

2004 PROGRESS REPORT  
To  
North Carolina SweetPotato Commission

TITLE: Sweetpotato Breeding and Variety Development Support

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DEPARTMENT: Horticultural Science

REPORT:

**Project Objective(s):** The objectives of the Sweetpotato Breeding and Genetics Program are: 1) to develop sweetpotato varieties for North Carolina growers that possess exceptional yield, appearance and quality characteristics, and are resistant to diseases and insects; and 2) to conduct basic and applied breeding and genetics studies focused on identifying and incorporating traits of economic importance into sweetpotato germplasm and new cultivars.

**Project Summary**

Funds provided by the North Carolina Sweetpotato Commission supported all aspects of the breeding program's work. Highlights of our 2004 activities are listed below. A detailed description of the overall activities of the breeding program, advanced clone comments, and tables presenting the results of our advanced, preliminary and National Sweetpotato Collaborators trials follow the project summary.

1. Our most advanced clone, NC98-608, was evaluated by at least five certified seed producers and at least as many growers in multi-acre trials in several locations in NC. Most reports on the performance of NC98-608 (yield, shape, storage quality, pack-out potential, plant bed productivity and plant stand establishment) have been favorable. We have are planning to officially release this clone as the variety Covington during 2005.
2. To determine the optimal planting, spacing, fertility and harvest dates for NC98-608, we collaborated with Dr. Jonathan Schultheis and Mr. Allan Thornton to evaluate NC98-608 in replicated research station and on-farm yield trials. Their report on the outcome of the trials is presented later in this publication.
3. In our polycross breeding nurseries, we generated over 120,000 true seed. The crosses represent the foundation of our program's efforts and roughly half will be planted in the field for evaluation during 2005.
4. In our early generation breeding plots we planted 44,000 true seed in research station and on-farm sites, and made 759 new seedling selections. We also planted 420 second-year and 20 third-year selections at the Horticultural Crops Research Station (HCRS) in Clinton and the Cunningham Research Station (CRS) in Kinston as 20-hill and 100-hill plots from which 60 and 9 selections were made, respectively.
5. We conducted 8 replicated yield trials of preliminary and advanced clones at the HCRS and CRS.
6. We completed our seventh year of the Grower-Participatory Breeding Project (GPBP) and evaluated 9 advanced or preliminary lines in unreplicated trials at our three GPBP sites. Details results of these evaluations are reported on in the GPBP report.
7. We evaluated 140 clones for field resistance to *Streptomyces* soil rot (SSR) in 5-hill plots in our disease screening nursery at the HCRS. These clones were also screened for *Fusarium* wilt, root-knot nematode and SSR resistance in replicated greenhouse trials.
8. We worked with the Specialty Crops Program to develop specialty-type sweetpotatoes (including boniato-type, Asian-type, and yellow- and purple-fleshed types) to promote new marketing opportunities for sweetpotato growers.
9. We collaborated with Dr. Zvezdana Pesic-VanEsbroeck on the MPU project to provide Nuclear Seed of NC98-608 for experimental grower evaluations, and assisted with the design and evaluation of the "seed source" tests conducted at the HCRS. Details results of these evaluations are reported on in the MPU report.
10. We collaborated with Dr. Bryon Sosinski, Research Assistant Professor in Horticultural Science and Director, CALS Genome Research Laboratory, on applied genomics projects in sweetpotato to

address long-term breeding needs in sweetpotato and develop new breeding tools. As part of this project:

- a. Mr. Jim Carlos Cervantes, a PhD student working with the program, completed his genetic map of sweetpotato and planted his second year of field trials - the largest field trials ever conducted by the program. His project has helped us to develop the most detailed genetic map of sweetpotato in the world. We plan use this map to identify genes for yield, resistance to sweetpotato feathery mottle virus and root knot nematodes, dry matter content and beta-carotene production in sweetpotato.
  - b. Mr. Adam Bruckner, completed his MS thesis to genetically characterize the entire USDA-ARS sweetpotato germplasm collection (750+ accessions) with AFLP molecular markers. This research will enable scientists at the genebank to better curate the collection facilitating improved utilization by breeders, etc.
11. We collaborated with Dr. Den Truong, Food Scientist, USDA-ARS, to evaluate the processing and fresh cut potential of several orange-fleshed clones including Beauregard and NC98-608. We also started a project to determine the inheritance of anthocyanins in purple-fleshed sweetpotatoes and evaluate the beneficial nutraceutical and natural colorant properties of the anthocyanins extracted from purple sweetpotatoes.
  12. With additional support from the NC Crop Improvement Association and the NC Certified Sweetpotato Seed Growers, Inc., we continued a long-term project to identify and develop sweetpotatoes more resistant to soil insects.

### Project Cooperators

Researchers	Extension	Growers
Dr. Bryon Sosinski	Mr. William Little	Mr. Jim Jones
Dr. Zvezdana Pesic-VanEsbroeck	Ms. Tiffany Harrelson	Mr. Tim McLamb
Dr. Jonathan Schultheis	Mr. Allan Thornton	Mr. Roger Lane and Pride of Sampson
Dr. Den Truong		
Mr. Bill Jester		
Dr. Gerald Holmes		
Dr. Charles Averde		

