

2006 PROGRESS REPORT
To
North Carolina SweetPotato Commission

TITLE: Sweetpotato Breeding and Variety Development Support

LEADERS: G. C. Yencho and K. V. Pecota

DEPARTMENT: Horticultural Science

REPORT:

Project Objective(s): The objectives of the Sweetpotato Breeding and Genetics Program are: 1) to develop high quality sweetpotato varieties for North Carolina growers that possess exceptional yield, appearance, quality, and disease and insect resistance characteristics; 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 research. Highlights of our 2006 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. Overall, we experienced a very productive year.

1. The variety Covington, officially released during 2005, continued to grow in importance in NC during 2006 and we expect over 20,000 acres of Covington to be produced in 2007. Many, but not all, reports on the performance of Covington (yield, shape, storage quality, pack-out potential, plant bed productivity and plant stand establishment) have been very favorable, but we are monitoring its performance very closely since it is so new.
2. A Plant Patent Application for Covington is pending and we expect that it will be granted in 2007. The licensing fee and royalty agreement, established for in-state and out-of-state producers in consultation with the NCSPC and the NCCSPSGA, was finalized and is being closely monitored. Revenue generated will benefit the breeding program and contribute to its long-term sustainability.
3. In our paired-cross and polycross breeding nurseries we continued our vigorous breeding efforts and generated nearly 65,000 true seed. These crosses represent the foundation of our program's efforts. Roughly two-thirds will be planted in the field for evaluation during 2007.
4. In our table-stock early generation breeding plots, we planted 45,175 true seed in research station and on-farm sites, and made 637 new seedling selections. We also planted 580 second-year and 76 third-year selections at the HCRS and CRS as 20-hill and 100-hill plots from which 79 and 30 selections were made, respectively. Each of these selections has the potential to be a new variety, but further testing is required.
5. In our preliminary and advanced clone evaluations, we conducted 9 replicated yield trials of at the Horticultural Crops Research Station (HCRS), Clinton and the Cunningham Research Station (CRS), Kinston. NC99-573 was grown for the first time as virus-indexed material and performed well. In 2007 it will be entered into several more replicated trials, our on-farm evaluations and into the National Sweetpotato Collaborators Group Trials.
6. We completed our ninth year of the Grower-Participatory Breeding Project (GPBP) and evaluated 20 advanced or preliminary lines in unreplicated trials at our three GPBP sites. Detailed results of these evaluations are reported on in the GPBP report.
7. In our disease nurseries, we evaluated 164 clones for field resistance to *Streptomyces* soil rot (SSR) in replicated 5-hill plots in our disease nursery at the HCRS. These clones were also screened for *Fusarium* wilt, root-knot nematode and SSR resistance in replicated greenhouse and field trials.
8. With the MPU, we continued our long-standing collaboration with Dr. Zvezdana Pesic-VanEsbroeck

by providing new clones for clean-up and testing, and assisting with the design and evaluation of the “seed source” tests conducted at the HCRS. Detailed results of these evaluations are reported on in the MPU report.

9. We continued our collaboration with Dr. Bryon Sosinski, Director, CALS Genome Research Laboratory and Assistant Professor in Horticultural Science on a sweetpotato applied genomics project to address long-term breeding needs in sweetpotato and develop new breeding tools. As part of this project Mr. Jim Carlos Cervantes, a PhD student working with the program, completed his genetic map of sweetpotato and has tagged genes for yield, resistance to sweetpotato feathery mottle virus and root knot nematodes, dry matter content and beta-carotene production in sweetpotato. To the best of our knowledge, we are the first sweetpotato breeding program to do this worldwide. Along with this study, we are continuing our efforts to establish genetic fingerprints of our Plant Patented varieties to enable infringement enforcement as needed.
10. We also continued our collaboration with Dr. Den Truong, USDA-ARS to evaluate the processing and fresh cut potential of several orange-fleshed clones including Beauregard and Covington, and continued our project to determine the inheritance of anthocyanins in purple-fleshed sweetpotatoes and their potential nutraceutical and natural colorant properties.
11. 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. Several putative insect resistant parents have been identified in this project to date and we have begun making paired crosses amongst them.

Project Cooperators

Researchers	Extension	Growers
Dr. Bryon Sosinski	Mr. William Little	Mr. Mike Hocutt
Dr. Zvezdana Pesic-VanEsbroeck	Mr. Allan Thornton	Mr. Johnny and Terrill Williams
Dr. Jonathan Schultheis	Mr. Mark Seitz	Mr. Kendall Hill
Dr. Den Truong		
Dr. Gerald Holmes		
Dr. Charles Averde		

2006 Polycross Breeding Nurseries

Two polycross nurseries were established at the Central Crops Research Station (CCRS) in Clayton in 2006. The **Elite Nursery**, designed to produce materials with the potential to become varieties, contains 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**, dedicated to developing parents with high levels of soil rot resistance has parental breeding material developed by NCSU, LSU, and the USDA. Table 1 provides results of the seed harvests per maternal parent for the Elite and SSR nurseries. This was an off year for seed production, however enough has been produced for this season’s planting. We also have a large amount of very good remnant seed from the previous several years. We will look at the performance of the offspring from these nurseries and plant seed from the lots that produced the best advanced and breeding clones. This may actually increase the average quality of the seedlings in 2007.

