10.59	12.16	7.90	30.64	9.17	2.98	28.59
4	Mocap 1 gal/A	13.06	15.53	9.46	38.04	2.71	1.82	10.87
5	Telone 10 gals/A	15.47	10.22	9.64	35.34	4.19	2.66	16.04
6	Telone 7 gals/A	13.60	12.99	8.58	35.18	4.02	1.01	11.74
	LSD 0.10	3.31	3.98	NS	5.89	4.12	NS	9.83

US #1's Roots 2 to 3.5 inches in diameter, length 3 to 9 inches, well shaped and free of defects.

Canners Roots 1 to 2 in diameter, 2 to 7 inches in length.

Jumbos Roots that exceed the diameter and length requirements of above grades, but are of marketable quality.

Mkt Yield Total marketable yield is the sum of the above three categories.

Culls Roots greater than 1" in diameter that are so misshapen or unattractive as to be unmarketable.
Culls were classed due to grubs/wireworms or nematode damage.

bins/A 1000 lb bins per acre

LSD 0.10 Least significant difference at the 90% confidence level.

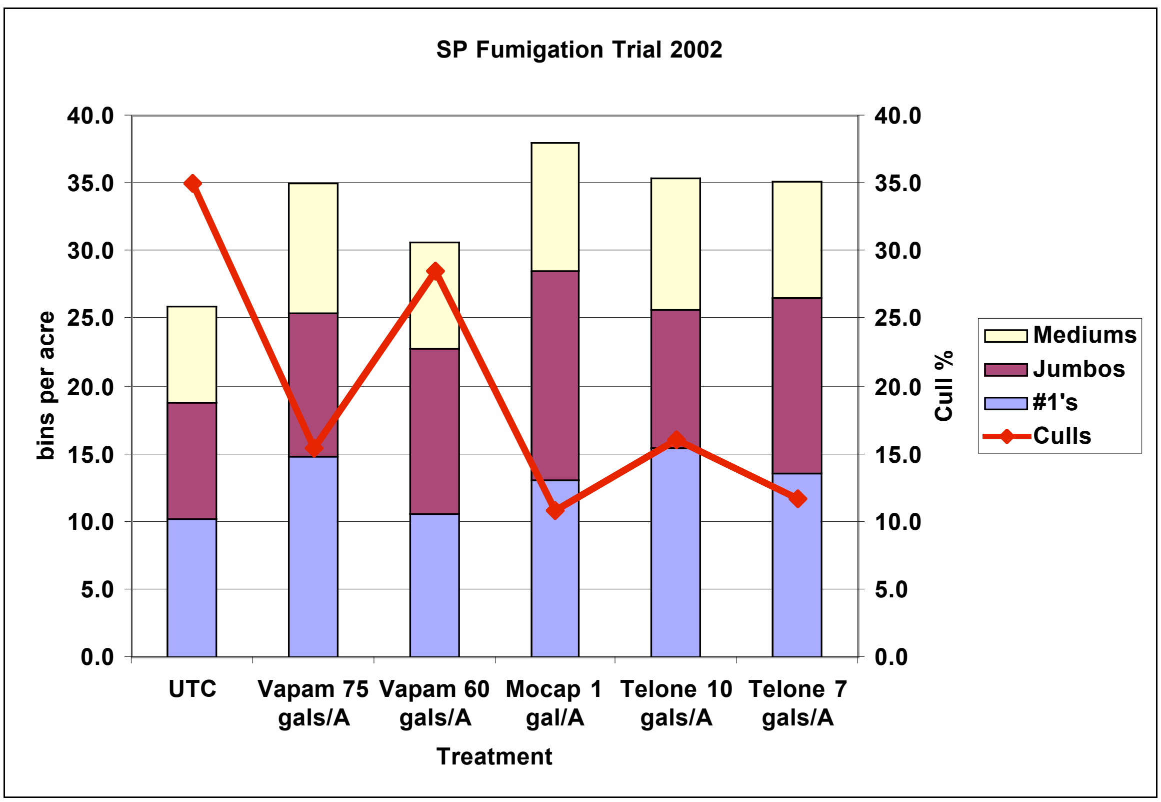

Figure 1. Yields by grade (bars) and cull percentage (red line), for the Merced County fumigation trial 2002.