### 2004 Polycross Breeding Nurseries

We established two polycross nurseries at the Central Crops Research Station (CCRS) in Clayton in 2004. The **Elite Nursery** is designed to produce materials with the potential to become varieties. In this nursery, cultivars and near-commercial clones that are outstanding for particular characteristics, such as yield, appearance, and disease and insect resistance are combined and crossed. The **Streptomyces Soil Rot (SSR) Nursery** is dedicated to developing parents with high levels of soil rot resistance. These nurseries are composed primarily of breeding material developed by NCSU, LSU, and the USDA sweetpotato breeding projects. Table 1 provides results of the seed harvests per maternal parent for the Elite and SSR nurseries. For a number of years we had a third nursery, our **High Dry Matter Nursery**, located at the HCRS, designed to develop lines with high levels of dry matter suitable for industrial purposes including the production of bio-based products in sweetpotato. However, we discontinued this polycross nursery this year in favor of paired crosses. Much of the current focus for the high dry matter types is in developing lines with soil rot resistance, but to date we have not identified any lines with high dry matter and soil rot resistance. By making paired crosses we know we have a chance to pick up the resistance in every cross. We have also begun making paired crosses for tablestock varieties, but it is very expensive and time-consuming and we will need extra personnel to achieve this goal. Polycross nurseries are a good low cost method of producing seed, but there is a great opportunity for specific goals to be reached by paired crosses, and the genetic information gained helps focus our breeding efforts. More than sufficient seed was obtained for next year, from both paired crosses and polycross nurseries.

### First-Year Seedling Selections

#### Research Station Trials

Almost 44,000 true seed from the 2003 polycross nurseries were grown in the Horticultural Department

greenhouses starting in February. This year we did not evaluate the seedlings for flesh color because less than 10% of the seedling screened for this trait were white- or cream-fleshed. Also, we are actively pursuing white flesh clones with soil rot resistance for the dry matter crosses and this is a way to obtain them. In the field, the seedlings were planted three feet apart so they remained as distinct hills at harvest. Selection at harvest was based on relative yield, shape, flesh color, skin texture, size distribution, root number, earliness, and observable diseases or defects. This year we also produced nearly 800 table stock seed from paired crosses in the greenhouse. These were grown in the greenhouse the same as the other seedlings but instead of planting them as single hills in the field, they were planted as single hills on black plastic. When the plants were big enough, five cuttings were made and planted out as plots. While this is more work it eliminates the tendency towards jumbo's and gives us more material to save of promising looking selections.

Table 2 contains a list of the selections made by nursery and maternal parent at the CRS. A total of 162 selections were made from the 13,500 seed planted from the soil rot nursery for a selection rate of 1.2%. The 10,675 seed from the Elite nursery yielded 183 selections, a rate of 1.7%. Our long-term average is 1.5%. We selected 40 clones from the 800 seed from paired crosses, a selection rate of 5%. We do not know if this higher selection rate is due to the fact that we know the parentage of both parents or because a five-plant selection unit is more favorable. This discrepancy will be further evaluated during 2005.

The selection percentage from the dry matter nursery was much higher at 3.7%. However, these lines still have to undergo a dry matter screening which will eliminate about half the lines. Selection criteria, especially appearance and shape are also less important in an industrial-type.

#### On-Farm Trials

For the Grower-Participatory Breeding Project, three on-farm sites were used to evaluate 15,000 seedlings. The parents and selections are shown in Table 3 and a more detailed report on this project is presented in our GPBP report. Cooperators involved in this project were:

<u>Extension Personnel</u>	<u>Growers</u>
Tiffany Harrelson	Timmy McLamb
William Little	Jim Jones
Allan Thornton	Roger Lane and Pride of Sampson

Field sites were located within commercial fields and the trials were treated in the same fashion as the commercial fields (fertilizer, herbicides, etc.) except for the three-foot in-row spacing. Selections were made in cooperation with extension personnel and growers. Growing conditions varied from site to site, but all sites yielded selections that had better appearance than the check variety Beauregard. These selections will be planted at the HCRS and CRS in 2005 as unreplicated 20-hill plots for the second cycle of selection. It is very useful for us to select under commercial conditions to identify material adapted to actual growing conditions. Selection percentage over all on farm tests was 1.2%, which is typical.

During 2002, we established a second component to the GPBP and began evaluating promising breeding lines under commercial conditions. In 2003, eleven advanced breeding lines and three check lines were grown and evaluated at each location as single-row, 100-hill plots. In 2004, nine advanced breeding lines were evaluated. Notes on how they performed at each location were taken and these are combined with research station data to determine the potential of each as a variety.

#### **Second-Year Selections**

In 2003, we made 445 first-year table-stock seedling selections. A few of these rotted in storage or did not sprout in the spring. The remainder (ca. 420) were planted in 20-hill plots at the HCRS and CRS in 2004. Selection criteria were essentially the same as for the first-year single-hill selections, but having a row instead of a hill allows for a better idea of shape and size consistency, and relative yield. Twenty-six overlapping selections were chosen at both sites. An additional 23 were selected at the CRS and 11 at the HCRS. thus 60 selections remain out of the 420 planted. This number is more slightly than we typically save at this level, usually an indication of a good growing season.

### Third-Year Selections

The 20 second-year selections made in 2003 were planted as unreplicated 100-hill plots at the HCRS and CRS in 2004. We selected 9 for further evaluation with three being selected in both locations. Our evaluation criteria remain the same as our second-year selections, but we become stricter for any flaws in appearance, yield and disease susceptibility, etc. at this stage. Next season these clones will go into replicated yield tests in multiple locations. The most promising will be entered into the on-farm trials for a more rapid assessment of their adaptability across environments.

### Advanced Selection Trials

Twenty-one advanced selections were evaluated this year. Nine have been dropped, four have been designated as breeding lines, and the remainder will be tested again in 2005. The two most promising clones are described below.

