

# Sweetpotato (*Ipomea batatas* var. *batatas*) Cultivars Evaluated on Hawaii Island



## for Yield, Resistance to Pests, and Quality

Susan C. Miyasaka<sup>1</sup>, Marisa Wall<sup>2</sup>, Don LaBonte<sup>3</sup>, and Christopher Clark<sup>3</sup>



<sup>1</sup>University of Hawaii – Manoa, Dept. of Tropical Plant & Soil Sciences, Hilo, HI, U.S.A.

<sup>2</sup>USDA-ARS DKI U.S. Pacific Basin Agricultural Research Center, Hilo, HI, U.S.A.

<sup>3</sup>Louisiana State University Agricultural Center, Baton Rouge, LA, U.S.A.

### ABSTRACT

Ten sweetpotato accessions/ cultivars were evaluated for yield, resistance to pests, and quality in field trials in Pepekeo, Hawaii. Thirty cuttings of each accession/ cultivar were planted at a spacing of 0.3 m in a hill that was 1.5 x 9.1 m and blocked over time due to limited availability of space. In the first two field trials, local cultivars planted were Okinawan, Mokuau, and Kona B, as well as accessions 531094, 566613 (Beauregard), 573309, 573330, 595199 (Darby), 634398 (Pelican Processor), and 634399 (Picadito). Yields of 'Mokuau' and 'Kona B' were too low and they were replaced in the latter three field trials with two new cultivars from Louisiana State University Agricultural Center (Murasaki-29 and LA 08-21p). Five trials were planted on May 2014, October 2014, February 2015, 15 July 2015, and January 2016. Plots were harvested from 4.5 to 6 months after planting. Storage roots were graded according to State of Hawaii standards, and categorized as Grade AA, A, B, and off-grade. Marketable yields combined storage roots in Grades AA, A, and B. In addition, injuries of storage roots in each category were estimated due to infestations of sweetpotato weevil [*Cylas formicarius elegantulus* (Coleoptera: Brentidae)]. Finally, sugar concentrations, anthocyanins, and  $\beta$ -carotene contents were measured in storage roots. Accessions/ cultivars differed significantly in marketable fresh weight yields, with 'LA 08-21p' having the greatest marketable yields. However, 'LA 08-21p' also had the greatest incidence of damage due to weevils, perhaps due to its growth habit of a tight cluster of storage roots located close to the soil surface. Accessions/ cultivars also differed significantly in sugar concentrations (fructose, glucose, sucrose, maltose, and total sugars). Concentration of sucrose was highest among mono- and di-saccharides analyzed and ranged from 25 to 68 mg gfw<sup>-1</sup>. 'Beauregard' had the highest sucrose concentration and total sugars. Purple-fleshed cultivars (Okinawan and LA 08-21p) contained total monomeric anthocyanins that ranged from 34 to 37 mg 100 gdw<sup>-1</sup>. Orange-fleshed cultivars (Beauregard and Darby) contained  $\beta$ -carotene that ranged from 5485 to 8302 ug 100 gfw<sup>-1</sup>. Results from these field trials demonstrate healthful benefits of purple-fleshed and orange-fleshed sweetpotato cultivars, as well as provide yield information to growers interested in producing new cultivars.

### MATERIALS AND METHODS

Table 1. Planting date, harvest date, and sampling date for quality measurements.

|                    | Block 1 | Block 2 | Block 3 | Block 4 | Block 5 |
|--------------------|---------|---------|---------|---------|---------|
| Planting date      | 5/8/14  | 10/1/14 | 2/25/15 | 7/15/15 | 1/12/16 |
| Harvest date       | 10/3/14 | 2/18/15 | 7/16/15 | 1/12/16 | 7/19/16 |
| Sample for Quality | 0       | 0       | 0       | X       | X       |



Figure 1. 'LA 08-21p' (red-skinned, purple fleshed) harvested on 7/19/16. It formed tight clusters of storage roots near the soil surface.



Figure 2. 'LA 08-21p' harvested on 7/19/16 and graded into AA, A, B (marketable), and off-grade.