First-Year Seedling Selections

Research Station Trials

Over 40,000 true seed from the 2005 Elite and SSR polycross nurseries were grown in the Horticultural Department greenhouses starting in February. An additional 2550 were grown from selected parents from the 2004 Elite and 2040 from the 2004 SSR nurseries. Seedlings were not evaluated for flesh color because less than 10% of the seedlings screened for this trait are white or cream-fleshed. Also, we are actively pursuing white-fleshed 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.

Table 2 contains a list of the selections made by nursery and maternal parent at the CCRS. A total of 187 selections were made from the 13,037 seed planted from the soil rot nursery for a selection rate of 1.4%. The 12,250 seed from the Elite nursery yielded 231 selections, a rate of 1.9%. Our long-term average is 1.4%. The 2004 seed yielded 34 and 35 selections from the Elite and SSR nurseries for selection rates of 1.3% and 1.7%.

In addition to the above, we planted 5,384 seed from dry matter nurseries. Half of this seed was seed from an African population with very high levels of virus tolerance. These, however, were very poorly adapted with many not producing storage roots. 41 hills were selected from 2792 seed, a rate of 1.5%. 82 selections were made from 2592 polycross nursery seed for a 3.2% selection rate. Shapes do not have to be as pretty as for table-stock material and many of these lines will be discarded for lack of disease resistance and for not having high dry matter content.

On-Farm Trials

For the Grower-Participatory Breeding Project, three on-farm sites were used to evaluate 15,300 seedlings. The parents and selections are shown in Table 3. 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>
Mark Seitz	Tull Hill Farms
William Little	Hocutt Farms
Allan Thornton	Terrill and Johnny Williams

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 of seedlings. Selections were made in cooperation with extension personnel and growers. Growing conditions varied from site to site. Selection criteria were based on the appearance of the check varieties Beauregard and Covington. These selections will be planted at the HCRS and CRS in 2007 as unreplicated 25-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 1.3%.

During 2002, we established a second component to the GPBP and began evaluating promising breeding lines under commercial conditions. In 2006, 20 advanced and preliminary 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 2005, we made 637 first-year table-stock seedling selections. A few of these rotted in storage or did not sprout in the spring. The remainder (ca. 580) were planted in 25-hill plots at the HCRS and CRS in 2006. 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. This year only 6 overlapping selections were chosen at both sites, a very low number and probably due to the tough conditions at the HCRS. An additional 53 were selected at the CRS and 20 at the HCRS; thus 79 selections remain out of the 580 planted. This number is about the percentage we typically save at this level.

Third-Year Selections

The 76 second-year selections made in 2005 were planted as unreplicated 100-hill plots at the HCRS and CRS in 2006. We selected 30 for further evaluation with ten 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

Thirty-three advanced selections were evaluated this year. Five have been dropped, twenty have been designated as breeding lines only, and the remainder will be tested again in 2006. The most promising clones are described below.

Covington was released during 2005 based on its performance over six years (see summary table below). 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 11% jumbo's vs. 15% for B94-14 G2, and producing fewer culls, 8% vs. 13% for Beauregard averaged over 36 yield tests (3 in 2001, 7 each 2002 and 2003, and 6 each in 2004 and 2005 and 7 in 2006). We have not seen russet crack in Covington, and the generations used in the 2001 to 2004 were G4 to G7. Since then G2 has been used in the trials. The shapes of Covington 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, Covington 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 Covington is given an additional one to two weeks it will size more canners into the No. 1 class, but relatively few No.1's will become jumbo's further enhancing its productivity. Occasionally root skin color may be noticeably lighter from the stem to distal end. The Beauregard check lines in these same trials showed some of this effect in the same tests, but not as much. In terms of disease resistance, Covington has tested resistant to Fusarium wilt, and moderately resistant to Streptomyces soil rot and southern root-knot nematodes. It has held up well in our field SSR disease nursery which has become a general disease screen as well.

Average performance of Covington and B94-14 Beauregard over 3 yield tests in 2001, 7 in 2002, 7 in 2003, 6 in 2004, 6 in 2005 and 7 in 2006.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class			
				(% of total yield)			
		Bu/A	%Beau	No.1's	Canners	Jumbo's	Culls
Covington	808	741	106	58	24	11	8
B94-14 G2	872	756	100	54	18	15	13

Note: % Beauregard is determined by adding the percentage Beauregard for each test, then dividing by the number of tests. There were two tests where Covington 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 98%.

