# Sweetpotato Research Progress Report 2016

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UC CE UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources Cooperative Extension

**Sweetpotato Collaborators Trial -- 2016**

Scott Stoddard, UCCE Merced County

This year's sweetpotato evaluation was with Quail H Farms, south of Livingston, CA. Soil type was Delhi sand, slightly saline.
Conventional field, fumigated with metam-K prior to planting. Drip irrigated, water quality marginal - high salts & alkalinity.
Good winter and spring rains, timely planting, hot summer. Bellevue did much better in beds than previous years.
Two row plots, machine harvested and sorted by grower crew. Excellent overall yields, especially Covington. NC 122 and 531 not at this location.

| Rep | Var# | Variety Name | Skin Color | Skin Text | Flesh color | Eyes | Lents | Shape | Shape Uniform | Overall App | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Covington | Rose-Cu | 7 | 4 | 7 | 7 | 2,6 | 7 | 7 | excellent set, typical grooving |
| 2 | | | | 7 | | | | | | 8 | smooth skin |
| 1 | 2 | Cal Bx G3 | Rose | 3 | 3 | 5 | 7 | 3,4 | 4 | 5 | RC banding rough skin |
| 2 | | | | 5 | | | | 7 | | 4 | Light orange flesh, YCR |
| 1 | 3 | Burgundy G3 | maroon | 7 | 5 | 9 | 5 | 5,6 | 6 | 7 | smooth skin, good flesh color |
| 2 | | | | 7 | | | 6 | | | | poor set, curled shapes |
| 1 | 4 | Orleans G2 | Cu | 5 | 3 | 7 | 5 | 3,5 | 5 | 5 | some RC, RKN better flesh color than Bx |
| 2 | | | Rose | 7 | | | 6 | | | | |
| 1 | 5 | L-13-84 | orange | 9 | 3.5 | 8 | 9 | 2 | 9 | 9 | Looks like Bellevue. Big yield, good set |
| 2 | | | | | | | | | | | Slightly more eyes, lents, than Bellevue |
| 1 | 6 | L-13-81 | purple | 7 | 4 | 7 | 7 | 3,8 | 5 | 8 | thick purple skin, bright orange flesh |
| 2 | | | | | | | | | | | shape little long and variable |
| 1 | 7 | NC-05-198 | rose CU | 7 | 3 | 9 | 7 | 3 | 7 | 7 | light red, smooth skin, stringy, latex |
| 2 | | | | | | | | | | | dull skin color |
| 1 | 8 | NC08-553 | tan | 7 | 1 | 7 | 7 | 3,4,7 | 7 | 7 | Nice skin color, but it's a bleeder |
| 2 | | | | 6 | | | | | 5 | 6 | long, too much latex |
| 1 | 9 | Bonita | buff | 7 | 1 | 5 | 5 | 3,4 | 5 | 6 | some vins, some pink skin |
| 2 | | | cream | 7 | | | | 8 | 4 | 7 | some purple spots |
| 1 | 10 | Bellevue | orange | 7 | 3 | 7 | 7 | 2,3 | 7 | 7 | a few cracks tapered shape |
| 2 | | | | 9 | | 9 | 9 | | | 9 | |
| 1 | 11 | Diane | red | 7 | 4 | 5 | 5 | 4 | 7 | 7 | very long classic Diane |
| 2 | | | | 8 | | | | 3 | | | faded red, eyes |
| 1 | | NC-04-531 | deep red | 7 | 4 | 9 | 8 | 3,8 | 7 | 7 | Good shape, some pimples. Latex |
| 2 | | | | | | | | | | | moderate yield |
| 1 | | NC-09-122 | dark red | 5 | 3 | 7 | 7 | 2,8 | 7 | 7 | Variable set and size. Bleeder. |
| 2 | | | burgundy | 7 | | | | | | | Too many jumbos, long crazy roots |

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

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

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

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

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

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

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

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

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

## NATIONAL SWEETPOTATO COLLABORATORS SUMMARY OF DATA
## 2016

STATE AND LOCATION REPORTING: Livingston, CA
DATE TRANSPLANTED: 5/18/2016. DATE HARVESTED: 10/14/2016. No. GROWING DAYS: 149
DISTANCE BETEEN ROWS (in): 40. DISTANCE IN ROW (in): 9
PLOT SIZE: NO. OF ROWS: 2 LENGTH (ft): 40 NO. OF REPS: 4
IRRIGATION: drip irrigation. 1.5 to 2 inches per week during summer, total 30".
FERTILIZER: PPI 60 gpa 8-8-8 followed by drip applied 10-0-10. About 175-50-175 N-P2O5-K2O.

| | | | ------- | 40 | lb box/A | ------- | | % | % |
|---|---|---|---|---|---|---|---|---|---|
| | **SELECTION** | **CLASS** | **US #1'S** | **CANNERS** | **JUMBOS** | **MKT YIELD** | **BINS/A** | **US #1'S** | **CULLS** |
| 1 | Covington | yam | 908.1 | 196.3 | 338.1 | 1442.5 | 57.7 | 62.9% | 3.3% |
| 2 | Bx | yam | 541.8 | 132.7 | 312.5 | 987.0 | 39.5 | 55.1% | 17.6% |
| 3 | Burgundy | red | 482.5 | 132.0 | 324.4 | 939.0 | 37.6 | 50.8% | 10.2% |
| 4 | Orleans | yam | 648.9 | 174.0 | 244.3 | 1067.2 | 42.7 | 60.9% | 16.9% |
| 5 | L-13-84 | yam | 869.7 | 169.9 | 307.3 | 1346.8 | 53.9 | 64.5% | 5.5% |
| 6 | L-13-81 | red | 594.0 | 217.9 | 351.8 | 1163.7 | 46.5 | 51.2% | 8.8% |
| 7 | NC05-198 | yam | 756.9 | 152.3 | 248.8 | 1158.0 | 46.3 | 65.4% | 5.4% |
| 8 | NC08-553 | sweet | 545.1 | 185.6 | 121.2 | 852.0 | 34.1 | 64.2% | 16.0% |
| 9 | Bonita | sweet | 617.7 | 210.5 | 243.8 | 1072.0 | 42.9 | 57.7% | 11.5% |
| 10 | Bellevue | yam | 588.7 | 149.1 | 288.2 | 1026.0 | 41.0 | 57.6% | 8.7% |
| 11 | Diane | red | 853.0 | 184.2 | 290.5 | 1327.7 | 53.1 | 64.2% | 8.4% |
| | Average | | 673.3 | 173.1 | 279.2 | 1125.6 | 45.0 | 59.5% | 10.2% |
| | LSD 0.05 | | 128.3 | 41.6 | 105.7 | 191.9 | 7.7 | 6.5% | 5.5% |
| | CV, % | | 13.2 | 16.6 | 26.2 | 11.8 | 11.8 | 7.6 | 37.3 |

| | |
|---|---|
| US #1's | Roots 2 to 3.5 inches in diameter, length 3 to 9 inches, well shaped and free of defects. |
| Canners | Roots 1 to 2 in diameter, 2 to 7 inches in length. |
| Jumbos | Roots that exceed the size requirements of above grades, but are marketable quality. |
| Mkt Yield | Total marketable yield is the sum of the above three categories. |
| bins/A | bins/A are estimated based on market box yield assuming 22 boxes (17.6 Bu) per bin. |
| % US #1's | Weight of US #1's divided by total marketable yield. |
| % Culls | Roots greater than 1" in diameter that are so misshapen or unattractive as to be unmarketable. |
| LSD 0.05 | Least significant difference. Means separated by less than this 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: 2/23/16 Location: Weir Rd, Livingston CA near old dairy

Date Evaluated: 3/29/16 Type of bed: cold bed

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 | Covington | yes | 4 | 3 | 4 | | just trimmed |
| 2 | Cal Beauregard | yes | 5 | 4 | 5 | | most plants 5" |
| 3 | Burgundy G1 | yes | 2 | 2 | 2 | poor | clumpy, sparse |
| 4 | Orleans | yes | 5 | 4 | 4 | | some trimmed |
| 5 | L-13-84 | yes | 3 | 3 | 3 | | purple lvs |
| 6 | L-13-81 | yes | 2 | 2 | 3 | | purple and green lvs |
| 7 | NC-05-198 | no | 5 | 5 | 5 | | all green, lots of plants |
| 8 | NC08-553 | yes | 2 | 2 | 3 | | clumpy, sparse |
| 9 | Bonita | yes | 4 | 4 | 3 | | good, uniform |
| 10 | Bellevue | yes | 4 | 3 | 2 | solid | fairly good emergence this year |
| 11 | Diane | yes | 5 | 5 | 3 | | trimmed before the others |

(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 disked shortly after transplanting.