FUNGICIDE TRIAL

2002 Research Progress Report
Scott Stoddard, Assistant Farm Advisor
Merced and Madera County

INTRODUCTION

With the cancellation of Benolate (Benomyl) fungicide, sweetpotato growers have lost one of the few registered materials that can help prevent *Fusarium* stem rot in transplants. A potential replacement is Topsin (thiophanate-methyl, Cerexagri), but it has not been tested and is not yet registered. The objective of this trial was to evaluate the effectiveness of various fungicides for control of stem rot and other diseases in Hanna (stem rot susceptible) sweetpotatoes.

METHODS

Site was located near the corner of Westside Blvd and Washington Rds, near Livingston. Hanna slips were cut and dipped into the following fungicides:

1. Untreated control.
2. Benolate dip (benomyl), 16 oz/50 gal, 15 minutes
3. Mertect dip (thiabendazole), 8 fl oz/7.5 gals, 4 minutes
4. Botran 75 dip (DCNA, dichloro nitroaniline), 1 lb/7.5 gals, 4 minutes
5. Topsin M dip (thiophanate-methyl), 16 oz/50 gal, 15 minutes
6. Chlorox (sodium chlorate), 2% solution, 15 seconds

Plants were planted immediately after dipping on May 21, 2002. Plot size was 40 plants per plot, replicated 4 times. Variety was Hanna Gold, new seed stock. Trial was drip irrigated. Plots visually checked several times during the growing season for disease problems and growth. Plots were harvested October 30, 2002 with a commercial one-row digger and separated and weighed in the field. Topsin plots were a crop destruct and were dug for this trial but not harvested.

RESULTS

No disease problems were noted in this trial, and therefore no results are presented on the efficacy of the treatments. None of the treatments caused phytotoxicity problems to the crop. There was a slight trend for improved yield over the untreated control (Table 1), but this difference was not significant.

ACKNOWLEDGEMENTS

Many thanks to Mr. Nathan Mininger for cooperating with this trial, and Mr. Lonnie Slayton with Simplot for providing fungicide materials.

Table 1. Hanna sweetpotato yield as affected by fungicide treatment, Merced County 2002.

Treatment	*#1's*	*Jumbos*	*Mediums*	*TMY*	*Culls*
	------------- **Lbs per plot (30 ft)[1]** -------------				
1. UTC	32.0	8.7	23.6	64.2	0.7
2. Benolate	44.5	13.8	23.5	81.8	2.4
3. Mertect	41.7	12.8	22.4	76.9	1.1
4. Botran	38.2	10.4	25.1	73.8	2.5
5. Topsin	42.0	12.8	21.6	76.5	0.0
6. Chlorox	35.9	9.2	27.7	72.8	1.4
LSD 0.10	NS	NS	NS	NS	NS

1. Pounds per plot. One plot was 40 plants, var Hanna, on 9" spacing. To convert to bins per acre, multiply by 0.4356.
2. NS = differences between means are not significant at the 90% confidence level.

HERBICIDE TRIAL
2002 Research Progress Report
Scott Stoddard, Assistant Farm Advisor
Merced and Madera County

INTRODUCTION

The same herbicide trial was put out in two locations in 2002 to evaluate the optimal rate of Devrinol and Dacthal herbicides and the grass herbicide Prism (Clethodim, Valent Corp.). Prism is a selective grass herbicide similar to Poast or Fusilade in its mode of action.