SUMMARY DESCRIPTION - Covington

Status Released. Plant patent pending.
Plants:
 Vine: Trailing, dense canopy
 Leaves: Heart-shaped to slightly lobed, green
 Sprout production: Good, but short internodes
 Transplant survival: Excellent

Storage roots:

Shape: Blocky, stays short
 Skin color: Rose to dark 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: Good
 Consumer quality: Good baking and canning quality

Remarks: Desirable attributes include highly attractive, short roots with high packout.
 Similar appearance to Beauregard, but more stable shapes.
 Slight end-to-end color variation occasionally observed.
 Tendency to form round storage roots in cold or heavy soils.
 Russet crack has not been observed.
 Susceptible to damage by Dual and Sandea herbicides

Yield Trial Data: see table above

NC99-573

This clone produces attractively shaped, smooth skinned, rose-colored roots. Yield is high with a growing season about 10 days longer than Beauregard. Rows of eyes are a concern for appearance, and lenticels are fairly prominent in wet conditions. It is susceptible to root-knot nematodes. This clone is now virus-indexed and was evaluated as G2 material in 2006.

Average performance of NC99-573, B94-14 Beauregard and Covington over 1 yield test in 2002, 4 in 2003, 4 in 2004 and 4 in 2005 and 5 in 2006.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	%Cov	No.1's	Canners	Jumbo's	Culls
NC99-573	942	853	112	108	53	27	10	9
B94-14 G2	916	801	100	101	53	20	15	12
Covington	855	784	105	100	58	22	12	8

SUMMARY DESCRIPTION - NC99-573

Parentage: L87-95, open pollinated from the 1998 Parallel nursery

Plants:

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

Storage roots:

Shape: Fusiform to 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
 Root-knot nematodes: Susceptible
 Storability: Has not been stored commercially yet
 Consumer quality: OK baking quality, canning quality unknown
 Remarks: Desirable attributes include highly attractive, smooth skinned fusiform roots. Yields are very high. Storage needs to be tested under commercial conditions. Can set a high number of roots making it late. Spacing and fertility need to be optimized. Very similar shapes and appearance to Beauregard.

Yield Trial Data: see table above
Disposition Will be extensively trialed in advanced and on-farm trials during 2007. Is an official entry into the National Sweetpotato Collaborators Trial.

NC99-573 has been entered into the MPU and been virus indexed. It does have moderately prominent rows of eyes and can be long on occasion. It tends to set more roots than Beauregard.

In addition to NC99-573, 8 additional advanced clones will be evaluated in 2007. Many clones that fall short of becoming a named variety are used as parents based on the multiple tests gathered for release potential. We have twenty lines that are being evaluated for breeding potential and inclusion in the 2007 nurseries. The results of yield tests that included these clones and other promising selections are presented in Tables 4-10. 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.

Purple-Fleshed Breeding Project

Six years ago we began breeding for sweetpotatoes with high levels of anthocyanin content. Our initial efforts focused on identifying material with purple flesh from the US germplasm repository, and acquiring germplasm from international sources. During last three years we made paired crosses using the best purple-fleshed material we had, with well adapted US clones. In 2004, we planted 6,653 seed resulting in 117 selections. Twenty-nine of these were selected in 2005 based on field performance and 14 selected in 2006 based on field performance and anthocyanin content in collaboration with Dr. Den Truong in Food Science. In addition to the paired cross seed, we obtained and evaluated 575 seed from a polycross nursery acquired from the International Potato Center (CIP). We made 37 selections from these in 2004, but kept only four in 2005. Most were very poorly adapted to our growing conditions. They had good color but very low yield and poor shapes. These were used as parents in 2005 with seed grown out in 2006. We grew 4,055 seed from 50 paired crosses from which 90 selections were made, and 575 seed from CIP from which 14 selections were made. Thirty-three of these were saved in 2006. In 2006 we planted out 6973 true seed and made 53 selections. Our standards were higher in 2006 given that we had better material to select from. Now a selection has to have decent horticultural characteristics in addition to good color.

Our goals are quite diverse for the purple-fleshed materials and include 1) fresh market cultivars, 2) chipping lines, and 3) natural food coloring. Crosses have been made between purple-fleshed clones and clones varying widely in dry matter to produce a wide range of physical properties suited for these different purposes. Evaluation for horticultural traits will be done the same as for table-stock lines, though selection standards will not be as strict until better lines are obtained. Prototype lines were tested on two of the GPBP trials in 2005 and 2006. This will continue in 2007 to help us rapidly identify ones adapted to NC growing conditions. Our collaboration with Dr. Truong to characterize both the pigments and physical properties is vital for the success of this project.

Disease Resistance Screenings

In addition to the selection and yield evaluation trials, we screened 164 advanced, preliminary, and parental lines for resistance to *Streptomyces* soil rot in the field and 94 of these in the GH. Of the GH lines, 20 of the lines were resistant, 16 had moderate resistance, 31 were moderately susceptible and 27 were rated as susceptible. Most of the susceptible lines were either high dry matter or purple-fleshed clones. 152 of these lines were also screened for resistance to southern root-knot nematode with 53 resistant, 26 moderately resistant, 25 moderately susceptible, 27 testing susceptible and 21 highly susceptible. Resistance and susceptibility was across all types. The Fusarium test, usually our most reliable, failed three times, we are working to find out what has happened and then to retest the lines. All cultivars released from the program must have fusarium resistance.