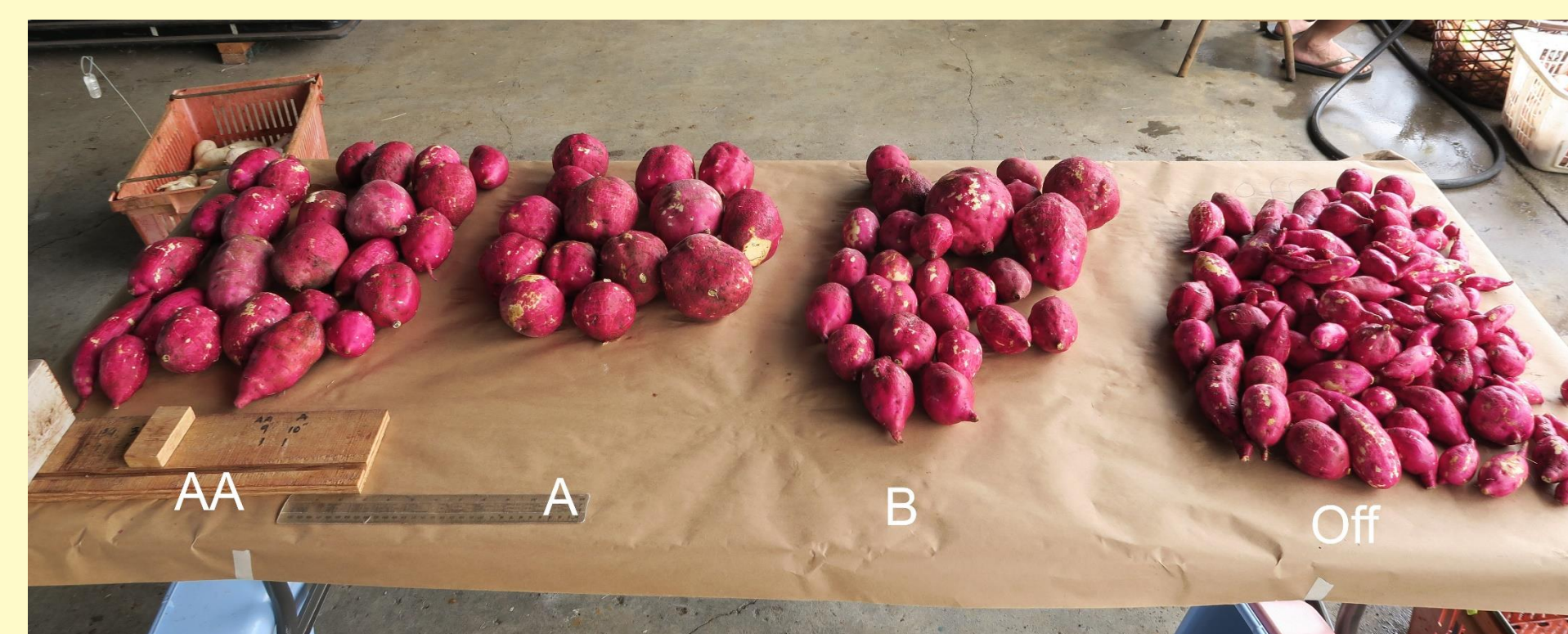


Figure 4. 'Murasaki-29' harvested on 7/19/16 and graded into AA, A, B (marketable), and off-grade categories.



Figure 3. Accession 566613 'Beauregard' harvested on 7/19/16 and graded into AA, A, B (marketable), and off-grade.



Figure 5. Left, 'LA 08-21p' in consumer acceptance trial; Right, accession 566613 'Beauregard'.

### RESULTS

Table 1. Fresh weight yield of marketable storage roots (kg/ha), total yield (kg/ha), and incidence of weevil damage in marketable storage roots (%) averaged across five blocks. Means followed by the same letter are not significantly different at the 95% probability level.

| No./ Accession | Cultivar          | Fresh Wt. Marketable, kg/ha | Total Fresh Wt., kg/ha | % Weevil in Marketable, % |
|----------------|-------------------|-----------------------------|------------------------|---------------------------|
|                | Okinawan          | 3,779 b                     | 6,470 b                | 7.6 b                     |
|                | Mokuau            | 1,140 b                     | 2,828 b                | 21.8 a                    |
|                | Kona B            | 263 b                       | 2,199 b                | 0.0 b                     |
|                | Murasaki-29       | 11,575 a                    | 15,878 a               | 6.5 b                     |
|                | <b>LA 08-21p</b>  | <b>22,403 a</b>             | <b>33,197 a</b>        | <b>52.8 a</b>             |
| 531094         |                   | 5,608 b                     | 13,487 b               | 20.3 a                    |
| 566613         | Beauregard        | 17,149 a                    | 28,777 a               | 36.9 a                    |
| 573309         |                   | 13,872 a                    | 25,626 a               | 12.1 b                    |
| 573330         |                   | 9,572 b                     | 30,490 a               | 26.8 a                    |
| 595199         | Darby             | 8,195 b                     | 15,379 a               | 19.5 a                    |
| 634398         | Pelican Processor | 12,567 a                    | 19,866 a               | 12.1 b                    |
| 634399         | Picadito          | 12,780 a                    | 16,924 a               | 6.4 b                     |