**NC98-608** has been elevated based on its performance over the last four years (see summary table below). We plan to release it during 2005 as the variety Covington in honor of the late Henry Covington. It is similar to Beauregard in appearance, but it has been more uniform in shape and has packed out quite well. It is less prone to making jumbo's than Beauregard, averaging 8% jumbo's vs 13% for B94-14 G2, and producing fewer culls, 7% vs 12% for Beauregard averaged over 23 yield tests (3 in 2001, 7 each 2002 and 2003, and 6 in 2004). We have not seen russet crack in NC98-608, and the generations used in the 2001 and 2002 yield tests are G4 and G5, respectively. This year we compared G2 and G7 seed in two trials. There were no statistical differences in any yield or packout category. There is a slight difference in length to diameter ratio, seen not only this year with G2 vs G7 but also last year with G2 vs G6. The G2 roots are shorter for the same diameter. This tends to make the G6 to G7 slightly later for optimizing packout of No.1's. The shapes of NC98-608 have held up very well, which is one of its strengths, and it will generally stay short but if it is planted in cool soils early in the season it has a tendency to produce too many rounds. Overall, NC98-608 tends to size its roots fairly evenly, like Hernandez, and has the potential to produce a reasonably high percentage of number one roots. The yield tests listed below were typically harvested when Beauregard was ready. If NC98-608 is given an additional one to two weeks we think it will size more canners into the No. 1 class, but relatively few No.1's will become jumbo's further enhancing its productivity. In two locations this year root skin color was noticeably lighter from the stem to distal end. The Beauregard check lines showed some of this effect in the same tests, but not as much. In terms of disease resistance, NC98-608 has tested resistant to Fusarium wilt, and moderately resistant to Streptomyces soil rot and southern root-knot nematodes.

### Average performance of NC98-608 G2-G7, B94-14 G2 Beauregard, and Hernandez G2-G4 over 3 yield tests in 2001, 7 in 2002, 7 in 2003 and 6 in 2004.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		Bu/A	%Beau	%Hern	No.1's	Canners	Jumbo's	Culls
<b>NC98-608</b>	<b>751</b>	<b>702</b>	<b>110</b>	<b>117</b>	<b>60</b>	<b>26</b>	<b>8</b>	<b>7</b>
B94-14 G2	797	701	100	112	54	21	13	12
Hernandez G2-4	702	640	96	100	54	32	5	9

Note: % Beauregard is determined by adding the percentage Beauregard for each test, then dividing by the number of tests. There were two tests where 98-608 was over 200% of the Beauregard yield, thus the average is higher averaged this way than if determined on the overall average, which would be 100%.

### SUMMARY DESCRIPTION - NC98-608

#### Plants:

Vine:	Trailing, dense canopy
Leaves:	Heart-shaped to slightly lobed, green
Sprout production:	Good, but short internodes make it late
Transplant survival:	Good

**Storage roots:**

Shape: Blocky to Fusiform, stays short  
 Skin color: Rose  
 Flesh Color: Moderately deep orange, uniform  
 Skin Surface: Smooth

**Characteristics**

Yield: High  
 Season: Mid to early  
 Fusarium stem rot: Resistant  
 Pox: Moderately resistant  
 Root-knot nematodes: Moderately resistant  
 Storability: In commercial storage this winter  
 Consumer quality: Good baking quality, very good taste, canning quality being tested  
 Remarks: Desirable attributes include highly attractive, short roots and high packout. It is very similar to Beauregard in appearance. Showed some color variation, darker at the stem end and lighter at the distal end, in a couple locations this year.

Yield Trial Data: see table above  
 Disposition: Release in Spring 2005

**NC99-573**

This clone produces attractively shaped, smooth skinned, rose-colored roots. Yield is high with a growing season about two weeks longer than Beauregard. Lenticels are fairly prominent in wet conditions and it is susceptible to root-knot nematodes. This clone merits further evaluation and has been entered into the MPU for clean-up.

**Average performance of NC99-573, B94-14 G2 Beauregard, and Hernandez G2-4 over two yield tests in 2002 and 4 in 2003 and 4 in 2004.**

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	% Hern	No.1's	Canners	Jumbo's	Culls
<b>NC99-573</b>	<b>816</b>	<b>748</b>	<b>112</b>	<b>124</b>	<b>51</b>	<b>33</b>	<b>8</b>	<b>9</b>
B94-14 G2	817	734	100	117	52	25	13	10
HernandezG2-4	694	635	91	100	54	32	6	9

**SUMMARY DESCRIPTION - NC99-573****Plants:**

Vine: Trailing, dense canopy  
 Leaves: Heart-shaped to slightly lobed, green  
 Sprout production: Good  
 Transplant survival: Good

**Storage roots:**

Shape: Blocky  
 Skin color: Rose  
 Flesh Color: Moderately deep orange, uniform  
 Skin Surface: Smooth

**Characteristics**

Yield: High  
 Season: Mid to early

Fusarium stem rot:	Resistant
Pox:	Resistant, but needs further screening
Root-knot nematodes:	Susceptible
Storability:	Has not been stored commercially yet
Consumer quality:	Good baking quality, canning quality unknown
Remarks:	Desirable attributes include highly attractive, smooth skinned blocky roots. Disease resistance needs further testing.
Yield Trial Data:	see table above
Disposition	Will be extensively trialed in advanced and on-farm trials during 2005.

NC99-573 has been entered into the MPU for virus cleanup. It has held up well through G6, not showing russet crack and little apparent effects of the viruses on shape or yield compared to G2 Beauregard. As soon as plants are ready we will compare G1 or G2 99-573 to G7 for a direct comparison.