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

**Sweetpotato ALT NC cultivars -- 2016**

Scott Stoddard, UCCE Merced County

This year's ALT was with Dave Souza of D&S Farms and in two locations because of separate planting dates:
May 27, 2016 with mostly NC varieties at a field off Atwater Jordan east of Bert Crane, and off Sunset Rd
east of Bert Crane with mostly LSU varieties transplanted May 23. 175 clone evaluation trial at this location as well.
One row plots, machine harvested and sorted by grower crew on Oct 26, 2016

| Rep | Var# | Variety Name | Skin Color | Skin Text | Flesh color | Eyes | Lents | Shape | Shape Uniform | Overall App | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | NC 13-604 | Buff | Smooth | White | Few | 7 | 3,8 | 7 | 8 | Mostly med. Latex. Good shape |
| 2 | | | | | | | | | | | 2 totes. bleeds attractive yld good |
| 1 | | NC 04-531 | Red rose | 9 | 3 | 9 | 5 | 2,3 | 6 | 9 | Nice shape,smooth skin, slight veins |
| 2 | | | | | | | | | | | some hair roots attractive, latex |
| 1 | | Bellevue | Orange | 9 | 3 | 9 | 9 | 2 | 9 | 9 | Lots of Jumbos, good production |
| 2 | | | | | | | | | | | |
| 1 | | NC 09-122 | dark red | 7 | 3 | 9 | 6 | 2,3,7 | 3 | 5 | Bleeder lots of latex, nice deep red color |
| 2 | | Bucket yield | 2 #1s | 2.5 med | 7 jumbo | .5 cull | | | | | Some rough lumpy roots hairs small |
| 1 | | NC 13-151 | Dark red | 7 | 3 | 9 | 7 | 3,5 | 6 | 7 | Bleeds latex,smooth, good shape |
| 2 | | bucket yield | 4#1s | 4med | 3 jumbo | 0 cull | | | | | good color, size dist. Bleeder |
| 1 | | NC 13-150 G2 | Red | 5 | 3 | 6 | 6 | 3,1,6 | 3 | 5 | Grooves mostly mediums. |
| 2 | | bucket yield | 3 | 4 | 5 | 0.5 | | | | | some eyes,lents lumps |
| 1 | | NC05-198 | rose | 7 | 3 | 9 | 7 | 2,6,7 | 6 | 6 | Bx color, some air cracking, |
| 2 | | bucket | 2 | 2.5 | 1.5 | 0.5 | | | | | not as pretty as cov or 52, dull skin |
| 1 | | NC 13-410 | red | 7 | 3.5 | 7 | 8 | 2,3 | 8 | 7 | Latex, variable set and shape not a bleeder |
| 2 | | bucket | 3 | 4 | 4.5 | 0.5 | | 3 | | | looks nice in tote |
| 1 | | L-13-84 | copper | 9 | 3.5 | 8 | 9 | 2 | 9 | 9 | looks like bellevue big yield |
| 2 | | bucket | *5* | 4 | 12 | 1 | | | | | Lots of jumbos, good set |

| 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 | | | **Culls = main reason for culls** |
| 8 = asymmetric | | | |

**Sweetpotato ALT 2016**
Sunset and Bert Crane Rds location

| Variety | buckets per plot #1 | Med | Jumbo | CULLS | root description (skin/flesh color, shape, smoothness) | keep/drop |
|---|---|---|---|---|---|---|
| BX-G1 | 2 | 1 | 8 | 1 | rose Cu. good set. Smove skin saved two totes for seed | keep |
| Orleans | 3 | 3 | 17 | 1.5 | copper. Good set excellent production | keep |
| | | | | | | |
| L-11-119 | | | | | rose Cu almost red. Mostly smooth,god set. Some lents | keep |
| | | | | | | |
| L-13-111 | 0.5 | 0.5 | 1 | 0 | buff/orange. Erratic set &shape | drop |
| L-13-160 | 4 | 2 | 5 | 3 | red/orange long variable set some lumps | drop |
| L-13-193 | 1 | 1 | 2.5 | 0.5 | Cu skin, Orange flesh. Smooth good set | Drop |
| L-13-3 | 5 | 4 | 4 | 0.5 | dull burgundy too many hair roots going round | Drop |
| L-13-84 | 7 | 4 | 8 | 2.5 | Looks like Bellevue. Big yield | Keep |
| L-13-93 | 1.5 | 1 | 5 | 0 | red/orange very large, lots irregulars | drop |
| | | | | | | |
| L-14-11 | 2 | 0.5 | 7 | | smooth red, nice shape but variable size scratches easily | keep |
| L-14-123 | 0.5 | 1.5 | 3 | 1 | long purple/orange. Variable shape | drop |
| L-14-14 | 2.5 | 1 | 4 | 1 | copper/orange long lents | drop |
| L-14-144 | 1 | 1 | 1 | 2 | Dull red/white flesh long, lumps, poor shape | drop |
| L-14-145 | 3 | 2 | 10 | 0 | purple/deep orange double skin smooth good yield | keep |
| L-14-15P | 3.5 | 1.5 | 7 | 1 | purple purple rough skin | keep |
| | | | | | | |
| L-14-27 | 2.5 | 3 | 3 | 0.5 | purple/orange nice color but small skinny low yield | drop |
| L-14-31 | 3 | 3 | 5 | 0 | purple/orange, good set. slightly round asymetric | Keep |
| L-14-41R | 1 | 1 | 4 | 0 | ruff shape, orange flesh, lents permanent | drop |
| L-14-56 | 3.5 | 2 | 12 | 4 | Purple/orange round eliptical avoid air cracks | drop |
| L-14-69 | 4 | 4 | 1 | 1 | Long nice red, smooth skin good set. Air cracks | drop |
| | | | | | | |
| L-15-22 | 0.5 | 0.5 | 1 | 0 | short plot dull orange/orange double skin | drop |
| L-15-39 | 0.5 | 0.5 | 4 | 0.5 | purple/white | keep |
| L-15-55 | 0.5 | 1 | 0 | 1 | purple/orange. letex. Small. Rotting | drop |
| L-15-59 | 1 | 0 | 2 | 0 | pinkish rose/white, round short plot | Drop |
| L-15-73 | 0.5 | 1.5 | 1.5 | 0 | Pinkish Buff/white lenticles rough | keep |
| | | | | | | |
| | | | | | | |
| NC-10-104 | 5.5 | 2 | 7 | 1 | purple/orange smooth ,variable shape, large, latex | keep |
| NC-12-029 | 7 | 3 | 5 | 3 | huge yields, but RKN. Long variable, red/orange | drop |
| NC-12-145 | 4 | 2 | 3 | 1 | purple/orange some crazy shapes, double skin | keep |
| NC-12-745 | | | | | Nice Red | keep |
| NC-12-910 | 5 | 4 | 1 | 0.5 | Red/orange. Good set. Uniform shape | Keep |
| NC-13-150 | | | | | Too grooved dull red | drop |
| NC-13-151 | | | | | Purple/Orange | keep |
| NC-13-410 | | | | | Too many purples | Drop |
| NC-13-604 | | | | | Nice sweet | keep |

**SCORE SHEET FOR EVALUATION OF SWEETPOTATO SPROUT PRODUCTION - ALT**

Date bedded: 2/23/16 Location: Cressey Ranch near Atwater

Date Evaluated: 3/29/16 Type of bed: cold bed

Evaluated by: S. Stoddard

| | Selection | Roots presprouted yes/no | Plant Production 1-5 (1) | Uniformity of Emergence 1-5 (2) | Earliness 1-3 (3) | Root Conditions 1-5 (4) | Remarks (5) |
|---|---|---|---|---|---|---|---|
| 1 | L-14-145 | Yes | 3 | 4 | 3 | | spade leaf with crinkle clumpy all green |
| 2 | L-14-15p | Yes | 4 | 4 | 3 | | 3-lobe leaf,tall all green |
| 3 | NC10-104 | Yes | 3 | 4 | 3 | | green, yellow-green new growth vining horizontal |
| 4 | NC12-029 | Yes | 2 | 3 | 1 | | small sparse |
| 5 | L-14-31 | Yes | 4 | 4 | 3 | | thick stems spade lleaf. Slight purple new growth |
| 6 | L-13-160 | Yes | 4 | 3 | 3 | | crinkle in leaves all green |
| 7 | L-11-119 | Yes | 4 | 5 | 2 | | green/purple new growth uniform |
| 8 | L-14-56 | Yes | 2 | 4 | 2 | | green w/ purple new growth low production ,short |
| 9 | L-13-3 | Yes | 1 | 2 | 1 | | poor production purple new growth |
| 10 | NC12-910 | Yes | 5 | 5 | 3 | | all green tall very good production |
| 11 | L-14-69 | Yes | 2 | 1 | 2 | | dk green/ purple new growth clumpy |
| 12 | L-14-27 | Yes | 4 | 5 | 3 | | mostly green very uniform |
| 13 | NC12-745 | Yes | 3 | 4 | 2 | | all green, horizontal runners, low growing |
| | 175 1 | Yes | 2 | 1 | 1 | | poor |
| | 175 4 | Yes | 1 | 1 | 1 | | poor |
| | 175-6 | yes | 1 | 1 | 1 | | poor |
| | 175-DJ4 | yes | 2 | 1 | 1 | | poor but better than others |
| | DJ2 | yes | 1 | 1 | 1 | | very poor |

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.

**L-14-15P at AV Thomas 2016**
Scott Stoddard, UCCE Merced

Location 2nd Ave, off Van Clief in Stevenson
Transplant 1-Jun-16
Plot size 1 bed demonstration strip, varying length
Harvest 10/15/16

**L-14-15p and NC12-029 yield trial with A.V. Thomas, 2016.**

| | 40 lb box/A | | | adjusted TMY | | No. 1's | Culls |
|---|---|---|---|---|---|---|---|
| **Variety** | **No. 1's** | **Meds** | **Jumbos** | **Boxes** | **bins/A** | **#1%** | **cull%** |
| **14-15p purple/purple** | 680.1 | 103.1 | 257.9 | 1041.2 | 41.6 | 65.3% | 1.1% |
| **NC12-029 red skin** | 920.7 | 143.5 | 53.0 | 1117.2 | 44.7 | 82.4% | 3.1% |

Yields based on harvested bins and may not include total root production. Cull % may be incorrectly low
Yields adjusted to 22 boxes per 1000 lb bin.

Both of these lines were dropped. L-14-15P because the interior was not consistently purple, but rather marbled with white, and NC12-029 for having too much end to end color variation (red to copper).

**Burgundy (LSU 175) Hill Selection Trial.**

Since its release in 2013, Burgundy has yielded poorly due to poor root set. Typical root counts are about 4 per hill. In 2014 several above average hill selections were made from commercial fields to see if root set could be improved over the clone currently available at UC Davis. With help from Dave Souza, runner cuttings were made using these selections and planted into replicated small plots. Results are shown in Table 1 and Figure 1. Hill counts below 5 are unacceptable. The top five hills were saved for further evaluation in 2016.