Table 3. Accession, skin color, flesh color, anthocyanin content of purple-fleshed cultivars, and beta-carotene content of orange- or yellow-fleshed cultivars.

| No./ Accession/ Cultivar  | Flesh Color   | Beta-carotene, ug/100 gfw | Vitamin A, ug RAE/100 gfw | Anthocyanin, total monomeric, mg/100 gdw | Anthocyanin, % polymeric |
|---------------------------|---------------|---------------------------|---------------------------|--|--------------------------|
| Okinawan                  | Purple        | n.d.                      |                           | <b>37.3 ± 3.8</b>                        | 28.9 ± 2.4               |
| Murasaki-29               | White         | n.d.                      | n.d.                      | n.d.                                     | n.d.                     |
| LA 08-21P                 | Purple        | n.d.                      | n.d.                      | <b>33.5 ± 2.6</b>                        | 32.0 ± 3.8               |
| 531094                    | White         | n.d.                      | n.d.                      | n.d.                                     | n.d.                     |
| 566613/ Beauregard        | Orange/salmon | <b>8301.7 + 733.6</b>     | 691.8 ± 61.1              | n.d.                                     | n.d.                     |
| 573309                    | White         | n.d.                      | n.d.                      | n.d.                                     | n.d.                     |
| 573330                    | Light yellow  | n.d.                      | n.d.                      | n.d.                                     | n.d.                     |
| 595199/ Darby             | Orange        | <b>5485.2 ± 343.5</b>     | 457.1 ± 28.6              | n.d.                                     | n.d.                     |
| 634398/ Pelican Processor | Light yellow  | n.d.                      | n.d.                      | n.d.                                     | n.d.                     |
| 634399/ Picadito          | White         | n.d.                      | n.d.                      | n.d.                                     | n.d.                     |

Table 2. Concentrations of sugars (fructose, glucose, sucrose, maltose, and total) in 10 sweetpotato accessions/ cultivars. Means followed by the same letter are not significantly different at 95% probability level.

| Accession/ Cultivar       | Fructose, mg/gfw | Glucose, mg/gfw | Sucrose, mg/gfw | Maltose, mg/gfw | Total Sugars, mg/gfw |
|---------------------------|------------------|-----------------|-----------------|-----------------|----------------------|
| Okinawan                  | 0.77 fg          | 2.50 f          | 50.03 c         | 0.44 b          | 53.29 cd             |
| Murasaki-29               | 0.51 g           | 2.58 f          | 56.28 b         | 0.77 ab         | 59.96 b              |
| LA 08-21p                 | 4.70 c           | 11.78 c         | 38.59 fg        | 0.57 ab         | 52.40 cde            |
| 531094                    | 6.81 b           | 14.27 ab        | 36.25 g         | 0.80 ab         | 52.18 cde            |
| <b>566613/ Beauregard</b> | 3.04 d           | 7.19 d          | <b>68.38 a</b>  | 0.51 b          | <b>76.88 a</b>       |
| 573309                    | 1.43 ef          | 4.00 ef         | 46.84 cd        | 1.07 a          | 52.41 cde            |
| 573330                    | 8.47 a           | 16.23 a         | 25.29 h         | 0.49 b          | 45.18 f              |
| 595199/ Darby             | 7.49 b           | 13.89 b         | 38.78 efg       | 0.70 ab         | 55.74 bc             |
| 634398/ Pelican Processor | 2.07 e           | 5.24 de         | 43.78 ed        | 0.58 ab         | 50.28 def            |
| 634399/ Picadito          | 1.75 e           | 4.02 ef         | 42.48 def       | 0.53 b          | 47.79 ef             |

### ACKNOWLEDGEMENTS

This project was funded by the County of Hawaii Department of Research and Development and by USDA National Institute of Food and Agriculture Hatch project #08029-H, managed by the University of Hawaii Manoa-College of Tropical Agriculture and Human Resources. We would like to acknowledge the dedication and hard work of Agricultural Technician Layne Matsushita at the Waikeae Research Station, who was assigned responsibility for installation, maintenance, and harvesting of these sweetpotato cultivar trials. In addition, we would like to thank Farm Manager Angel Magno and other Agricultural Technicians at the Waikeae Research Station who assisted in these field trials: Christopher Bernabe, Mary Kaheiki, Ryan Kaneko, Jon Katada, Eric Magno, and Dayle Tsuha. We thank USDA-ARS Biological Science Technicians Julie Duhaylongsod, Sandra Silva and Suzanne Sanxter for compositional analyses.