In addition to NC98-608 and NC99-573, 15 additional advanced clones will be evaluated in 2005. Many clones that fall short of becoming a named variety are used as parents based on the multiple tests gathered for release potential. The results of yield tests that included these clones and other promising selections are presented in Tables 4-9. The comment codes used in the tables are described in the Comment Codes Section after the tables. All yields are reported as 50 lb. bushels per acre units.

### **Disease Resistance Screenings**

In addition to the selection and yield evaluation trials, we screened 140 advanced, preliminary, and parental lines for resistance to Fusarium wilt. Of these, 21 of the lines were resistant, 35 had moderate resistance, 18 were moderately susceptible and 66 were rated as susceptible. Susceptible tablestock lines were discarded. Many of the susceptible lines were plant introductions from the germplasm repository and high dry matter lines. 82 of these lines were also screened for resistance to southern root-knot nematode with 55 resistant, 13 moderately resistant, 7 moderately susceptible and 7 testing susceptible.

The establishment process continues for our field SSR screening nursery, having completed its seventh year. Soil rot incidence was moderate, but there was considerable damage due to root-knot nematodes and subsequent infection with fusarium and other rots. The presence of all the other diseases made it hard to rate for soil rot damage, but any clones surviving selection in this site should have high levels of multiple disease resistance. The severe disease pressure in the SSR plot has enabled us to identify one clone that appeared to be resistant to all the problems present. While it does not have all the horticultural traits needed in a release, it will be put into one of our 2005 polycross nurseries. In years with high soil rot pressure, we will use this field to measure yield reduction caused by SSR on advanced clones being considered for release. This field screening is an asset to the program because it allows us to evaluate a large number of lines for resistance to SSR under field conditions. Further, we get an idea of how much yield is reduced and if SSR is able to form lesions on the storage root. Our greenhouse test, while very useful, doesn't give us storage root lesion data. Soil rot may affect primarily fibrous roots, storage roots or both depending on the clone and knowing this will help us in developing clones resistant to both.

### **2004 National Sweetpotato Collaborator Trials**

In 2004 we combined our Advanced and National Sweetpotato Collaborators trials, and conducted the test at the HCRS and CRS. Tables 4a and 4b present the results of the 2004 HCRS trial, and tables 5a and 5b the results of the CRS trial. The Clinton site was in a deep sand that dried out several times during the season. Beauregard had the highest yield, though it not was significantly different than NC98-608. For overall appearance Beauregard, NC98-608 and L99-35 were the best. NC98-608 had an unusually high percentage of jumbo's (15% for G2 and 10% for G7) due to short and stocky shapes. The length to diameter ratio (LD) in NC98-608 was better in the G7 than the G2 with and LD of 2.0 vs 1.5.

In the CRS trial, moisture was good throughout the year. Root set per plant was fairly high causing some clones to be late, or produce many canners. Root shapes were fair overall. Beauregard and Hernandez had the highest yields, though not significantly different than NC98-608. Appearance was best in the NC98-608 and Hernandez, both having good size distributions. The same two NC clones that cracked in Clinton, cracked here and will be eliminated. In this test L99-35's yield was only 77% of Beauregard. Overall appearance was rated using a subjective 0-9 scale with 0 = very poor, 3= poor, 5=fair, 7=good and 9= excellent. Appearance ratings such as a 6 mean that a clone, in our opinion, was a little bit better than fair (6), but still not good (7).

#### **Description of Official Entries - Clinton HCRS National Sweetpotato Collaborators Trial**

**Beauregard (B94-14 G2)** - Rose skin, orange flesh, smooth skin, fusiform to blocky shapes, early season. Overall appearance = 7.0.

**L99-35** – Rose skin, deep orange flesh, smooth skin, elliptic shapes, mid season. Shapes tapered on both ends, with some ovoids. Overall appearance = 6.0.

**NC98-608 G2**- Rose skin, orange flesh, smooth skin, blocky shapes with some round, mid season. Shapes more uniform than G7. Length/diameter ratio = 1.5. Overall appearance = 7.0.

#### **Unofficial entries in the 2004 National Sweetpotato Collaborator Trial for comparison (HCRS):**

**Hernandez G4** - Copper-orange skin, deep orange flesh, moderately smooth skin, elliptic to blocky shapes, mid to late season. Some pimples. Overall appearance = 6.0.

**NC98-608 G7**- Rose skin, orange flesh, smooth skin, blocky and elliptic shapes, a few round, mid season. Length/diameter ratio = 2. Overall appearance = 7.0.

**NC99-088** – Rose skin, deep orange flesh, smooth skin, elliptic to blocky shapes, mid season, drop for low yield and culls. Some circular spot. Overall appearance = 5.0.

**NC99-524** - Red skin, deep orange flesh, smooth skin, elliptic and blocky shapes, mid season. A lot of cracking and disease (Fusarium wilt) Overall appearance = 5, would have been 7 without cracking and disease. Overall appearance = 5.0.

**NC99-573** - Rose skin, orange flesh, very smooth skin, elliptic and blocky shapes, mid season. Some cracking, probably due to root-knot nematodes. Overall appearance = 6.0.

#### **Description of Official Entries -Kinston CRS National Sweetpotato Collaborator Trial**

**Beauregard (B94-14 G2)** - Rose skin, orange flesh, moderately smooth skin, elliptic to blocky shapes, mid season. Overall appearance = 7.0.

**L99-35** – Rose skin, deep orange flesh, moderately smooth skin, elliptic shapes, mid to mid-late season. Shapes tapered on both ends. Overall appearance = 6.3

**NC98-608 G2**- Rose skin, orange flesh, moderately smooth skin, elliptic to blocky shapes, mid season. Length/diameter ratio = 2. Overall appearance = 7.3.