Our field SSR screening nursery has completed its ninth year. Soil rot incidence was moderate, but there was considerable damage due to circular spot, and some 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 in this site should have high levels of multiple disease resistance. This plot has allowed us to pick parents with multiple disease resistances under field conditions for use in our nurseries. In years with high soil rot pressure, we use this field to measure yield reduction caused by SSR on advanced clones being considered for release. Results of the 2006 test (Table 11) show large differences in marketable yield, but clones differ in the reason why. Some have very high total yield, but the diseases made many of them culls (ex. 01-362), while for others the total yield is vastly reduced versus resistant clones (ex. Jewel). Besides affects on yield the field trial gives information on whether 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.

2006 National Sweetpotato Collaborator Trials

In 2006 our National Sweetpotato Collaborators trial was conducted at the CRS. Tables 4a and 4b present the results of the trial. NC99-573 had the highest marketable yield, though this was not significantly different from Covington. Covington had the best pack-out with 71% being No.1 roots, 19% canners, 9% jumbo's and only 1% culls. It had uniform, chunky shapes. Overall appearance ratings were the same for NC99-573 and Covington with B94-14 G2 one step down due mainly to some souring in the first rep and culls for misshapen roots. B63 Beauregard, the LA check in this trial, was another step down both for misshapes and a poor size distribution, 24% of the roots being jumbo's. L99-35, the LA entry had a number of hills with one large root and a number of canners, leading to a poor size distribution. However the plants came from an area in our beds that were having some problems and this may not be indicative of the performance of this line. There was also a purple skinned, cream fleshed entry this year, L01-29. It is aimed at replacing the current Japanese type. It has much better disease resistance, though the yield was a little lower in this trial than the Japanese. Shapes were more variable and it had significant secondary root development. It did not show the skinning as much as Japanese. 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).

Cunningham Research Station National Sweetpotato Collaborators Trial - 2007
Description of Official Entries -

Beauregard (B94-14 G2) - Rose skin, orange flesh, moderately smooth skin, fusiform, and blocky shapes, early to mid season. Some geotricum (souring) Overall appearance = 6.

Beauregard (B63 G2) - Rose skin, orange flesh, moderately smooth skin, fusiform and blocky shapes, early to mid season. High percent jumbo's, many misshapen, some russet crack. Overall appearance = 5.

Covington (G2) - Rose skin, orange flesh, moderately smooth skin, round elliptic to round shapes, mid to early season. Length/diameter ratio = 2. Overall appearance = 7.

L99-35 (G3) – Rose skin, very deep orange flesh, moderately smooth skin, elliptic shapes, mid to late season. Many misshapen and tapered roots. Poor size distribution, but plant quality probably a factor. Overall appearance = 5.

NC99-573 (G2) – Rose skin, orange flesh, smooth skin, elliptic and blocky shapes, early to mid season, rows of eyes, good size distribution. Overall appearance = 7.

L01-29 (G2) – Purple skin, cream flesh, moderately smooth skin, elliptic and ovoid shapes, mid-late season. Length/diameter ratio = 2.5. Shapes variable, moderate secondary roots. Overall appearance = 5.

NC Japanese (G4) – Purple skin, cream flesh, smooth skin, elliptic, long elliptic and blocky shapes, mid season. Some long, length/diameter ratio = 3. Some russet crack, shows skinning. Overall appearance = 6

Table 1. Sweetpotato True Seed Harvested in 2006.

Maternal Parent	No. Seed/Polycross Nursery		Total
	CCRS, Clayton		
	Elite	SSR	
1880	---	8565	8565
96-61	937	3716	4653
97-166	403	---	403
97-433	2220	---	2220
97A-04	621	---	621
97A-45	---	6822	6822
99-026	---	3801	3801
99-524	1806	---	1806
99-573	2624	3949	6573
00-677	991	---	991
00-720	---	2167	2167
01-156	---	1455	1455
01-214	3717	---	3717
02-350	---	4467	4467
02-423	---	3046	3046
02-459	---	3684	3684
C58	985	436	1421
Covington	0	---	0
L87-95	751	---	751
L95-95	1482	---	1482
L99-35	1067	---	1067
Norton	---	3	3
Ruddy	1204	2140	3344
Tib 4	---	1622	1622
	18808	45873	64681

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

Table 2. 2006 Sweetpotato seedlings selected at the CRS, Kinston.