Yield results for 2016 are shown in Table 2 and Figure 2. Selections 2, DJ2, DJ4, 1, and 6 were compared to the current LSU clone. While the LSU clone had significantly higher TMY, this was a result of a higher number of jumbos. #1's and mediums were the similar, indicating that root number was not different. The #1 % was low, only 36.7%

Making hill selections to improve root set did not work in this trial.

**Table 1. Burgundy hill selection results, 2015.**

| hill selection | # roots per hill | #1 yield boxes/A | mediums boxes/A |
|---|---|---|---|
| 4 | 5.2 | 350 | 346 |
| DJ2 | 5.2 | 360 | 253 |
| FPS 1 | 5.1 | 323 | 248 |
| DJ4 | 5.1 | 320 | 328 |
| 6 | 5.0 | 376 | 316 |
| 10 | 4.8 | 314 | 285 |
| DJ6 | 4.8 | 290 | 334 |
| 8 | 4.8 | 484 | 339 |
| DJ3 | 4.5 | 293 | 218 |
| DJ5 | 4.4 | 264 | 186 |
| 5 | 4.4 | 363 | 244 |
| 9 | 4.3 | 375 | 207 |
| DJ1 | 4.0 | 323 | 170 |
| 7 | 4.0 | 372 | 227 |
| 3 | 3.9 | 151 | 76 |
| 2 | 3.4 | 246 | 242 |
| **LSD 0.05** | **NS** | **NS** | **153** |

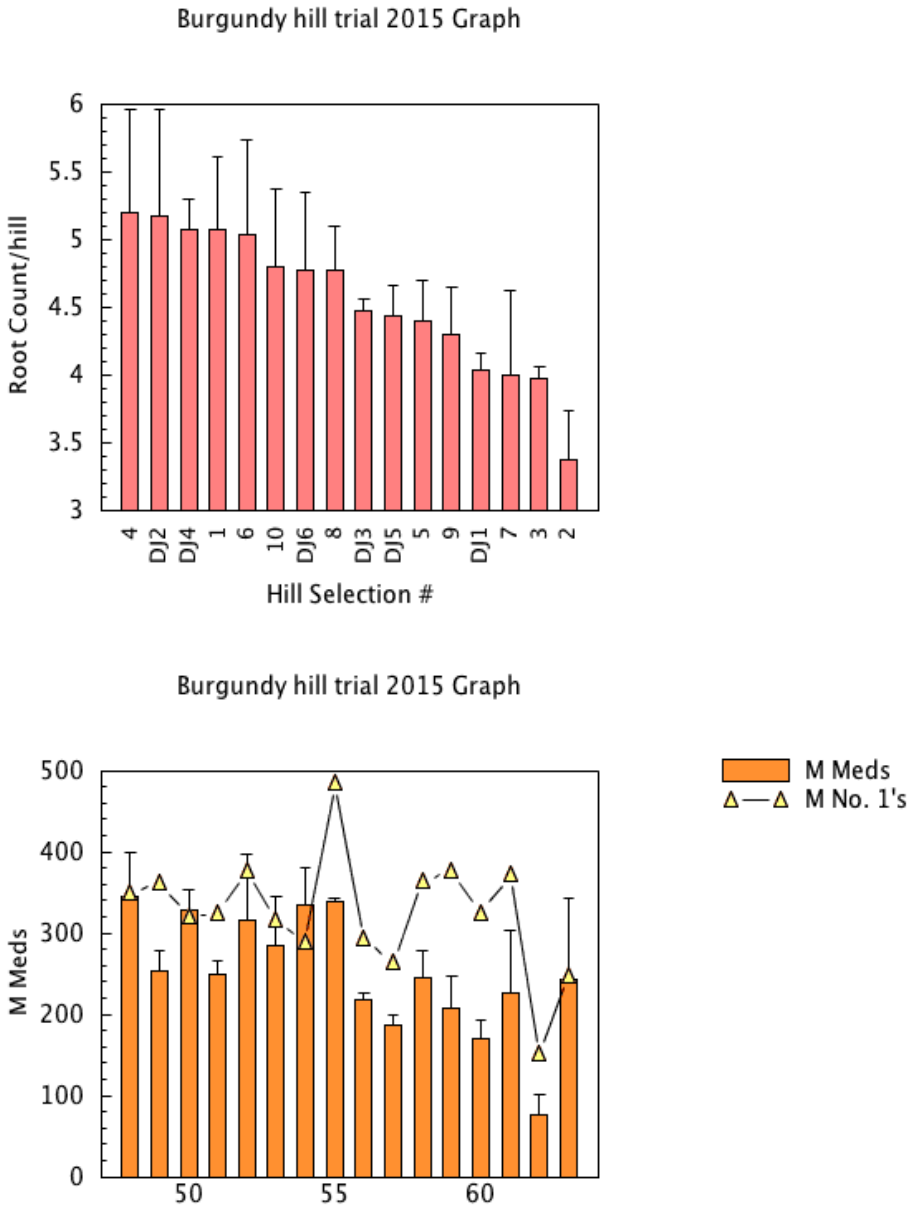


**Figure 1. Burgundy hill selection results, 2015.**

**Table 2. L-04-175 hill selection trial, 2016.**

| clone | TMY lbs/A | 40 lb box/A No. 1's | Meds | Jumbos | adjusted TMY box/A | bins/A | No. 1's #1% | Culls cull% |
|---|---|---|---|---|---|---|---|---|
| 175-1 | 58958 | 530 | 305 | 462 | 1297 | 51.9 | 39.8% | 2.1% |
| 175-4 | 49015 | 365 | 236 | 478 | 1078 | 43.1 | 33.9% | 10.8% |
| 175-6 | 48899 | 380 | 263 | 433 | 1076 | 43.0 | 35.4% | 3.5% |
| DJ2 | 44719 | 413 | 278 | 293 | 984 | 39.4 | 41.6% | 5.5% |
| DJ4 | 44206 | 334 | 289 | 349 | 973 | 38.9 | 34.0% | 1.8% |
| LSU | 71891 | 559 | 258 | 765 | 1582 | 63.3 | 35.4% | 3.7% |
| Average | 52948 | 430 | 271 | 463 | 1165 | 46.6 | 36.7% | 4.6% |
| LSD 0.05 | 14585 | NS | NS | 202 | 321 | 12.8 | NS | 5.9 |
| CV, % | 15.1 | 26.3 | 27.5 | 24.1 | 15.1 | 15.1 | 16.5 | 69.9 |

| | |
|---|---|
| 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 (17.6 Bu) per bin. |
| % US #1's | Weight of US #1's divided by total marketable yield. |
| % Culls | Roots greater than 1" in diameter that are so misshapen or unattractive as to be unmarketable. |
| LSD 0.05 | Least significant difference. Means separated by less than this amount are not significantly different (ns). |
| CV, % | Coefficient of variation, a measure of variability in the experiment. |

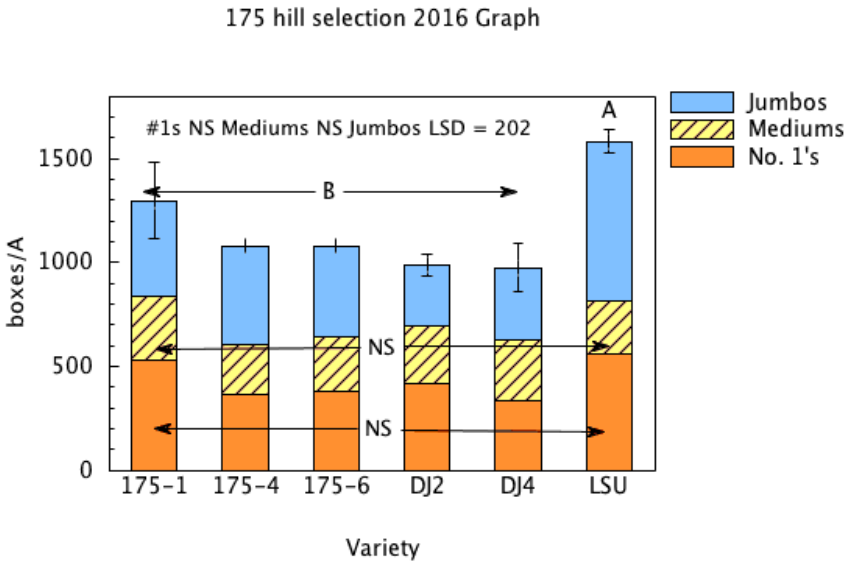


**Figure 2. Burgundy hill selection yield results, 2016.**

**Nimitz shank trial on sweetpotatoes 2016**

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This was a research trial conducted in a commercial sweetpotato field to evaluate two different rates (3.5 and 5 pints per acre) and methods of application (shank and broadcast incorporated) of Nimitz nematicide (fluensulfone) on yield and root quality. Treatments were compared to a standard metam –K application (shanked 41 gpa) and untreated control (UTC).

Rational. Sweetpotato production in CA is concentrated in Merced and Stanislaus Counties on sandy and loamy sand soils. Nematodes, especially root knot nematodes (predominantly *Meloidogyne incognita*) are perennial problems in any production field, decreasing both yield and quality of the harvested roots. Standard control methods are fumigation with Telone (1,3-D) at 9 – 12 gpa, or metam products (metam –Na and metam-K are both used). Even with resistant varieties, yields are significant improved when nematodes are controlled with these products. Mocap (ethroprop) is registered on sweetpotatoes in CA but rarely used because of worker safety concerns and marginal efficacy. Due to high levels of regulatory scrutiny of all fumigants, their use requires extensive "fumigation management plans", and are restricted by use caps (for Telone), restrictions on when they can be applied, how much can be applied in a 24-hr period, and buffer zones near homes and other structures. Nimitz has shown good efficacy on controlling root knot nematodes in sweetpotato production in small plot tests in southern CA with Antoon Ploeg (UC Riverside Extension Nematologist), and has a category 3 (Caution) rating on the label, and therefore offers growers an excellent alternative to fumigation. Dr. Ploeg's work was done with simulated water incorporation, however. Most commercial sweetpotato fields do not use sprinklers at any time, and the crop is exclusively irrigated with drip. The challenge is to determine the optimal rate and method of application for the CA industry.