#### **Unofficial entries in the 2004 National Sweetpotato Collaborator Trial for comparison (CRS):**

**Hernandez G4** - Orange skin, deep orange flesh, moderately smooth skin, elliptic shapes, mid season. Overall appearance = 7.8.

**NC98-608 G7**- Rose skin, orange flesh, moderately smooth skin, elliptic and blocky shapes, mid season, distal end lighter colored skin. Length/diameter ratio = 2.5. Overall appearance = 7.3.

**NC99-088** – Dark rose skin, orange flesh, moderately smooth skin, elliptic to long elliptic shapes, mid season, drop for low yield and culls. Overall appearance = 5.2.

**NC99-524** - Red skin, deep orange flesh, smooth skin, elliptic and blocky shapes, mid-late season. Large set, some cracking Overall appearance = 5.3.

**NC99-573** - Rose skin, orange flesh, smooth skin, elliptic and blocky shapes, mid-late season. Large set. Overall appearance = 6.0.

Table 1. Sweetpotato True Seed Harvested in 2004.

Maternal Parent	No. Seed/Polycross Nursery		
	CCRS, Clayton		Total
	Elite	SSR	
1528	5266	---	5266
93-50	---	5701	5701
96-27	1714	---	1714
97A-04	3789	---	3789
97A-45	---	1015	1015
97-166	657	---	657
97-433	---	3701	3701
98-076	4361	---	4361
98-576	---	1663	1663
99-088	---	7563	7563
99-524	3760	---	3760
99-573	5152	---	5152
00-101	2750	---	2750
00-677	5941	---	5941
01-351	---	4861	4861
Beauregard	---	6757	6757
Bienville	4926	2856	7782
C58	2991	2562	5553
Hernandez	---	1262	1262
L95-95	---	251	251
L96-117	2901	3604	6505
L99-35	1054	586	1640
Ruddy	2640	---	2640
Tib 4	---	4549	4549
W250	3031	3013	6044
Totals	50933	49944	100877

'---' line was not in this nursery.



Table 2. 2004 Sweetpotato seedlings selected at the CRS, Kinston.

Maternal parent	# selections	Maternal parent	# selections
<i>Seed from the 2003 Elite nursery</i>			
NC1528	9	Bengal	9
NC96-27	12	Bienville	12
NC97A-04	14	Hernandez	8
NC97-166	19	L96-117	5
NC98-061	3	MSK39	7
NC98-576	12	Ruddy	49
NC99-573	9	W250	3
NC C58	12		
<b>Total</b>			<b>183</b>
<i>Seed from the 2003 SSR nursery</i>			
NC93-50	9	Beauregard	2
NC96-13	10	Bengal	10
NC97A-45	13	Bienville	11
NC97-079	9	Hernandez	10
NC97-433	9	L78-21	10
NC98-175	10	L96-117	13
NC98-342	2	Tib 4	14
NC98-576	6	W250	10
NCC58	14		
<b>Total</b>			<b>162</b>
<i>Seed from the 2003 Dry matter nursery*</i>			
NC1880	21	BM83-4	14
NC93-11	8	BM85-42	21
NC96-27	13	HiDry	5
NCA193	11	Minamiyutaka	5
NCDM01-074	8	O'Henry	21
NCDM01-158	21	Suwon 122	31
NCFT4-89	4	Tib 4	5
NCFTA94	9	Whitestar	13
NCPDM P4	1	Xushu 18	1
Bienville	16		
<b>Total</b>			<b>228</b>
<b>Grand Total</b>			<b>573</b>

\*Selections from the dry matter nursery will be screened for dry matter percentage, with any clones below 30% discarded. This should eliminate about half of the selections.

Seedling Selections Continued on Next Page

Table 3. 2004 Sweetpotato seedlings selected on farm.

Maternal parent	# selections	Maternal parent	# selections
<i>Timmy McLamb Farm, seed from the 2003 Elite nursery</i>			
NC1528	1	Bienville	1
NC96-27	3	Hernandez	6
NC97A-04	5	L96-117	1
NC98-576	7	Ruddy	13
NCC58	11	W250	8
<b>Total</b>			<b>56</b>
<i>Jones Farm, seed from 2003 SSR Nursery</i>			
NC93-50	8	NC98-342	1
NC97A-45	12	NCC58	9
NC97-079	5	Bengal	5
NC97-433	11	Bienville	9
NC98-175	6	Hernandez	3
<b>Total</b>			<b>69</b>
<i>Pride of Sampson</i>			
	<i>2003 Elite nursery</i>		<i>2003 SSR nursery</i>
NC1528	6	NC93-50	10
	<i>2003 Dry Matter nursery</i>	NCC58	9
NC93-11	1	L96-117	4
NC96-27	3	Tib 4	12
Bienville	10	W250	2
Tib 4	4		
<b>Total</b>			<b>61</b>
<b>On Farm Grand total</b>			<b>186</b>

Table 4a. 2004 National Sweetpotato Collaborators/Advanced Yield Trial, HCRS, Clinton, NC Planted: 16Jun04; Harvested: 05Oct04; Days to Harvest: 111.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		Bu/A	%Beau	% Hern	No.1's	Canners	Jumbo's	Culls
NC98-608 G2	688	649	88	105	54	26	15	6
NC98-608 G7*	708	642	87	105	51	29	10	10
NC99-088*	438	351	48	56	45	33	3	19
NC99-524*	769	585	80	95	37	37	2	24
NC99-573*	638	627	85	101	50	42	6	2
B94-14G2	767	736	.	120	54	34	9	4
Hernandez G4*	647	623	85	.	61	26	10	3
L99-35	660	640	87	104	58	33	6	3
Grand Mean	664	607	80	98	51	32	8	9
CV (%)	10	12	13	13	16	19	59	72
LSD (p=0.05)	89	95	14	17	10	8	6	8

All trials are reported in 50 lb. bu.