Maternal parent	# selections	Maternal parent	# selections
<i>Seed from the 2005 Elite nursery</i>			
NC93-50	22	NC00-101	7
NC97A-04	18	NC00-677	9
NC97-166	16	NC01-214	17
NC97-433	19	NC01-351	11
NC98-076	17	L99-35	12
NC99-524	23	Ruddy	18
NC99-573	31	W250	11
Total			231
<i>Seed from the 2005 SSR nursery</i>			
NC1880	6	NC02-459	14
NC96-61	17	NC C58	3
NC97A-45	21	Bienville	9
NC99-026	18	Jasper	2
NC99-088	11	L99-35	9
NC99-573	16	Ruddy	10
NC00-720	14	Tib4	24
NC01-362	5	Unk-05	8
Total			187
<i>Seed from the 2004 SSR + Elite nurseries</i>			
NC99-573 2004 Elite	16	NC C58 2004 SSR	11
Bienville	12		
Total			39
Grand Total			457

Seedling Selections Continued on Next Page

Table 3. 2006 Sweetpotato seedlings selected on farm.

Maternal parent	# selections	Maternal parent	# selections
<i>Williams, seed from the 2004 SSR, 2005 Elite and 2005 SSR nurseries</i>			
<i>2004 SSR nursery</i>		<i>2005 SSR nursery</i>	
NC97-433	7	NC00-720	5
W250	3	NC01-362	6
		NC02-459	6
<i>2005 Elite nursery</i>		Bienville	3
L99-35	5	L99-35	22
Ruddy	3	Ruddy	16
		Tib 4	16
Total			92
<i>Tull Hill Farm, seed from 2004, 2005 Elite and SSR Nurseries</i>			
<i>2004 Elite nursery</i>		<i>2004 SSR nursery</i>	
NC99-524	4	Tib 4	12
Ruddy	2		
<i>2005 Elite nursery</i>		<i>2005 SSR nursery</i>	
NC01-214	8	NC1880	3
NC01-351	3	NC96-61	1
L99-35	6	NC97A-45	11
Ruddy	1	NC99-088	4
W250	4	NC99-573	19
Total			78
<i>Hocutt Farms</i>			
<i>2004 SSR nursery</i>		NC97-166	3
NC C58	2	NC97-433	6
<i>2005 Elite nursery</i>		NC98-076	2
NC93-50	4	NC99-524	2
NC97A-04	6	NC99-573	9
Total			34
On Farm Grand total			204

Table 4a. 2006 National Sweetpotato Collaborators Yield Trial, CRS, Kinston, NC Planted: 21Jun06; Harvested: 02Oct06; Days to Harvest: 103.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		Bu/A	%Beau	% Cov	No.1's	Canners	Jumbo's	Culls
NC99-573 G2	917	890	121	110	64	22	11	3
NC99-573 BRD	953	906	123	111	60	28	7	5
B63	886	774	104	95	53	10	24	13
B94-14 G2	821	748	.	92	61	19	10	9
Covington G2	825	815	110	.	71	19	9	1
Japanese G4	784	691	94	85	64	20	4	12
L01-29	666	600	81	74	61	26	2	10
L99-35	704	628	84	77	54	34	1	11
Grand Mean	820	757	102	92	61	22	8	8
CV (%)	10	12	12	13	14	26	55	65
LSD (p=0.05)	101	105	15	14	10	7	6	6

All trials are reported in 50 lb. bu.

Table 4b. 2006 National Sweetpotato Collaborators 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
NC99-573 G2	EM	16	2	rs	sm	3.25	7	7	3,6	6	7	~CRK, ~OV, ^nice
NC99-573 BRD	ME	15	2.5	rs	sm	3	6	7	3,6	7	7	^uniform, short but not rnd
B63	EM	15	3	rs	ms	3	7	7	3,6	6	5	^MSH,RC, ^jumbo's
B94-14 G2	EM	17	2.5	rs	ms	3	7	7	3,6	6	6	~RT, G
Covington G2	ME	17	2	rs	ms	3.25	7	6	2	7	7	~RND, ~2oR, ^uniform shows skinning, L,
Japanese G4	M	31	3	p	sm	1.5	5	6	3,4, 6	6	6	~RC
L01-29	ML	29	2.5	p	ms	1.5	7	6	3,5	5	5	Var sh, ~MSH,~2oR ^hills w\1 big root+can.,
L99-35	ML	17	3	rs	ms	3.5	7	7	3	5	5	MSH, TP

Comments: A good test, though another week would have helped the pack-out of all but Beauregard. Covington a standout for pack-out, NC99-573 a standout for yield.

Table 5a. 2006 Advanced Yield Trial at CRS, Kinston, NC. Planted: 21Jun06; Harvested: 02Oct06; Days to Harvest: 103.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	% Cov	No.1's	Canners	Jumbo's	Culls
NC99-026	741	671	89	81	60	21	10	9
NC99-573 G2	887	838	111	102	62	25	8	5
NC00-720	922	664	88	81	48	18	5	28
NC02-350	999	867	115	104	57	26	5	13
B94-14 G2	864	778	.	93	66	11	13	10
Covington G2	894	839	109	.	71	16	6	6
Grand Mean	884	776	103	92	61	20	8	12
CV (%)	9	15	14	15	17	26	40	82
LSD (p=0.05)	122	171	22	21	15	8	5	15

Table 5b. 2006 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
NC99-026	M		2	lt rs	sm	2.75	6	7	3,6, 5	6	5	~OV, EY, mixed lengths
NC99-573 G2	M		2	rs	sm	3.5	7	7	3,6	7	7	v good shapes
NC00-720	M		2.5	d rs	sm	3	7	7	3,6	7	4	^^G, n app but ^rot
NC02-350	ME		3	rs	sm	3.5	7	7	6,3	6	6	^VN, ^MSH, BRD only
B94-14 G2	EM		3	rs	ms	3	7	7	6,3	7	5	~YCR, ~RT, ~CR, G
Covington G2	M		1.5	rs	sm	3	6	6	6,3	8	8	~YCR, no culls, Jum-dia.