Methods. Nemitz shank applications were made on April 21, 2016, to a field site that had not received any fumigation the previous year. Shanked applications of Nimitz were made by Crop Production Services (CPS) using their metam application rig to a clean cultivated field: 21 ft tool bar with shanks on 9" spacing and emitters at 3", 6", and 9" deep and flow rates controlled by a Raven unit to apply volumes of 41 gpa. Metam was first drained from the tanks, then water and the 3.5 or 5 pints of Nimitz per acre equivalent were added. Shanked application plots were 125 feet long. Broadcast applications were made by hand using a $CO_2$ backpack

sprayer and incorporated to a depth of about 2-3". Hand applied plots were 30 feet long, and the product was applied in water at 75 gpa equivalent. Treatment design was a randomized complete block with 3 reps. The treatment area received a light rain (0.1") on April 22.

This was the last field fumigated for the grower. Unfortunately, it was not transplanted until June 10, far later than expected. 'Diane' cultivar was transplanted using standard equipment on a 9" spacing and drip irrigated thruout the season. Diane is a common variety grown in CA but is moderately susceptible to nematodes. Each plot had 3 beds, or 6 rows, of sweetpotatoes; all data are from the center bed of each plot. Nematode samples were taken July 19 and Sept 28 by taking 10 cores 12" deep from the center bed of each plot and were sent to Dr. Antoon Ploeg at UCR for RKN counts. Plots were dug using grower harvesting equipment and all roots were sorted by his crew into standard sizes. Root weights were measured using bin scales. Treatment list and other plot details are listed in Table 1.

Results. Weed growth in the plot area was evaluated May 9 by counting the number of emerged weeds in each plot. The metam plots had significantly reduced weed numbers as compared to the other treatments. There was no difference between any of the Nimitz treatments and the untreated control (Table 2).

Nimitz and metam reduced the RKN counts compared to the untreated control on both sample dates, however due to very high variability, these differences were not significant (Figure 1). September counts were much higher as would be expected. The number of culled roots was significantly greater in the UTC plot as compared to the other treatments (Table 3).

Yields are shown in Table 3 and Figure 2. No. 1's, mediums, and total marketable yield was significantly increased by all treatments except the 3.5 pint/A broadcast application of Nimitz. No. 1 yields increased 100 – 200 boxes, and total yields were increased 200 – 400 boxes per acre over the untreated plots. Best yields were with metam and Nimtz shanked at 5 pints/A.

A second trial was conducted in a different location with very high RKN pressure to evaluate shank versus drip applied Nimitz. Treatments were applied by the grower were on the edge of the field and were not replicated, and therefore no statistical analysis could be performed. The results showed a similar trend as the first trial, with an average total yield increase of about 200 boxes per acre, and yields from Nimitz similar as metam (Table 4). Additional data from trials in southern CA (A. Ploeg, 2015 & 2016) on RKN infested soil have also shown significant yield increases with Nimitz treated soil.

The significant improvement in yield and reduction in culled roots by the Nimitz treatments is impressive when considering how late the crop was transplanted relative to treatment application. A simple economic analysis shows the benefits from Nimitz far exceed the cost of

doing nothing: 100 boxes/A No. 1's at $14 per box ($20 box - $6 packing charge) = $1400/A increase revenue. Nimitz pricing is not set, but assuming $75 per pint, the cost of application is around $400 per acre. Growers need be aware that wireworms and grubs will not be controlled by Nimitz as with metam and Telone, and therefore insecticides likely will be needed at additional expense.

**Table 1. Nimitz shank trial on sweetpotatoes 2016**

| | |
|---|---|
| PI: | Scott Stoddard, UCCE Merced |
| Objective: | Evaluate efficacy of shanked applications of Nimitz nematicide on sweetpotatoes |
| Location: | SE corner of Atwater Jordan and Robin Roads<br>37 19'51.88" N 120 44'16.49" W |
| Soil: | Delhi Loamy Sand |
| Cooperators: | David Betchhart, Victors Best Produce |
| | Rodney Ratzlaff, CPS |
| | Issa Qandah, Adama |
| Variety: | Diane |
| Transplant: | 10-Jun-16 |
| Irrigation: | drip |
| Harvest: | 24-Oct-16 |
| Application: | 21-Apr-16 |
| Treatments: | 1 UTC<br>2 CPS shank Nimitz 3.5 pints/A<br>3 CPS shank Nimitz 5.0 pints/A<br>4 Nimitz broadcast 3.5 pints/A<br>5 Nimitz broadcast 5 pints/A<br>6 Metam-K 41 gpa CPS shank |
| Plot design: | RCB with 3 reps<br>CPS shank treatments were 21 ft x 125 ft<br>treatments #4 & #5 were 30 ft x 20 ft |
| | CPS treatments applied with standard metam rig<br>41 gpa using Raven unit to control flow<br>shanks on 9" centers with 3 emitters per shank<br>Broadcast applications made with backpack sprayer, hand incorporate to 3" |

**Table 2. Root knot nematode (RKN) counts as affected by Nimitz treatments.**

| | treatment | 7/19/16 # j2's/100g | 9/28/16 # j2's/100g | RKN sq rt transformed 19-Jul | 28-Sep | 9-May # weeds |
|---|---|---|---|---|---|---|
| 1 | UTC | 153.0 | 650.0 | 12.2 | 23.8 | 24.0 |
| 2 | CPS shank Nimitz 3.5 pints/A | 41.7 | 206.7 | 5.9 | 14.3 | 14.3 |
| 3 | CPS shank Nimitz 5.0 pints/A | 41.0 | 670.0 | 5.9 | 25.6 | 26.3 |
| 4 | Nimitz broadcast 3.5 pints/A | 112.0 | 233.3 | 9.3 | 15.1 | 22.7 |
| 5 | Nimitz broadcast 5 pints/A | 99.0 | 152.7 | 7.9 | 11.1 | 20.3 |
| 6 | Metam-K 41 gpa CPS shank | 0.7 | 360.0 | 1.0 | 18.8 | 4.3 |
| | **Average** | **74.6** | **378.8** | **7.0** | **18.1** | **18.7** |
| | **LSD 0.05** | **ns** | **ns** | **ns** | **ns** | 11.5 |
| | **CV %** | **101** | **74.3** | **63.4** | **33.1** | 33.5 |

RKN counts include adults and hatched juveniles from 100g soil extracted Baerman funnel.
LSD 0.05 = least significant difference at 95% probability level. NS = not significant.
CV % = coefficient of variation
# weeds = weed count per 250 sq ft taken before transplanting or cultivation (9-May)

**Table 3. 'Diane' sweetpotato yield as affected by nematode treatment, Merced County 2016**

| | Treatment | TMY lbs/A | 40 lb box/A No. 1's | Meds | Jumbos | adjusted TMY box/A | bins/A | No. 1's #1% | Culls cull% |
|---|---|---|---|---|---|---|---|---|---|
| 1 | UTC | 28563 | 368 | 132 | 150 | 650 | 26.0 | 56.8% | 18.6% |
| 2 | CPS shank Nimitz 3.5 pints/A | 39148 | 481 | 199 | 181 | 861 | 34.4 | 55.8% | 12.5% |
| 3 | CPS shank Nimitz 5.0 pints/A | 42360 | 555 | 194 | 183 | 932 | 37.3 | 59.6% | 11.6% |
| 4 | Nimitz broadcast 3.5 pints/A | 34458 | 418 | 159 | 181 | 758 | 30.3 | 55.2% | 13.8% |
| 5 | Nimitz broadcast 5 pints/A | 38576 | 510 | 156 | 183 | 849 | 33.9 | 60.1% | 15.0% |
| 6 | Metam-K 41 gpa CPS shank | 47280 | 613 | 205 | 221 | 1040 | 41.6 | 58.9% | 7.6% |
| | **Average** | 38397 | 490.3 | 173.2 | 181.1 | 844.7 | 33.8 | 57.7% | 13.2% |
| | **LSD 0.05** | 6382 | 83.1 | 37.4 | ns | 140.6 | 5.6 | ns | 5 |
| | **CV %** | 9.1 | 9.3 | 11.9 | 21.1 | 9.1 | 9.1 | 4.3 | 20.4 |

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 (17.6 Bu) per bin.
% US #1's — Weight of US #1's divided by total marketable yield.
% Culls — Roots greater than 1" in diameter that are so misshapen or unattractive as to be unmarketable.
LSD 0.05 — Least significant difference. Means separated by less than this amount are not significantly different (ns).
CV, % — Coefficient of variation, a measure of variability in the experiment.

**Table 4. Machado Ranch location yield results.**

| | TMY | 40 lb box/A | | | adjusted TMY | | No. 1's | Culls |
|---|---|---|---|---|---|---|---|---|
| treatment | lbs/A | No. 1's | Meds | Jumbos | box/A | bins/A | #1% | cull% |
| UTC | 13849.9 | 186.8 | 153.3 | 6.2 | 304.7 | 12.2 | 53.7% | 25.5% |
| Nimitz 3.5 pts | 22610.7 | 363.5 | 181.1 | 20.7 | 497.4 | 19.9 | 63.4% | 10.1% |
| Nimitz 5.0 pts | 22674.9 | 365.6 | 193.9 | 7.4 | 498.8 | 20.0 | 64.4% | 12.8% |
| Metam K | 21381.6 | 337.3 | 181.8 | 15.4 | 470.4 | 18.8 | 63.2% | 22.1% |

Average yield from two plots per treatment.