METHODS

Trials were in two locations: near the corner of Dwight and Longview Rds and Westside and Washington Rds. Devrinol and Dacthal Flowable (55% DCPA, a new liquid formulation) were applied at transplanting and incorporated. Plot size was 40 feet by 1 bed at one location, 50 feet by one bed at the other. Plots were replicated 4 times. The following treatments were used:

1. UTC
2. Devrinol 2 lbs/A at transplant incorporated
3. Devrinol 4 lbs/A
4. Dacthal Flowable 1.0 gal/A at transplant incorporated
5. Dacthal Flowable 2.0 gal/A
6. Prism 17 fl oz/A + COC post emergence

RESULTS

Unfortunately, both locations were mechanically cultivated and hand weeded before weed control evaluations could be made. Therefore, no treatment effects were seen for the Devrinol and Dacthal, and Prism was never applied. The results of one evaluation made in early August, after canopy closure, for one of the trials are shown in Table 1. While there are no significant differences in the amount of grass and broadleaf weeds seen at this time, there was a trend for greater weed pressure in the untreated plots, even after mechanical cultivation and hand hoeing.

ACKNOWLEDGEMENTS

Many thanks to Mr. Nathan Mininger and Mr. Bob Weimer for their help and cooperation with this test. Also, thanks to Chuck Dirkson with Amvac, and Tino Lopez with Valent for provide herbicide materials.

Table 1. Late season weed pressure as affected by herbicide treatment. Evaluated August 2, 2002 at one location. Merced County 2002.

Treatment	*Broadleaf weeds (1)*	*Grasses (2)*
1. UTC	2.0	2.25
2. Devrinol 2 lbs/A	1.5	0.25
3. Devrinol 4 lbs/A	1.75	0.50
4. Dacthal 1.0 gal/A	1.5	1.0
5. Dacthal 2.0 gal/A	0.75	1.50
6. Prism + COC 17 oz/A	1.5	1.75
LSD 0.10	NS	NS

1. Predominant broadleaf weed was pigweed. Evaluated on a 0 – 10 scale, where 0 = no pressure, and 10 = completely covered.
2. Predominant grass was barnyard grass. Same scale as for broadleaf weeds.
3. NS = Not significant at the 90% confidence level.

SWEETPOTATO DEGREE DAY EVALUATION

2002 Research Progress Report

Scott Stoddard, Assistant Farm Advisor
Merced and Madera County

INTRODUCTION

Degree days, or heat units, are the total amount of heat needed, between a lower and upper threshold, for an organism to develop from one point in its life cycle to another. Previously, I have used the cotton degree day model, which has a lower threshold of 60° F and no upper limit, to try and determine the number of degree days required for seed, #1's, and Jumbos. This year continued that evaluation with Beauregard and Hanna sweetpotatoes.

METHODS

Commercial Beauregard and Hanna field with early, mid, and late transplant dates were used for this evaluation. Beginning about 45 days after transplanting, 5 feet of row from two locations was dug, graded, weighed, and photographed. All roots were weighed, including those too small to be considered in the seed category. Size determinations were based on the USDA sizing standards. Vine weight was also measured. This was repeated every two weeks. The Merced CIMIS station was used to determine degree days. All fields were drip irrigated with 9 – 12" in-row plant spacing. Transplant and harvest dates are shown in Table 1.

RESULTS

This year, the overall percentages of each size class were less than previous years, rarely exceeding 40% for any size. However, the overall trends were much the same, with both mediums and #1's having a fairly good correlation (R^2 = 57 – 80%) to the fitted models (Figures 1 and 2). The fit for Jumbos, however, was relatively poor for both Beauregard and Hanna. What these results say is that there is a fairly good association between size category and the number of degree days received during the season. Based on Figures 1 and 2, the number of degree days needed for mediums is about 1000 for Beauregard and 1300 for Hanna. Number 1's peaked at about 1600 DD 60's for Beauregard and 1800 for Hanna. These values correspond very well with those determined in previous years.