Comments: A good test, Covington tops for appearance and pack-out. NC02-350 comes from an insect resistant background and may be useful as a parent for insect resistance.

Table 6a. 2006 Advanced Yield Trial at HCRS, Clinton, NC. Planted: 23June06; Harvested: 30Oct06; Days to Harvest: 129.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	% Cov	No.1's	Canners	Jumbo's	Culls
NC99-026	785	633	72	76	45	12	24	19
NC99-573 G2	1175	1033	115	121	47	13	28	12
NC00-720	1083	964	106	111	51	10	28	11
NC02-350	1107	777	85	89	41	24	5	30
B94-14 G2	1064	921	.	106	53	9	23	14
Covington G2	939	878	95	.	55	10	28	7
Grand Mean	1025	868	94	101	49	13	23	16
CV (%)	11	12	12	12	10	22	27	29
LSD (p=0.05)	173	157	17	19	7.5	4	9	7

Table 6b. 2006 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
NC99-026	ME	22	2	cu rs	sm	3.25	7	7	3,2	7	7	MSH, CR, ~SSR, NS
NC99-573 G2	M	18	2	rs	sm	3.25	6	7	3,6	7	7	MSH, ^NS, a couple rots
NC00-720	M	18	2.5	red	sm	3.25	7	7	3	6	6	~CR, MSH, ~RT
NC02-350	ML	19	3	rs	ms	3.25	7	7	3,6	6	6	^VN, MSH, ~CR, L
B94-14 G2	ME	18	2.5	rs	sm	3.25	8	7	3,6	6	6	MSH, G
Covington G2	ME	18	2	rs	ms	3.25	7	6	3,6	7	7	MSH, chunky, ^Jum for diameter

Comments: This was a tough site, a lot of cracking and misshapen roots. Should have been harvested three weeks earlier to reduce jumbo's but the site was too wet.

Table 7a. 2006 Preliminary 1 Yield Trial at CRS, Kinston, NC. Planted: 08June06; Harvested: 11Oct06; Days to Harvest: 125.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	% Cov	No.1's	Canners	Jumbo's	Culls
NC99-524	916	649	73	73	37	32	2	29
NC99-573 G2	1173	1068	119	120	49	32	9	9
NC01-334	991	802	90	90	57	16	8	19
NC01-351	1134	1030	116	116	62	23	6	9
NC01-362	1091	966	106	107	54	24	10	12
NC02-121	1188	1056	118	118	50	28	11	11
NC02-165	887	726	81	81	51	30	0	18
NC02-350	1153	919	103	103	45	29	6	20
NC02-423	1132	995	109	109	65	10	13	13
NC02-459	823	783	87	86	44	47	4	5
B94-14 G2	1090	904	.	100	46	8	29	17
Covington G2	985	919	101	.	65	23	5	7
Hernandez G2	1071	1010	113	114	69	19	6	6
Grand Mean	1050	918	102	102	53	24	10	13
CV (%)	13	16	16	16	12	25	63	44
LSD (p=0.05)	187	207	24	24	9	8	9	8

Table 7b. 2006 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
NC99-524	M	17	2.5	red	ms	3	8	7	3	5	4	^CV,RC? ^CR, D, rundown
NC99-573 G2	M	16	2.5	rs	sm	3	7	8	3	7	7	good, ^canner
NC01-334	M	15	2.5	rs	ms	3	8	7	3	6	6	~T, ~CR
NC01-351	M	14	2.5	clr	sm	3	8	7	3,6	6	7	vg size dist, ^ mid sz#1's, no junk
NC01-362	M	16	3	rs	ms	3	7	8	3	6	5	B, long AT, ~IRR
NC02-121	ML	19	3	rs cu	ms	3	7	7	3	6	5	~L, ^^can.,D
NC02-165	ML	17	3	cu org	sm	3.5	7	8	3,6	7	6	Late, g sh, ~CR
NC02-350	M	19	3	cu rs	ms	3.25	8	7	6,3	7	6	A bit L, ^VN D for VN
NC02-423	M	19	2	cu rs	ms	3.25	7	8	3,6	6	6	~CR, short, ~T, few roots
NC02-459	L	21	2.5	org	ms	3.25	8	8	3	7	6	L, TP, ~T, ~AT, BRD
B94-14 G2	E	15	2.5	rs	ms	3	8	8	3,6	6	6	~CRK, ^Jumbo, ~G
Covington G2	M	19	2	rs	ms	3	8	7	3	7	7	g sh, a few T
Hernandez G2	M	18	3	org	ms	3.5	6	6	3,6	7	7	Nice, ~T, ^PI

Comments: Covington and Hernandez were the best for pack-out and appearance. NC99-573 had too many canners to size up most to number ones. A number of these lines will be dropped.