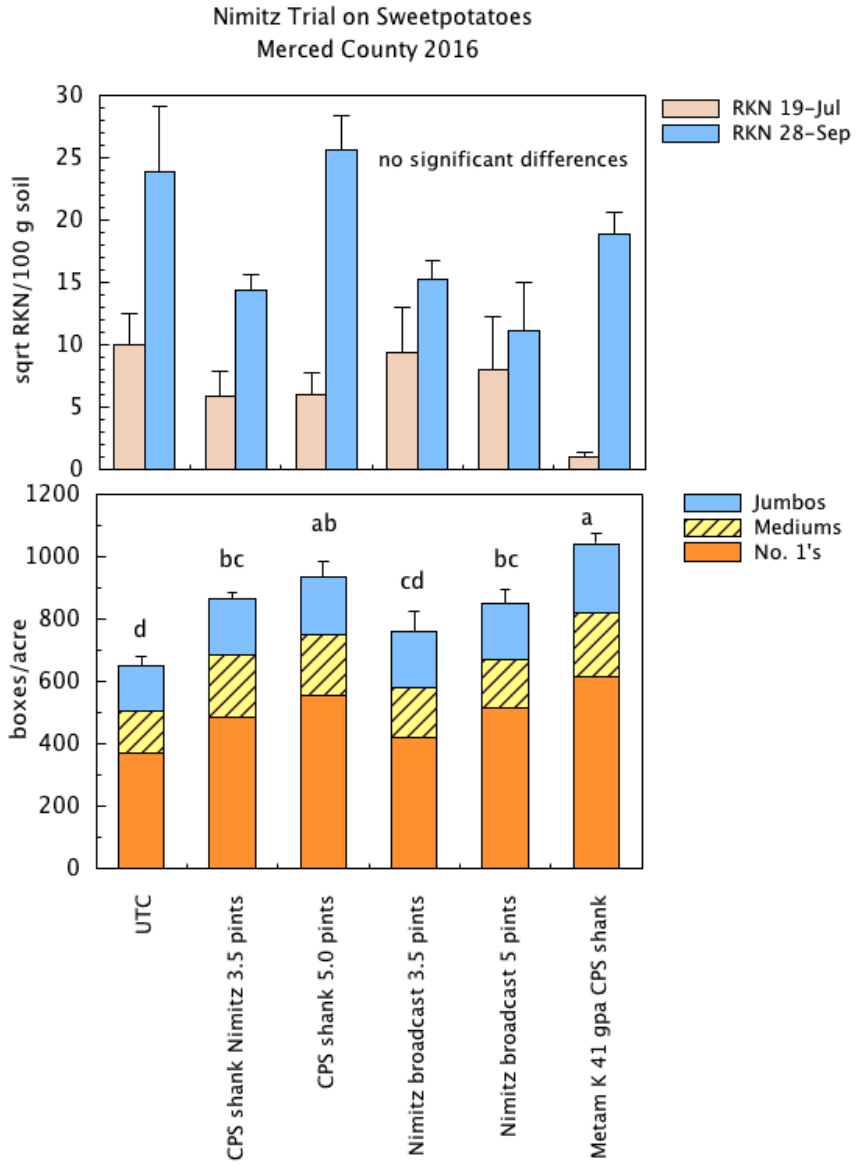


**Figure 1 (top) and 2 (bottom). Nematode counts by sample date and root yield as affected by treatment.**

**Suppress and Dual Magnum Herbicide efficacy trials in sweetpotatoes**
Scott Stoddard, UCCE Merced County

Efficacy trials to evaluate Suppress herbicide and Dual Magnum in commercial sweetpotato fields. Suppress as an OMRI approved herbicide that is a mix of caprylic and capric acids and is a non-selective, contact herbicide that interferes with plant cell membranes, causing leakage and rapid desiccation. It has shown good efficacy in trials in Southern and Coastal California. Dual Magnum (metolachlor) has a special local needs label (24-C) in Mississippi and Louisiana and is an integral component of their weed management system, however, it is not registered in sweetpotatoes in California and previous trial work has shown marginal efficacy and possible plant injury. Dual Magnum was tested in 2016 in 3 locations after transplanting without incorporation or mechanical incorporation immediately after application. Tables 1 and 2 give plot details.

**Table 1. Suppress Herbicide evaluation on sweetpotatoes**

| | |
|---|---|
| Objective: | Evaluate different concentrations of Suppress herbicide on drip irrigated organic sweetpotatoes |
| Cooperator: | A.V. Thomas |
| Location: | Longview and Washington Rds., near grapes |
| Variety: | Bellevue |
| Transplant: | Mid May, 2016 |
| Applications | June 1 and June 21, 2016 |
| Ratings | June 1 and June 21, 2016 |
| Treatments: | 1. UTC weedy<br>2. hand weeded<br>3. Suppress at 3% in 40 gpa<br>4. Suppress at 6% in 40 gpa<br>5. Suppress at 9% in 40 gpa<br>6. Suppress at 6% w/Latron B 1956 @ 0.25% |
| | directed spray to middle of bed<br>used 1 gal/4 plots<br>RCBD, plots 40 feet long, 1 bed wide<br>June 1: 102 F 8% RH, June 21 91 F, 20% RH |
| | Weeds: puslane, puncture vine, barnyard grass, pigweed |
| data: | weed pressure, 0 - 5 sale<br>pictures<br>plots hand weeded after June 21<br>no harvest data |

**Table 2. Dual Magnum Herbicide evaluation on sweetpotatoes**

| | |
|---|---|
| Objective: | Evaluate different rates of Dual Magnum (S-metolachlor) on sweetpotato root set |
| Cooperator: | Adam Shaner, Quail H Farms |
| Location: | North of Hwy 140 and West of Weir |
| Variety: | Diane |
| Transplant: | mid May |
| Applications | June 16, 2016 |
| Ratings | No weeds or crop phyto at any time after application |
| Treatments: | 1. 0.67 pints/A mechanically incorporated<br>2. 1.0 pints/A inc<br>3. 1.3 pints/A inc<br>4. UTC (cultivated)<br>5. 0.67 pints/A not incorporated<br>6. 1.0 pints/A not incorporated |
| | directed spray to middle of bed (1/2 the area)<br>rates adjusted accordingly (1/2 broadcast rate)<br>immediately incorporated with lillistons<br>RCBD with 4 reps, plots 50 ft long, 1 bed wide |
| | 2015 heavy nutsedge field, but applications made to clean cultivated field. |
| | Two test locations at either end of field, but south end only had treatments #1, #2, and #3 |
| data: | no weed data: no weed emergence in any plot<br>harvest plots on Oct 31, 2016<br>partial weights<br>root count data, north test location only |

**RESULTS**

Suppress Herbicide. Suppress herbicide was applied as a directed spray by hand to the center of the beds to weeds that were 2 – 6" in height. Applications were made with a $CO_2$ backpack sprayer using the equivalent of 40 gallons of water with TeeJet 8004 brass nozzles. The dominant weeds at this location was Barnyardgrass and puncture vine. Weed kill occurred very quickly with results obvious in less than 10 minutes. Weed control ratings at 3 weeks after treatment are shown in Table 3. Weed growth was significantly reduced at all three concentrations (3%, 6%, 9%), but there was no difference between the 6% and 9% treatments. The addition of Latron B 1956 reduced efficacy as compared to not using this surfactant. No

crop phyto was observed, and yields were not measured. Overall this herbicide was effective at this site location, and shows promise for organic sweetpotato production. Additional work at rates below 6% are planned for 2017.

**Table 3. Suppress herbicide evaluation at 3 weeks post application on June 21, 2016.**

| Plot # | treatment | 0 - 5 rating (1) BL (2) | Grass | Crop Phyto (3) |
|---|---|---|---|---|
| 1 | UTC - weedy | 2.75 | 3.0 | 0 |
| 2 | Hand weed | 0.25 | 0.5 | 0 |
| 3 | Suppress @ 3% in 30 gpa no adjuvant | 1.75 | 1.8 | 0 |
| 4 | Suppress @ 6% in 30 gpa no adjuvant | 1.50 | 1.0 | 0 |
| 5 | Suppress @ 9% in 30 gpa no adjuvant | 1.50 | 1.0 | 0 |
| 6 | Suppress @ 6% + 0.25% Latron B | 2.25 | 1.5 | 0 |
| | Average | 1.7 | 1.5 | 0.0 |
| | LSD 0.05 | 1.1 | 1.3 | --- |
| | CV, % | 42.9 | 60.3 | --- |

1) Severity of crop injury (phyto) or weed pressure on a 0 - 5 scale:
0 = no weeds/no phyto, 1 = < 10% weeds/phyto, 2 < 25%, 3 < 50%, 4 < 75%, 5 > 90% weeds/necrosis.
2) Main broadleaf (BL) and grassy weeds were barnyard grass, redroot pigweed, puncture vine, and purslane.
3) % of plants with crop injury, regardless of severity.
LSD Least significant difference at the 95% confidence level. Means less than this amount are not significantly different.
CV coefficient of variation.
--- not determined

UTC weedy on June 21

Treatment #4 15 minutes after application

Treatment #4 three weeks post on June 21

Dual Magnum. Dual Magnum (metolachlor) was applied at 1 pt/A 20 days post plant as part of the USDA IR-4 fluridone trial as a comparison treatment – results showed marginal weed control and slight crop phyto. Full results are shown in the fluridone report.