\*Not official entries

Table 4b. 2004 National Sweetpotato Collaborators/Advanced Yield Trial at HCRS, Clinton, NC - Trait Data. Please see Keys to Tables section at the end of this report for descriptions to the abbreviations.

CLONE	MAT	DM	L/D	SKC	SKT	FL	EYE	LEN	SH	SHV	APP	Comments
NC98-608 G2	M	21	1.5	rs	sm	3	7	7	6	7	7	Short, chunky, cull-MSH
NC98-608 G7	M	22	2	rs	sm	3	7	7	6,3	6	7	Short, chunky, cull-MSH
NC99-088	M	25	3	rs	sm	3.25	8	8	3,6	6	5	drop for low yld, CS cull-CR, FW,
NC99-524	M	19	2.5	rd	sm	3.5	6	7	3,6	7	5	VN, diseases
NC99-573	M	18	3	rs	v sm	3	6	8	3,6	7	6	~CR, RKN?
B94-14G2	E	21	2.5	rs	sm	3	8	8	3,6	7	7	
Hernandez G4	ML	22	2.5	cu or	ms	3.5	6	7	3,6	7	6	~pi's
L99-35	M	20	2.5	rs	sm	3.25	8	8	3	7	7	v elliptic, cull-MSH, nice

Comments: 98-608, Beauregard and Hernandez all very good

Table 5a. 2004 National Sweetpotato Collaborators/Advanced Yield Trial at CRS, Kinston, NC. Planted: 10Jun04; Harvested: 20Oct04; Days to Harvest: 132.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	% Hern	No.1's	Canners	Jumbo's	Culls
NC98-608 G2	975	932	92	93	62	29	4	4
NC98-608 G7	999	962	95	95	56	33	8	4
NC99-088	810	602	59	59	37	38	0	26
NC99-524	851	721	71	71	20	64	0	15
NC99-573	973	945	93	94	37	54	5	3
B94-14 G2	1092	1017	.	101	58	29	6	7
Hernandez G4	1071	1018	100	.	59	24	12	5
L99-35	844	780	77	78	51	36	4	8
Grand Mean	952	872	84	85	48	38	5	9
CV (%)	10	10	11	11	14	13	70	53
LSD (p=0.05)	108	107	11	11	8	6	4	6

Table 5b. 2004 National Sweetpotato Collaborators/Advanced Yield Trial at CRS, Kinston, NC - Trait Data. Please see Keys to Tables section at the end of this report for descriptions to the abbreviations.

CLONE	MAT	DM	L/D	SKC	SKT	FL	EYE	LEN	SH	SHV	APP	Comments
NC98-608 G2	M	20	2	rs	ms	3.25	7	7	3,6	7	7.7	exc size dist., v good sh tail end lighter
NC98-608 G7	M	20	2.5	rs	ms	3.25	7	7	3,6	7	7.3	skin color
NC99-088	M	22	3.5	dk rs	ms	3	7	8	3,4	6	5.2	L, CR, drop
NC99-524	ML	18	3	red	sm	3.25	7	7	3,6	6	5.3	CR, large set too many roots? L
NC99-573	ML	17	3	rs	sm	3.25	7	8	3,6	6	6.0	
B94-14 G2	M	18	3	rs	ms	3	8	8	3,6	6	7.0	
Hernandez G4	M	19	3	or	ms	3.5	7	7	3	7	7.8	good size dist
L99-35	M-ML	19	2.5	rs	ms	3.5	8	8	3	7	6.3	v elliptic, ^roots

Comments: High yielding test. 98-608 showed some color variation getting lighter from the stem to the distal end.

Table 6a. 2004 Preliminary 1 Yield Trial at HCRS, Clinton, NC. Planted: 09June04; Harvested: 06Oct04; Days to Harvest: 119.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	%Hern	No.1's	Canners	Jumbo's	Culls
00-101	888	829	111	128	64	16	13	7
00-720	914	846	109	129	59	20	13	8
00-748	736	692	91	107	52	40	3	6
98-608 G2	742	674	90	103	57	25	9	10
99-026	804	721	94	111	63	24	4	10
99-573	971	907	119	139	64	24	6	7
B94-14 G2	883	791	.	120	57	28	6	10
Hernandez G4	689	657	85	.	63	26	7	4
L99-35	815	737	98	113	63	25	3	10
Grand Mean	827	762	100	119	60	25	7	8
CV (%)	13	13	11	14	10	31	83	53
LSD (p=0.05)	163	142	16	24	9	11	NS	NS

Table 6b. 2004 Preliminary 1 Yield Trial at HCRS, Clinton, NC - Trait Data. Please see Keys to Tables section at the end of this report for descriptions to the abbreviations.

CLONE	MAT	DM	L/D	SKC	SKT	FL	EYE	LEN	SH	SHV	APP	Comments
00-101	ME	18	2	lt cu	sm	3.5	7	6	3	5	5.3	BR, ~VN ^T, Ruby
00-720	EM	21	2	rs	sm	3.5	7	8	3,5	6	6.3	replacement?
00-748	ML	28	3	cr	sm	1.5	6	6	3,6	6	6.0	~VN, LE
98-608 G2	EM	21	1.5	rs	ms	3	8	7	6,3,2	6	6.5	^round shapes light skin, nice
99-026	EM	19	2	lt cu rs	sm	3	7	8	3,6	6	6.3	shapes, CR v nice shapes, uniform
99-573	ME	18	2.5	rs	sm	3.25	6	8	3,6	8	7.3	uniform
B94-14 G2	EM	20	2.5	rs	msm	3	8	8	3,6	5	6.0	^poor shapes
Hernandez G4	M	20	2.5	cu o	ms	3.5	5	8	3,6,5	6	6.5	PI's L, mixed
L99-35	EM	20	3	rs	msm	3.5	8	7	3	5	6.0	shapes

Comments: A couple of lines had very nice shapes, Beauregard was not one of them.