Table 8a. 2006 Preliminary 1 Yield Trial at HCRS, Clinton, NC. Planted: 12Jun06; Harvested: 31Oct06; Days to Harvest: 141.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	% Cov	No.1's	Canners	Jumbo's	Culls
NC99-573 G8	1129	822	95	107	35	17	21	28
NC01-334	1026	649	72	84	27	16	20	37
NC01-351	1032	519	56	67	30	15	6	49
NC02-165	962	443	50	57	28	19	0	53
NC02-350	1230	801	88	103	29	19	17	35
NC02-423	1297	877	96	113	31	10	27	32
NC413#7M G2	670	484	53	63	28	41	3	28
B94-14 G2	1220	927	.	119	47	14	14	25
Covington G2	995	782	86	.	36	19	24	21
Hernandez	1198	951	104	122	36	17	27	20
Grand Mean	1104	868	80	95	32	18	17	33
CV (%)	12	19	22	22	23	29	42	28
LSD (p=0.05)	194	204	25.6	29.8	11	8	11	13

Table 8b. 2006 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
NC99-573 G8	M	15	2	rs	sm	3.25	7	7	3	6	6	NS for G8, ~CR, MS, ~PI D, BRD early, ^RND,
NC01-334	M	17	1.5	rs	sm	3	7	7	2,5	6	4	B,CR,tight hills BRD, ^^SSR,
NC01-351	ML	14	2	lt or	sm	3.5	7	6	3,6	7	4	NS
NC02-165	M	15	2.5	Co O	sm	3.5	7	7	3,6	6	5	^CR,~SSR,NS BRD-IR,~SSR,p
NC02-350	E	18	3	rs	sm	3.25	7	7	3	6	5	SH, AT,~VN, 2°R
NC02-423	M	18	2.5	lt rs	sm	3.5	7	7	3	6	6	^PI, ^CRK, ~CR,~FS?
NC413#7M G2	M	27	3	pur	ms	p3	7	7	3,6	6	6	^SSR,MS,nice for 413
B94-14 G2	M	16	2	rs	ms	3.25	7	7	3,6	7	7	MSh, ~CRK
Covington G2	M	19	1.5	Co rs	ms	3	7	7	6,2 6,3,	5	5	^RND, ~CRK ~OV, ~RND,
Hernandez	M	18	2	Co O	ms	3.5	5	6	5	6	5	EY,^PI

Comments: A tough site with high levels of Streptomyces and cracking, should have been harvested three weeks earlier. Culls for misshapes, cracking, Streptomyces and too round (most of Covington culls for being round).

Table 9a. 2006 Preliminary 2 Yield Trial at CRS, Kinston, NC. Planted: 08June06; Harvested: 12Oct06; Days to Harvest: 125.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	% Cov	No.1's	Canners	Jumbo's	Culls
NC03-066	1057	943	111	119	56	23	10	11
NC03-089	1071	999	116	126	47	43	3	7
NC03-114	753	707	81	90	54	37	3	6
NC03-239	1041	814	95	102	47	15	16	22
NC03-311	983	932	108	118	39	56	0	5
NC03-372	902	704	81	89	46	21	10	22
NC03-380	1287	1120	129	142	62	13	12	13
NC03-395	705	640	75	80	44	45	2	9
NC03-417	896	764	89	96	42	43	1	15
NC1528	810	590	69	75	44	25	3	27
B94-14 G2	961	877	.	111	50	5	36	8
Covington G2	898	793	93	.	56	16	17	12
Hernandez G2	1008	924	107	117	64	18	10	8
Grand Mean	952	831	96	105	50	28	10	13
CV (%)	11.4	12.6	12	13	14	17	47	36
LSD (p=0.05)	156	150	17	19.9	10	7	6	7

Table 9b. 2006 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
NC03-066	M	20	2	cu	ms	3	8	6	3,6, 5	5	5	~LE, Shapes inconsistent L in short fld,
NC03-089	ML	14	3.5	red	ms	3.25	8	7	3,4	7	6	^#roots
NC03-114	ML	19	2	dk rs	sflk	3.75	8	7	3	6	6	CV,~TP
NC03-239	ME	18	2	rs cu	ms	3.25	8	7	3	6	6	~VN, ~ESC
NC03-311	L	23	3	org	sflk	3.5	6	7	3	7	6	^root set,L, ~T,EY
NC03-372	M	21	2.5	dk rs	sm	3.25	8	8	3	5	6	~T, ~CR
NC03-380	M	16	2	rs	sm	3	6	7	3	6	6	~T,~B, few but EY,Cov sh, sm skin
NC03-395	ML	18	3	dk rs	ms	3	8	7	3,6	7	6	Too late? ~T
NC03-417	M	21	2.5	dk rs/pi	ms	3.5	8	8	3,5	7	7	~STR, a few CR, nice app Tight clusters,
NC1528	M	19	1.5	clr	sm	3	7	7	3	6	6	~VN
B94-14 G2	ME	16	2	rs	sflk	3	8	7	3,6	6	5	low root set
Covington G2	M	19	1.5	rs cu	ms	3	7	7	3	6	7	mostly g. sh
Hernandez G2	M	20	2	org	sflk	3.5	7	7	3	6	7	~SPR, ~PI