Long term average temperature data can be used to estimate when a sweetpotato crop will achieve these developmental stages. Using DD 60 curves based on 30 year temperature data, estimated dates for crop development depending on transplant date are shown in Table 2.

ACKNOWLEDGEMENTS

Many thanks to Mr. Dave Souza for his help and cooperation with this study, and Larry Burrow, County Ag Tech, for his help.

Table 1. Transplant and harvest dates and accumulated DD60's for Merced, 2002.

Variety		*Transplant date*	*Last harvest date*	*Days*	*DD 60's*
Beauregard	Early	May 10	Aug 14	96	1301
	Mid	June 4	Oct 2	120	1665
	Late	June 28	Oct 25	119	1512
Hanna	Early	April 10	Aug 14	126	1433
	Mid	May 23	Oct 2	132	1817
	Late	June 3	Oct 25	144	1839

Table 2. Estimated time of Beauregard and Hanna root size development at different transplant dates based on 30 yr climatic data for the Merced area.*

Transplant date	*Seed 900 DD 60's*	*#1 Beauregard 1500 DD 60's*	*#1 Hanna 1750 DD 60's*	*Jumbos 1800 + DD 60's*
April 1	July 2	Aug 3	Aug 16	Aug 20
May 1	July 10	Aug 11	Aug 26	Aug 29
June 1	July 26	Aug 28	Sept 14	Sept 17
July 1	Aug 18	Sept 28	Oct 27	---
July 15	Sept 3	Oct 27	---	---

* Assumes water is not limited and with a 9 – 12" in-row plant spacing. Number of DD 60's for Jumbos based on data from previous two years. DD 60 = cotton degree day model with a 60° F lower developmental limit and no upper limit.

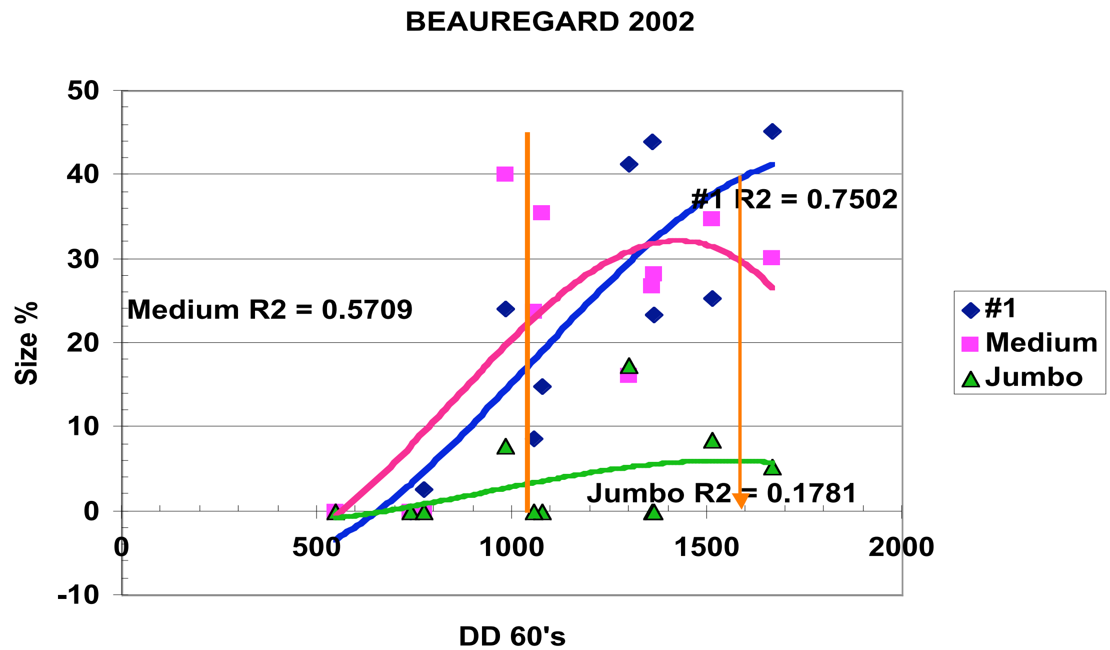

Figure 1. Beauregard size breakdown of the roots depending on accumulated DD 60's for 2002. Vertical lines indicate where maximum seed and #1 root percentages occurred.