Table 7a. 2004 Preliminary 1 Yield Trial at CRS, Kinston, NC. Planted: 08Jun04; Harvested: 12Oct04; Days to Harvest: 126.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	% Hern	No.1's	Canners	Jumbo's	Culls
98-608 G2	863	801	102	91	66	17	10	7
99-026	812	726	93	83	57	26	7	10
99-573	960	855	109	97	50	36	4	11
00-101	1007	974	124	111	64	16	17	3
00-720	1003	948	122	108	53	27	14	5
00-748	807	751	96	85	55	34	4	7
B94-14 G2	868	808	.	92	62	24	7	7
Hernandez G4	921	880	113	.	58	34	4	4
L99-35	865	845	109	96	63	29	5	2
Grand Mean	901	843	109	95	59	27	8	6
CV (%)	9	12	10	12	19	25	63	107
LSD (p=0.05)	124	145	16	17	NS	10	7	NS

Table 7b. 2004 Preliminary 1 Yield Trial at CRS, Kinston, NC - Trait Data. Please see Keys to Tables section at the end of this report for descriptions to the abbreviations.

CLONE	MAT	DM	L/D	SKC	SKT	FL	EYE	LEN	SH	SHV	APP	Comments
98-608 G2	M	20	2	rs	m flk	3	7	7	3.5	6	6.5	
99-026	M	20	2	cu	sm	3	7	6	3,6	6	6.0	g size distribution
99-573	M	19	3.5	rs	sm	3.5	7	7	3	6	5.5	L, ~curves
00-101	M	18	2.5	lt cu	ms	3.5	7	7	3	6	5.0	~T
00-720	M	19	3	rs	ms	3	7	8	3	6	6.3	
00-748	ML	28	2.5	cr	ms	1.5	7	6	3,6	7	6.8	g shapes
B94-14 G2	M	19	2.5	rs	ms	3	8	7	3	6	7.0	1 RC, culls- CR
Hernandez G4	M	22	2.5	org	ms	3.5	6	7	3	6	6.8	~SPR, ^nice, g size dist.
L99-35	M	20	3	rs	ms	3.5	8	8	3	7	6.5	nice, no junk

Comments: Lines sized up similarly, with no differences in %No.1's. 00-101 and 00-720 produced more jumbo's. 00-101 also held up well in the field soil rot test and will be used as a parent in the 2005 nurseries.

Table 8a. 2004 Preliminary 2 Yield Trial at HCRS, Clinton, NC. Planted: 09June04; Harvested: 11Oct3; Days to Harvest: 124.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	% Hern	No.1's	Canners	Jumbo's	Culls
98-608 G2	628	608	94	95	63	30	5	3
01-015	773	607	90	89	46	30	1	23
01-214	800	713	112	115	58	30	0	11
01-334	780	684	107	108	59	21	8	12
01-351	840	539	78	77	48	14	1	37
01-362	902	535	81	82	39	21	0	39
B94-14 G2	751	666	.	99	60	23	6	11
Hernandez G2	711	698	103	.	61	33	4	2
Pur01-192	793	701	104	104	49	9	28	13
Grand Mean	775	639	96	96	54	24	6	17
CV (%)	19	19	23	24	16	28	80	51
LSD (p=0.05)	NS	NS	NS	NS	13	10	7	12

Table 8b. 2004 Preliminary 2 Yield Trial at HCRS, Clinton, NC - Trait Data. Please see Keys to Tables section at the end of this report for descriptions to the abbreviations.

CLONE	MAT	DM	L/D	SKC	SKT	FL	EYE	LEN	SH	SHV	APP	Comments
98-608 G2	M	19	2.5	rs	ms	3.25	7	8	3,6	7	6	
01-015	M	18	3	red	ms	3	8	7	3,6	6	5	CR, FW, ~B
01-214	M	22	2	cu rs	ms	3	8	8	3	6	5	T, short
01-334	M	17	2	pi/ rs	ms	3.25	8	7	3	6	6	~T, ~CR
01-351	ME	15	2	buff	sm	3.25	6	7	3,6	6	6	BR, light skin, ^CR
01-362	M	17	3.5	rs	ms	3.25	8	7	3,4	6	5	L, CR, FW
B94-14 G2	M	19	2.5	rs	ms	3	8	6	3	6	6	
Hernandez G2	ML	21	3	org	ms	3.75	6	7	3	7	6	~PI
Pur01-192	E	28	2.5	dk pur	ms	pur	8	6	3,6	6	6	LG, few but large roots

Comments: A tough test for shape and quality. 98-608 and Hernandez stood out for few culls, which were mainly for cracking and shape.