Dual was also applied post plant at two other test locations as described in Table 2 above. Dual magnum was applied by hand as a directed spray in a commercial sweetpotato field that had just been cultivated. Product was applied down the center of the bed to minimize contact with foliage, with and without incorporation. The field was chosen because the previous year it had heavy nutsedge pressure, however, there very few weeds of any type in 2016 and no weed evaluations were made as a result (the grower had used metam in the spring). There was no obvious crop injury in any of the plots, and yield and root counts were only measured at the north test location. Number of harvestable roots were counted per plot, then adjusted to a per acre basis. Results are shown in Table 4. All Dual Magnum incorporated treatments (1 – 3) had significantly fewer roots/A than did the other treatments. Assuming a 12" down the row spacing (13,000 plants per acre), the average number of roots per plant where Dual was incorporated was 4.8 roots/plant; with the UTC and unincorporated treatments, 6.4 roots/plant. There appeared to be little impact on total marketable yield regardless of treatment, however, yields were estimated from a subset of plots, and therefore no statistical analysis could be made on yield data

**Table 4. Root counts and estimated yield as affected by the Dual Magnum treatments.**

| | # roots/A | 40 lb box/A | | | adjusted TMY | | No. 1's | Culls |
|---|---|---|---|---|---|---|---|---|
| treatment | x 1000 | No. 1's | Meds | Jumbos | Boxes | bins/A | #1% | cull% |
| 1. 0.67 pints/A inc | 62.9 | 825.9 | 216.1 | 20.4 | 1062.5 | 42.5 | 77.5% | --- |
| 2. 1.0 pints/A inc | 61.5 | 1010.9 | 219.3 | 111.4 | 1341.6 | 53.7 | 75.5% | --- |
| 3. 1.3 pints/A inc | 63.2 | 985.9 | 224.2 | 117.4 | 1327.5 | 53.1 | 74.4% | --- |
| 4. UTC (cultivated) | 82.6 | 751.6 | 235.4 | 23.5 | 1010.5 | 40.4 | 74.4% | --- |
| 5. 0.67 pints/A not incorporated | 86.1 | 867.5 | 273.3 | 28.4 | 1169.3 | 46.8 | 74.2% | --- |
| 6. 1.0 pints/A not incorporated | 80.7 | 972.9 | 288.7 | 47.4 | 1309.1 | 52.4 | 74.3% | --- |
| Average | 80.7 | 972.9 | 288.7 | 47.4 | 1309.1 | 52.4 | 74.3% | --- |
| LSD 0.05 | 11.5 | --- | --- | --- | --- | --- | --- | --- |
| CV, % | 10.5 | --- | --- | --- | --- | --- | --- | --- |

| | |
|---|---|
| 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 (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. |

## IR-4 Fluridone herbicide trial on sweetpotatoes in California

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**SUMMARY**
Weed control methods in commercial sweetpotatoes in Californian are characterized by the use of pre-plant weed management coupled with a limited number of registered herbicides, cultivation, and hand hoeing when appropriate. Annual weeds are the single largest category in commercial sweetpotato fields; common species include the nightshades (*Solanum* spp), pigweed (*Amaranthus* spp), purslane (*Portulaca oleracea*), puncturevine (*Tribulus terrestris*), and barnyard grass (*Echinochloa* spp). Of these, redroot pigweed is the dominant and most pervasive species. Unfortunately, very few pre-emergent herbicides are registered for sweetpotatoes in California, and are frequently not used as they require water incorporation from rain or sprinklers to be effective. Both Dual Magnum (S-metolachlor) and Valor (flumioxazin) are two such examples. In 2016, a USDA IR-4 field trial evaluated the herbicide fluridone (Sonar, Brake) applied to pre-formed beds prior to and after transplanting. Application rates were 9.6, 19.2, and 38.4 fl oz/A and were applied 1 day before transplanting. An additional post-plant treatment was also evaluated at 19.2 fl oz/A. Devrinol (napropamide) and Dual Magnum were used for comparison, and the test included both weedy and hand-weeded control plots. Sweetpotato cultivar 'Bonita' was mechanically transplanted April 29, and harvested on Sept 20, 2016, in a commercial field with standard equipment and practices. Experimental design was a randomized complete block (RCB) with 4 replications. Plot size was 2 rows by 35 feet. Data collected included visual crop injury, weed control, and yield. The sweetpotatoes were drip irrigated throughout the season, and the grower managed irrigation, fertilizers, and pest management with the exception of weed control. At no rate did pre-plant fluridone applications provide adequate pigweed or puncturevine control, which were the dominant weed species at this location. Crop phytotoxicity was severe at 19 and 38 fl oz/A, and yields were significantly reduced as compared to the hand weeded check plot. Fluridone at 21 days POST performed much better, with similar yield as the hand weeded check plot. Devrinol applied pre-plant incorporated had marginal weed control, but was excellent when applied at lay-by. Under conditions typical for California, fluridone applied pre-plant was an unacceptable herbicide for sweetpotatoes. POST plant applications were equivalent to Devrinol in weed control, but caused more crop injury.

### Introduction
Weed control methods in commercial sweetpotatoes in Californian are characterized by the use of pre-plant weed management coupled with a limited number of registered herbicides, cultivation, and hand hoeing when appropriate. Pre-plant fumigation, especially with metam – Na or metam – K products, can also reduce overall weed populations and can be an important component of an overall weed management plan. However, pre-plant herbicides are rarely used

in commercial production fields, as the registered materials need water incorporation to be effective. As a result, post emergence herbicide use dominates. Post-plant applications of glyphosate (Roundup) with hooded sprayers are commonly used, and while still effective, concerns about weed resistance to glyphosate, especially with *Amaranthus* species, necessitate continual evaluation of weed management options in sweetpotatoes. Work done in Mississippi and North Carolina with the herbicide fluridone, which is registered in cotton to help manage herbicide resistant Palmer Amaranth, has shown the product to be generally safe and effective for sweetpotatoes.[1,2]

The purpose of this research was to collect performance data in California to support registration of fluridone on sweetpotatoes.

**Methods**

This study was conducted in a commercial sweetpotato field near Livingston, CA. Herbicide treatments are listed in Table 1. Treatments were applied to a clean, cultivated field 1 day before transplanting with a $CO_2$ backpack sprayer at 40 psi using TeeJet 8004 flat fan nozzles and calibrated to 70 gpa equivalent. Subsequent to the start of the experiment, the registrant requested post applications be evaluated. Therefore, one additional fluridone treatment at 19.2 fl oz was added, however, there was not enough space in the trial location to add the other rates. A nontreated weedy check and a hand-weeded weed-free check were included for comparison. Preplant herbicide treatments were applied April 28, 2016. Napropamide (Devrinol) was incorporated by hand to about 2" deep, but the fluridone treatments were not. 'Bonita' sweetpotato cultivar was transplanted on April 29 with the grower's mechanical transplanter on raised beds 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.

Metolachlor (Dual Magnum), napropamide (Devrinol), and fluridone POST treatments were applied May 19-20, 2016, to the remaining plots and incorporated by hand to a depth of about 2". Applications were made using a directed spray to both sides of the plant row to minimize contact with foliage (Figure 1). Plot size was 1 bed (2 rows) 6.67 ft wide x 35 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, Figure 2) determined at 10, 19, 33, and 55 days after planting (DAP). Weed-free check plots were maintained weed free through light cultivation and hand removal. All plots were hand weeded after the final evaluation date on June 24. Yields were measured 144 DAP using a commercial 2-row harvester and hand graded by the harvest crew into standard size grades (Jumbo > 8.9 cm diameter, No. 1 > than 4.4 cm but < 8.9 cm diameter, and mediums >2.5 cm < 4.4 cm). 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 fluridone treatments were separated into their own bins and later destroyed.

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[1] K. Jennings, 2014. Sweetpotato crop tolerance and palmer amaranth control with fluridone. IR-4 technical report. North Carolina State University.

[2] S. Meyers, 2013. Weed control and crop tolerance to fluridone (pre-transplant) in Mississippi sweetpotato. IR-4 technical report. Mississippi State University.

**Table 1. Field site info and herbicide treatments for fluridone efficacy trial in sweetpotatoes, Livingston CA, 2016.**

| | |
|---|---|
| Location: | Westside Blvd and Sultana Rds, near Livingston in Merced County<br>Delhi loamy sand<br>37 21'26.22" N 120 41'27.93" W |
| Cooperator | Bob Weimer, Weimer Farms |
| Variety | sweetpotato cv 'Bonita', 9" spacing |
| Transplanted: | 4/29/16 |
| irrigation: | drip irrigation |
| Harvest: | 9/20/16 144 DAP |
| **Treatments**: | 1 UTC hand weeded<br>2 Fluridone 9.6 oz/A broadcast PRE<br>3 Fluridone 19.2 oz/A PRE<br>4 Fluridone 38.4 oz/A PRE<br>5 Devrinol (napropamide) 4 lbs/A PPI<br>6 Dual Magnum (metolachlor) 1 pt/A 20 days POST inc.<br>7 UTC weedy<br>8 Fluridone 19.2 oz/A 21 days POST inc.<br>9 Devrinol 4 lbs/A 21 days POST inc. |
| **Treatment dates** | treatments 2 - 5. Fluridone not incorporated,<br>4/28/16 Devrinol hand incorporated. 64 F<br>5/19/16 treatment 6. 82 F. Hand inc.<br>5/20/16 Treatments 8, 9. Hand inc.<br>All treatments applied with CO2 back pack sprayer, 40 psi, TeeJet 8004 flat fan nozzles, 70 gpa equivalent<br>hand weeding treatment began on May 27 and continued periodically thereafter |
| Plots | 1 bed (2 rows), 6.67 ft x 35 ft<br>RCBD with 4 reps |
| data | crop injury and weed ratings on<br>May 9 (10 days post plant)<br>May 18 (19 days post plant)<br>June 2 (33 days post plant). Vines starting to run.<br>June 24 (55 days post plant)<br>Harvest weights on Sept 20, 2016 |
| Weeds | 80% pigweed. Others: puncture vine, lambsquarters, barnyard grass, some malva |

**Figure 1. POST applications of Devrinol, Dual Magnum, and fluridone were made using a directed spray to minimize contact with foliage.**

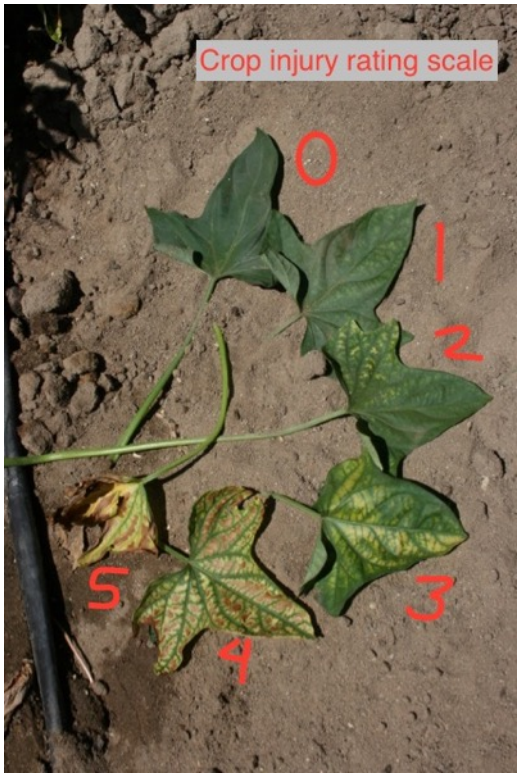


**Figure 2. Crop injury/phytotoxicity 0 – 5 rating scale.**

**Results**
Treatment effects on weed growth and crop phytoxicity on each evaluation date are shown in Table 2. Pre-plant applications of fluridone caused significant crop injury that increased with rate and as the season progressed. At the 38.4 fl oz/A rate, over 85% of the sweetpotato plants exhibited severe chlorosis and necrosis at 55 days after planting. The POST fluridone treatment faired better – initially most plants showed some level of crop injury one week after application, but this affect attenuated and was not significantly different than the unsprayed treatments at 55 DAP. Crop injury (stunting and leaf epinasty) was also noted for the metolachlor treatment one week after application, but the plants recovered and this effect was unnoticeable by the last evaluation date (Figure 3).