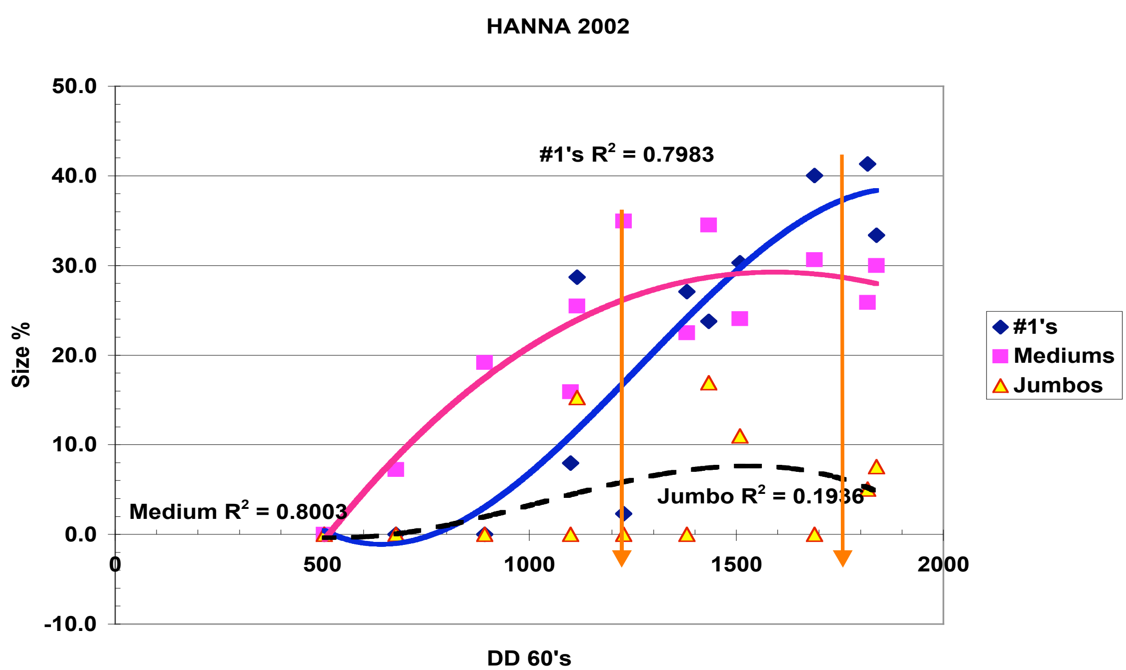

Figure 2. Size breakdown of Hanna sweetpotato roots depending on accumulated DD 60's for 2002. Vertical lines indicate where max seed and #1 percentages occurred.

SWEETPOTATO PEST MONITORING PROJECT
2002 Research Progress Report
Scott Stoddard, Assistant Farm Advisor
Merced and Madera County

INTRODUCTION

A pest monitoring project was undertaken in 2002 with the purpose of identifying certain insect pests in California sweetpotato production and when those pests become a problem. Of particular interest were grubs, wireworms, and aphids. Grubs and wireworms, because they are so erratic and unpredictable; and aphids, because they transmit the feathery mottle virus. The reasoning for the monitoring is that control programs may be developed once positive ID and relative insect pressures were known.

METHODS

Wireworm traps, consisting of oatmeal inside of a burlap sack buried about 8" deep, were placed in three locations in different fields and checked occasionally during the growing season for presence of wireworm grubs. One field was in organic production. Cucumber beetle (Diabrotica) traps were also set out, which utilizes a lure to attract adults. These traps were purchased from Trecé, Inc., and were set out in the same location as yellow sticky traps, for catching aphids, and water traps. The sticky traps and the water traps were used as general traps for catching adult flying insects. Theses traps were checked weekly.