Table 9a. 2003 Preliminary 2 Yield Trial at CRS, Kinston, NC. Planted: 12Jun03; Mowed: 30Sept; Harvested: 17Oct03; Growing Days: 110.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	%Hern	No.1's	Canners	Jumbo's	Culls
01-015	806	669	80	82	50	30	4	17
01-214	908	789	95	96	42	44	1	13
01-334	901	795	96	97	58	24	6	11
01-351	950	681	82	83	51	20	1	28
01-362	1094	801	96	97	45	26	3	26
98-608 G2	846	780	94	95	67	20	5	8
B94-14 G2	919	841	.	102	62	22	7	9
Hernandez G2	925	832	100	.	46	39	5	10
Pur01-192	572	511	61	63	54	24	11	10
Grand Mean	880	744	88	89	53	28	5	14
CV (%)	12	11	10	9	12	19	111	60
LSD (p=0.05)	149	114	13	12	10	8	NS	13

Table 9b. 2004 Preliminary 2 Yield Trial at CRS, Kinston, NC - Trait Data. Please see Keys to Tables section at the end of this report for descriptions to the abbreviations.

CLONE	MAT	DM	L/D	SKC	SKT	FL	EYE	LEN	SH	SHV	APP	Comments
01-015	ML	18	2.5	red	ms	3	6	7	3	6	5.0	B, culls - CR
01-214	ML	21	2.5	rs	ms	3	8	7	3	5	5.3	late, ^roots set
01-334	M	17	2.5	rs pi	sm	3	7	7	3	6	5.5	tight cluster, RC, drop
01-351	M	18	2	buff	ms	3.25	8	8	3,6	7	6.3	BR, ~CR, size + sh~608
01-362	M	16	3.5	cu rs	ms	3	7	8	3	4	4.8	CR, L, RT
98-608 G2	M	19	2	dk rs	s flk	3.25	8	7	3,6	7	7.0	
B94-14 G2	M	19	2.5	rs	ms	3	8	7	3	6	7.0	~CR
Hernandez												
G2	M	20	2.5	org	ms	3.5	6	7	3	6	6.3	~T
Pur01-192	M	27	2.5	dk pur	ms	pur	7	7	6	6	5.3	LG, ^ g shape

Comments: A high yielding test with significant cracking in certain clones. Best packout and appearance: 98-608 and B94-14 G2.



## Keys to Tables

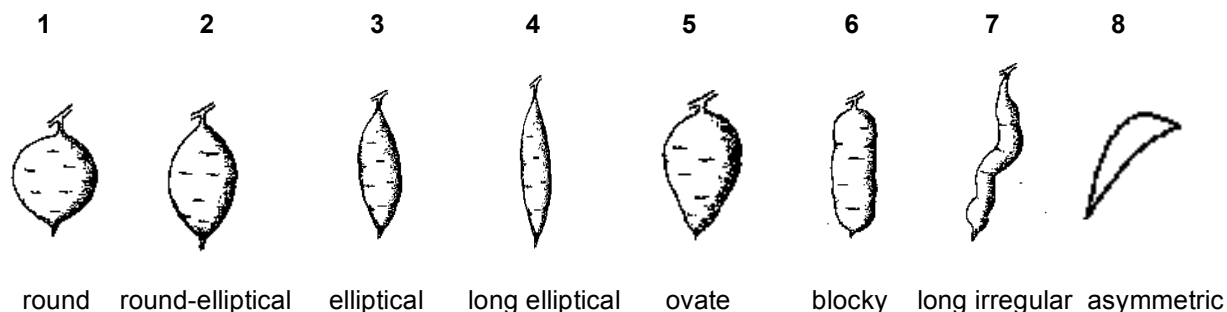
**Storage root data:** **MAT**=maturity E=early, M=mid and L=Late; **DM**=percentage dry matter; **L/D**=length/diameter ratio; **SKC**=skin color clr=clear cu=copper, lt=light, or=orange, pi=pink, pu=purple, rd=red, rs=rose, tn=tan wh=white; **SKT**= skin texture, m fl= moderate flakiness of skin, l fl= light flakiness to skin, ms=moderately smooth, sm=smooth; **FL**=flesh color (0-5 scale where 0=pure white, 1= cream, 2=yellow, 3= medium orange, 4=deep orange, 5= very deep orange; **EYE**=eyes(0-9); **LEN**= lenticels (0-9); **SH**=Shape (see diagram); **SHV**=shape variability(0-9); **APP**=overall appearance (0-9). All 0-9 scales go from low or poor to high or good.

**Comment codes:** **AT**=tough attachment; **B**=bumpy shapes; **BR**=breeding only; **BSR**=bacterial soft rot; **CR**=cracking; **CRK**= crooked shapes; **CS**=circular spot; **CV**=skin color variation end to end; **D**=drop; **EY**=deep eyes; **FB**=fleabeetle damage; **HC**=horizontal constrictions; **ID**=unspecified insect damage; **IRR**=irregular; **JL**=jumbo's for length; **L**=long; **LE**=lenticels; **LG**=longitudinal grooves; **LR**=Lateral rings; **LT**=latex; **MSH**=misshappen roots; **NS**=nice shapes; **OV**=ovate or pear shapes; **PI**=pimples (0-9); **PN**=pencil roots; **PP**=pulled plants; **R**=rodent; **RC**=russet crack; **RG**=restaurant grade; **RH**=root hairs; **RKN**=root-knot nematodes; **RSK**=rough skin; **RT**=rot; **SD**=skin discoloration; **SH**=sheen; **SG**=string roots; **SK**=skinning; **SO**=souring; **SPR**=sprouts; **SR**=soft rot; **SS**=stays short; **SSR**=streptomyces soil rot; **STR**=Striations; **T**=tails; **TP**=tapered roots **VN**= veins; **SC**=scurf; **SF**=surface Fusarium; **WB**=whitefringed beetle; **WG**=white grub; **WW**=wireworm; **YCR**=yellow cortical ring; **YLD**=yield; **2°R**=secondary roots.

↑ = lots, ~ = moderate, ↓ = little or poor

(Rating scale: 0 = very severe to 9 = absent)

## Shapes



## Acknowledgements

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