Weed control ratings were determined from the weed ratings given to each plot relative to the hand-weeded check plot within each block; therefore the hand-weeded plot data were excluded from the statistical analysis shown in Table 2. The dominant weeds at this location were redroot pigweed (*Amaranthus retroflexus*), puncture vine (*Tribulus terrestris*), and lambsquarters (*Chenopodium album*). Weed control was marginal for the pre-plant fluridone treatments (Table 2), averaging about 30 – 40% after May 18. There was no significant difference between the 9.6 oz rate of fluridone and the untreated weedy check plot. The higher rates significantly improved weed control, but less than 40%, and this was significantly less than the POST application herbicide treatments at 33 and 55 DAP (Figure 3). POST fluridone weed control was significantly better than the pre-plant treatments, with 69% control at 55 DAP.

Yield of all three size grades as well as total marketable yield (TMY) were significantly reduced in the pre-plant fluridone treatments, and were not statistically different than the weedy check plots (Table 3 and Figure 4). All were less than 500 boxes/A. The reduction in yield was a result of both poor weed control and crop injury. Culls increased relative to the unsprayed check plots, though this effect was not significant due to high variability with this category. Best TMY occurred with the hand-weeded, fluridone POST, and Devrinol POST treatments, around 1200 boxes/A. Poor weed control at 55 DAP resulted in a significant correlation with low yields (Figure 5) – yields rapidly decreased 58% when weed control was less than 70% at this time. Sweetpotatoes are a horizontally vining crop that competes poorly with the tall, vertical plant architecture of pigweeds.

**Summary:**
Unlike the research done at NCSU and Mississippi State, results from this research show poor crop tolerance and weed control with pre-plant applications of fluridone under the typical soil and environmental conditions for sweetpotatoes in California. Crop injury increased and yields decreased as the fluridone rate increased from 9.6 to 38.4fl oz/A. The post-plant application of fluridone faired much better, with little impact on yield and improved weed control relative to the pre-plant applications. However, the POST application caused extensive, though slight, crop injury compared to the POST applied Devrinol, which was very evident 2 weeks after application.

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**Table 2. Weed control and sweetpotato crop injury at 10, 19, 33, and 55 days after transplanting as affected by herbicide treatment, Merced County 2016.**

| | | May 9 | | | | May 18 | | | | June 2 | | | | June 24 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 - 5 scale | | Phyto | weed (4) | 0 - 5 scale | | Phyto | weed | 0 - 5 scale | | Phyto | weed | 0 - 5 scale | | Phyto | weed |
| plot | treatment | Phyto | Weeds(2) | % (3) | control, % | Phyto | Weeds | % | control, % | Phyto | Weeds | % | control, % | Phyto | Weeds | % | control, % |
| 1 | UTC hand weeded | 0.0 | 1.5 | 0.0% | 86.3% | 0.0 | 2.8 | 0.0% | 6.5% | 0.3 | 0.8 | 1.4% | 96.3% | 0.0 | 0.0 | 0.0% | 100.0% |
| 2 | Fluridone 9.6 oz/A broadcast PRE | 0.0 | 1.0 | 0.0% | 90.0% | 1.0 | 2.5 | 6.4% | 46.3% | 1.0 | 3.8 | 14.4% | 30.0% | 2.5 | 4.3 | 31.3% | 18.8% |
| 3 | Fluridone 19.2 oz/A PRE | 0.0 | 0.5 | 0.0% | 96.3% | 1.5 | 1.8 | 12.5% | 62.0% | 1.8 | 3.3 | 13.6% | 42.5% | 3.3 | 3.8 | 51.3% | 30.0% |
| 4 | Fluridone 38.4 oz/A PRE | 0.3 | 0.8 | 2.5% | 92.5% | 1.8 | 2.0 | 16.9% | 69.9% | 3.0 | 3.0 | 16.1% | 48.8% | 4.5 | 3.5 | 86.3% | 36.3% |
| 5 | Devrinol (napropamide) 4 lbs/A PPI | 0.0 | 1.3 | 0.0% | 88.8% | 0.0 | 2.3 | 0.0% | 53.8% | 0.8 | 3.5 | 3.9% | 37.5% | 0.3 | 4.1 | 6.3% | 17.5% |
| 6 | Dual Magnum (metolachlor) 1 pt/A 20 days POST | 0.0 | 1.0 | --- | --- | 0.0 | 2.8 | --- | --- | 1.8 | 1.5 | 26.1% | 82.5% | 0.5 | 3.5 | 1.0% | 42.5% |
| 7 | UTC weedy | 0.0 | 1.3 | 0.0% | 88.8% | 0.0 | 2.8 | 1.1% | 14.6% | 0.3 | 4.5 | 1.1% | 11.3% | 0.0 | 4.8 | 0.0% | 6.3% |
| 8 | Fluridone 19.2 oz/A 21 days POST inc. | --- | --- | --- | --- | --- | --- | --- | --- | 2.0 | 1.0 | 75.3% | 91.3% | 1.3 | 2.3 | 13.8% | 68.8% |
| 9 | Devrinol 4 lbs/A 21 days POST inc. | --- | --- | --- | --- | --- | --- | --- | --- | 0.5 | 1.5 | 4.2% | 82.5% | 0.3 | 1.8 | 2.5% | 78.8% |
| | **Average** | 0.0 | 1.0 | 0.4% | 90.4% | 0.6 | 2.4 | 6.2% | 42.2% | 1.3 | 2.9 | 11.0% | 49.8% | 1.6 | 3.4 | 25.1% | 35.9% |
| | **LSD 0.05** | ND | ns | ND | ns | 0.95 | 0.64 | 8.5 | 30.5 | 0.96 | 0.83 | 15.9 | 20.0 | 0.81 | 0.83 | 20 | 21.1 |
| | **CV, %** | ND | 54.3 | ND | 6.6 | 89 | 18.1 | 92.0 | 48.2 | 47.6 | 20.6 | 56.0 | 25.5 | 35.3 | 16.2 | 56.5 | 38.4 |

1) Severity of crop injury (phyto) or weed pressure on a 0 - 5 scale: 0 = no weeds/no phyto, 1 = < 10% weeds/phyto, 2 < 25%, 3 < 50%, 4 < 75%, 5 > 90% weeds/necrosis.
2) Main weeds were redroot pigweed, puncture vine, and lambsquarters
3) % of plants with crop injury, regardless of severity.
4) Weed control relative to the hand weeded plots (UTC). UTC plots were kept weed free after May 18 and are not included in the statistical analysis.

LSD Least significant difference at the 95% confidence level. Means within each column less than this amount are not significantly different; ns = not significant.
CV coefficient of variation.
--- treatments 6, 8, and 9 were not applied until May 19.
ND Not determined due to lack of data

**Table 3. Sweetpotato yield as affected by herbicide treatment, Merced County 2016.**

| plot | treatment | TMY lbs/A | 40 lb box/A No. 1's | Meds | Jumbos | adjusted TMY box/A | bins/A | No. 1's #1% | Culls cull% |
|---|---|---|---|---|---|---|---|---|---|
| 1 | UTC hand weeded | 53618.7 | 715.3 | 240.1 | 224.2 | 1179.6 | 47.2 | 60.8% | 6.9% |
| 2 | Fluridone 9.6 oz/A broadcast PRE | 22204.5 | 317.1 | 144.7 | 26.7 | 488.5 | 19.5 | 65.8% | 7.7% |
| 3 | Fluridone 19.2 oz/A PRE | 21222.3 | 254.8 | 165.7 | 46.5 | 466.9 | 18.7 | 55.4% | 19.1% |
| 4 | Fluridone 38.4 oz/A PRE | 19396.3 | 222.7 | 136.5 | 67.5 | 426.7 | 17.1 | 52.6% | 10.8% |
| 5 | Devrinol (napropamide) 4 lbs/A PPI | 29156.0 | 375.6 | 145.7 | 120.1 | 641.4 | 25.7 | 58.0% | 11.3% |
| 6 | Dual Magnum (metolachlor) 1 pt/A 20 days POST inc. | 44308.2 | 576.8 | 197.0 | 201.0 | 974.8 | 39.0 | 58.8% | 7.2% |
| 7 | UTC weedy | 13675.4 | 136.5 | 125.2 | 39.2 | 300.9 | 12.0 | 38.5% | 13.5% |
| 8 | Fluridone 19.2 oz/A 21 days POST inc. | 55081.6 | 749.2 | 237.1 | 225.6 | 1211.8 | 48.5 | 62.0% | 5.5% |
| 9 | Devrinol 4 lbs/A 21 days POST inc. | 55202.4 | 812.8 | 172.4 | 229.2 | 1214.5 | 48.6 | 67.2% | 7.3% |
| | **Average** | 34873.9 | 462.3 | 173.8 | 131.1 | 767.2 | 30.7 | 57.7% | 9.9% |
| | **LSD 0.05** | 11194 | 163.6 | 68.6 | 82.1 | 246.3 | 9.9 | 12.8 | ns |
| | **CV, %** | 22.0 | 24.3 | 27.1 | 42.9 | 22.0 | 22.0 | 15.2 | 78.8 |

No. 1's Roots 2 to 3.5 inches in diameter, length 3 to 9 inches, well shaped and free of defects.
Meds 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 (17.6 Bu) per bin.
% US #1's Weight of US #1's divided by total marketable yield.
% Culls Roots greater than 1" in diameter that are so misshapen or unattractive as to be unmarketable.
LSD 0.05 Least significant difference. Means separated by less than this amount are not significantly different (ns).
CV, % Coefficient of variation, a measure of variability in the experiment.