Occasionally throughout the growing season, the fields where the traps were located were checked for insects using a sweepnet.

RESULTS

There is very little to report from this initial preliminary survey. The wireworm traps did not catch anything, nor did the Diabrotica traps. We had difficulty maintaining water levels in the water traps, and few insects that could be considered pests in sweetpotatoes were identified.

The yellow sticky traps, however, did provide some information regarding aphid flights. Results are shown in Figure 1. Bottom line: aphids were present throughout the year, which implies that they could vector sweetpotato feathery mottle virus at any time. Counts were higher early and late in the season, possibly giving hope that some management strategies, such as controlling aphids early in the season, may lessen the severity of virus transmission during the year. What was not determined, however, was the particular species of aphids that were present (green peach aphid probably main spp).

Other results from the monitoring occurred serendipitously rather than as a result of the trapping. A late season population explosion of western yellowstripe armyworm,

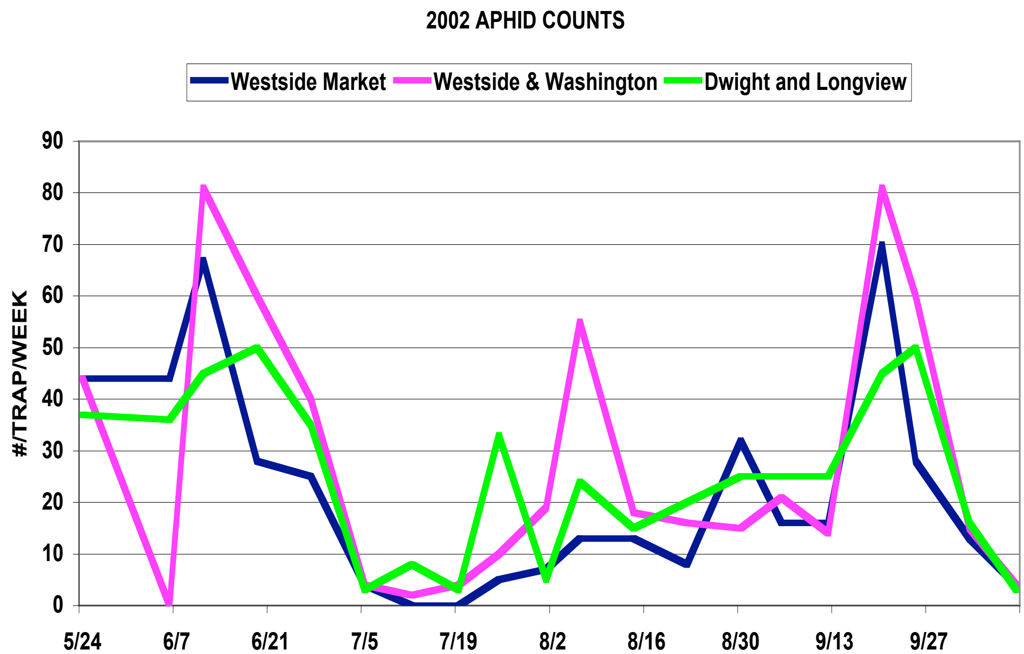

Figure 1. Aphid counts in sweetpotatoes during the 2002 growing season.

Spodoptera praefica, occurred in one of the fields being monitored. Sweepnet results suggest that a threshold could be developed, which would indicate a level above which sprays are warranted. In 2002, the grower sprayed the field about August 20, when the sweepnet results were 16 live larvae per 25 sweeps. Unfortunately, the sweepnet results were not intensive enough before the outbreak to determine the best number at which sprays could be made (Figure 2.).

No wireworms and only one grub were found in 2002. Most likely, wireworms infesting sweetpotatoes are the Western Sugarbeet Wireworm, *Limonius californicus,* however, other species may also be present, including false wireworms. Adults lays their eggs in moist soil in the spring, and hatch about 2 weeks later. Larvae live in the soil 1 to 5 years, with the majority taking 2 years to complete maturation to adults.

The one grub that was found probably was a species of white grub (scarab family), which are the larvae of June beetles. The sample was sent the CDFA for identification, but no keys exist for the larval stage of these types of insects. In North Carolina, the green June beetle is *Cotinis nitida*. The grubs live in the soil from 1 to 4 years, then pupate and emerge as adult beetles in May and June.

No doubt it is the muti-year development period for both of these species that make them so difficult to control as well as make the damage they cause so erratic in the fields. Both wireworms and grubs prefer grass and pasture land for egg laying, so pressure will

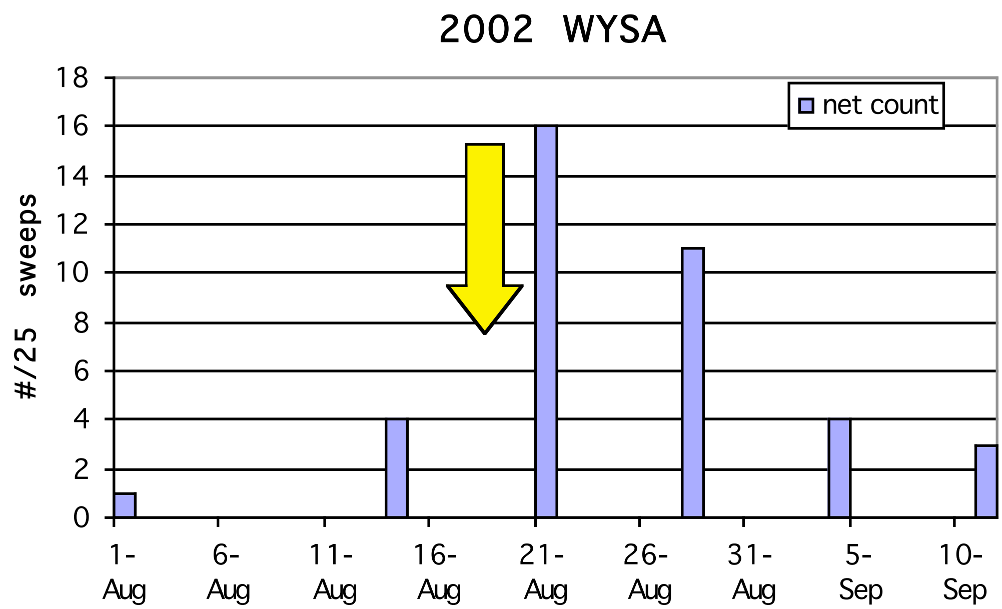

Figure 2. Sweepnet results for Western Yellowstripe Armyworms in sweetpotatoes in 2002. The arrow indicates when the field was sprayed (data are from areas not sprayed).

naturally be greater on land previously in pasture or fallowed. Foliar sprays are of limited value because the adults do not feed on the crop. Fumigation currently is the most effective method of controlling these pests.

The other development this year was the confirmation that the leafminer is not the Vegetable Leafminer, *Liriomyza spp.,* but rather the Morning Glory Leafminer, *Bedellia somnulentella*. This important observation was made by David Haviland, Entomology Farm Advisor from Kern County. The difference is significant, as *Liriomyza* is in the Diptera (fly) order, while *Bedellia* is in the Lepitoptera family (moths and butterflies). Pest management is completely different for these two species. Success, Bt's (Dipel, Crymax, Javelin), and Lannate all will effectively control *Bedellia* if needed.

ACKNOWLEDGEMENTS

Many thanks to Mr. Bob Weimer, Mr. Nathan Mininger, and Mr. Rick Vierra for participating in this project.