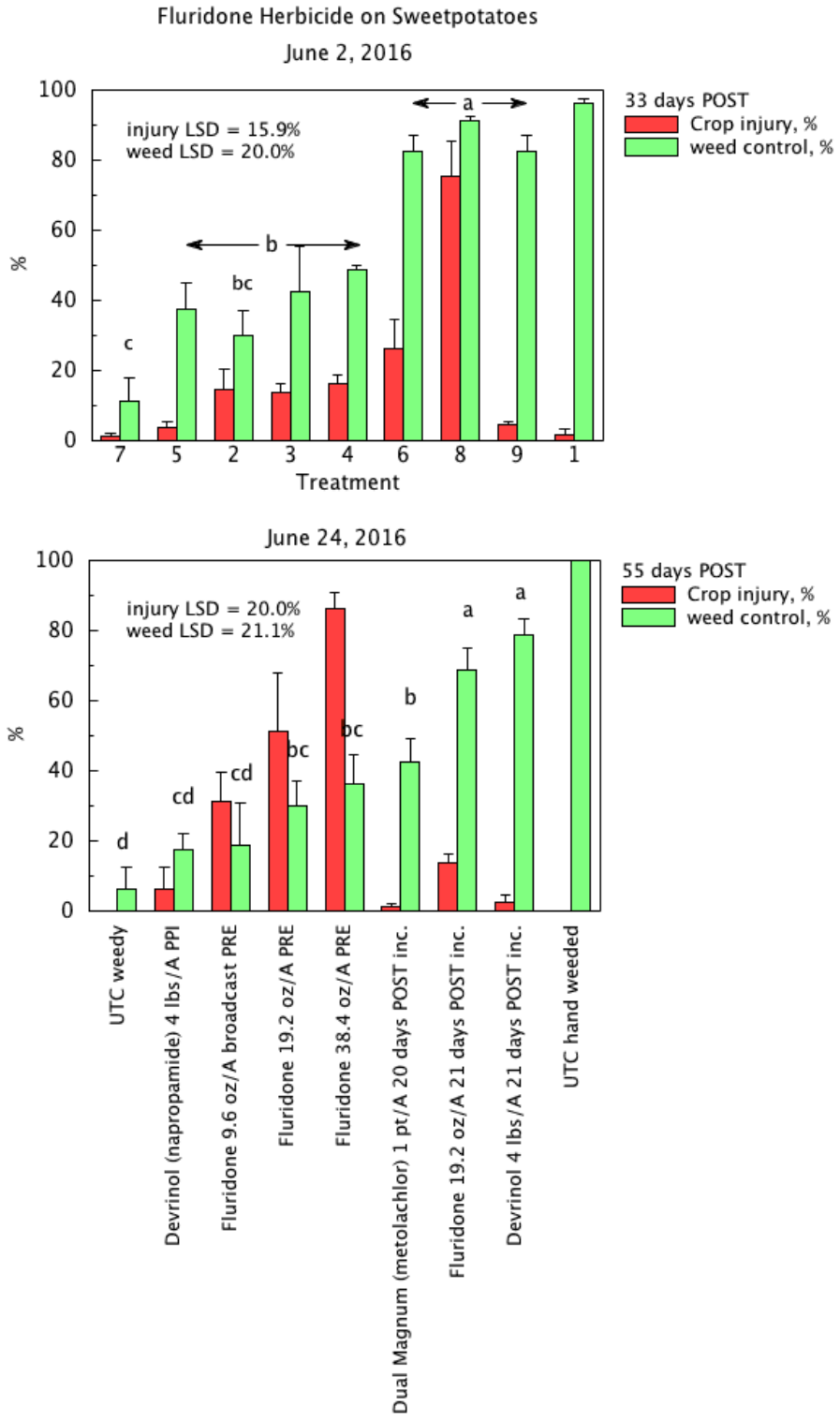


**Figure 3. Crop injury and weed control ratings at 33 and 55 DAP. Columns with the same letter (weed control only) are not significantly different.**

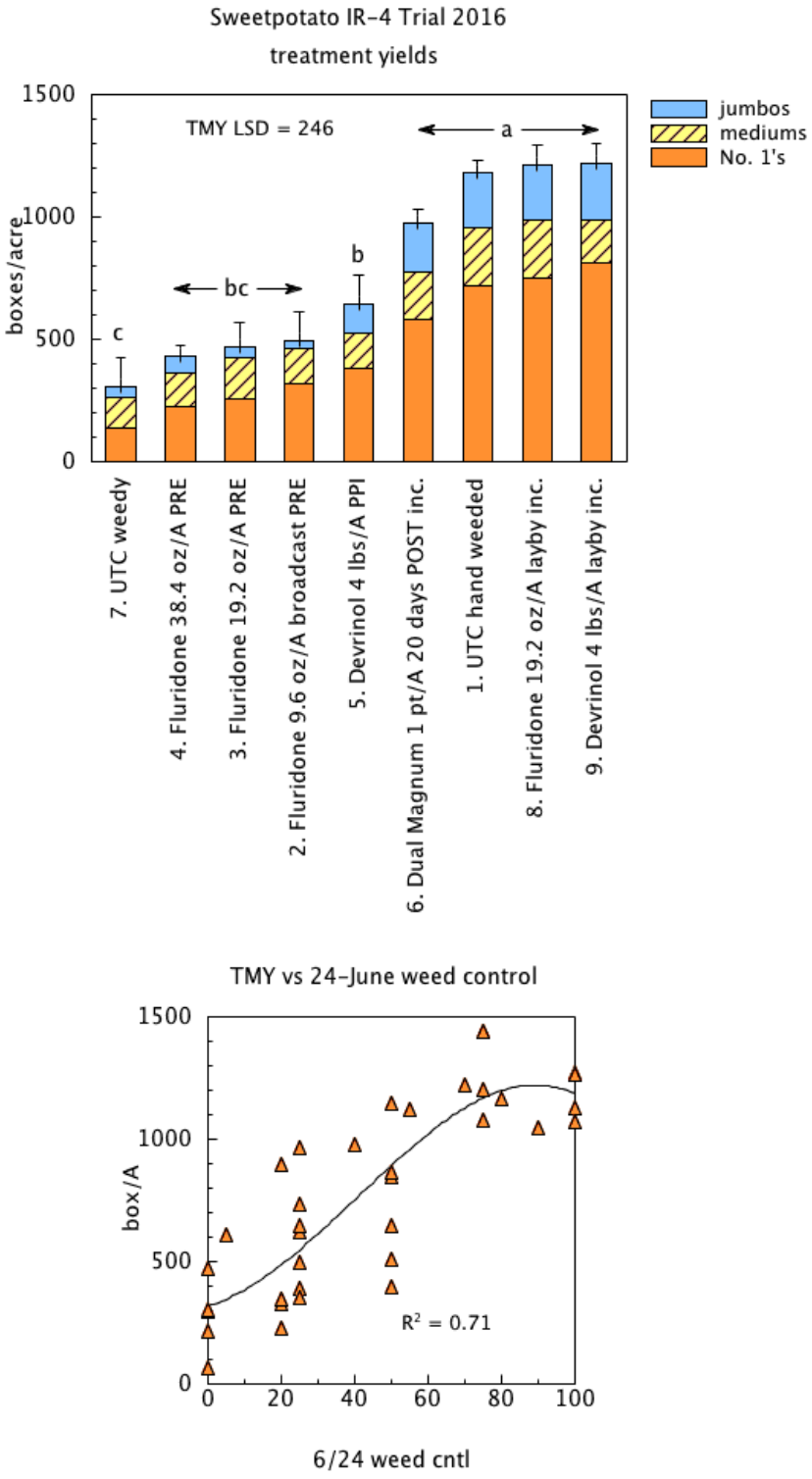


**Figure 4 (top) and 5 (bottom). Sweetpotato yields as affected by herbicide treatment, and yields as affected by weed control at 55 DAP.**

**Appendix. Photos of treatment area during season.**


19 DAP. Treatment 4. Sweetpotato and pigweed


Treatment 4. Severe crop phyto.


June 2, 2016. 33 DAP. Treatment 2


Treatment 3. Fluridone 19.2 oz/A


Treatment 4. Fluridone 38.4 oz/A


Treatment 5. Devrinol

Treatment 6. Dual magnum POST

Treatment 7. Weedy check.

Treatment 8. Fluridone POST

Treatment 9. Devrinol POST

Treatment 6 Dual Magnum plant size 33 DAP.

Untreated plant size 33 DAP.

June 24, 55 DAP. Treatment 1. Hand weeded

Treatment 2

Treatment 3

Treatment 4


Fluridone at 38.4 fl oz PRE severe phyto

| | | |
|---|---|---|
|  | |  |
| Treatment 5 | | Treatment 6 |
| | | |
|  | |  |
| Treatment 8 | | Treatment 9 |
| | | |
|  | |  |
| Fluridone 19.2 oz PRE crop phyto. | | Fluridone 19.2 oz POST crop phyto. |

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