Comments: A good site, Beauregard had a very low root set and a high percentage Jumbo's. Covington had many roots culled for being too round.

Table 10a. 2006 Preliminary 2 Yield Trial at HCRS, Clinton, NC. Planted: 12Jun06; Harvested: 31Oct06; Growing Days: 141.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
		bu/A	%Beau	% Cov	No.1's	Canners	Jumbo's	Culls
NC03-066	1132	695	81	76	35	19	7	39
NC03-089	1016	646	78	71	37	25	2	36
NC03-114	781	659	78	72	51	31	3	16
NC03-239	1148	535	64	59	16	11	22	51
NC03-311	952	701	82	76	33	41	0	25
NC03-372	1052	423	51	46	23	13	5	59
NC03-395	750	553	67	62	42	31	2	26
NC03-417	867	511	61	56	25	35	2	38
NC04-069	1155	936	113	102	41	8	31	19
NC1528	893	522	60	57	21	27	10	42
B94-14 G2	1019	850	.	94	57	9	17	17
Covington G2	1127	915	110	.	48	12	21	19
Grand Mean	991	662	77	70	36	22	10	32
CV (%)	14.4	15.1	21	18	20	31	54	27
LSD (p=0.05)	206	144	23	18	11	10	10	12

Table 10b. 2006 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
NC03-066	M	16	2	cu rs	ms	3	8	7	3	6	6	^AC, ~MSH, 1 RC?
NC03-089	M	13	3	dk rs	sm	3.25	7	7	3,4	7	5	~ AC, ~MSH, L, BRD(SP)
NC03-114	L	15	2	dk rs	ms	3.5	7	5	3	6	5	~AC,~CRK, ^LE, ~VN, ~T, OK shape
NC03-239		15										BRD (SP), D,^SSR,^MSH, ^CR,^VN,2oR
NC03-311	L	21	2.5	co rs	ms	3.5	7	5	3,6	7	5	^SSR, NS but
NC03-372	M	16	2	rs	sm	3.25	7	6	3	6	4	^CR, ~SSR, ~PI, D
NC03-395	ML	18	2	rs	sm	3 ycr	7	6	3,6	6	5	RC, D, BRD(SP),~CR
NC03-417	M	17	2	red	ms		7	7	3,5	5	4	^MSH, ^OV
NC04-069	M	15	2	cu	ms	3	8	6	3	7	7	good, no dis. Looking at
NC1528		17										yield potential
B94-14 G2	M	14	2.5	rs	ms	3	7	7	3,6	6	7	~MSH
Covington G2	M	16	1.5	dk rs	ms	3	7	7	6,2	6	6	Jum for dia.,~MSH

Comments: A tough site with high levels of Streptomyces and cracking, should have been harvested three weeks earlier. Culls for misshapes, cracking, Streptomyces and too round. Covington culls for being round, Jumbo's were short but wide.

Table 11. 2006 Soil Rot Yield Trial at HCRS, Clinton, NC. Planted: 16June06; Harvested: 27Oct06; Days to Harvest: 133.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)				
				bu/A	%Beau	% Cov	No.1's	Canners
NC01-334	1110	807	138	124	45	8	19	28
NC01-351	503	300	50	46	38	17	4	41
NC01-362	1011	332	58	52	16	17	1	67
NC02-165	613	455	81	71	48	20	7	25
NC02-350	790	610	104	94	41	19	17	23
NC02-423	1059	527	99	85	29	16	6	49
NC03-007	999	568	100	89	28	28	2	42
NC03-030	682	620	114	99	53	18	21	9
NC03-035	556	445	75	68	49	26	6	20
NC03-054	787	478	82	74	33	11	17	39
NC03-089	455	379	69	61	44	36	2	18
NC03-114	696	447	76	69	34	16	14	36
NC03-311	474	335	54	51	24	45	2	29
NC03-380	637	263	48	41	16	9	15	60
NC03-395	603	445	77	69	41	28	6	26
NC99-573	1008	644	109	99	39	18	8	35
B94-14 G2	797	621	.	94	55	15	6	24
Covington G2	827	649	111	.	34	19	25	22
Hernandez G2	878	686	123	109	35	16	26	23
Jewel	216	103	19	17	12	28	7	53
Grand Mean	735	486	83	74	36	20	11	33
CV (%)	16	23	27	25	26	38	74	32
LSD (p=0.05)	194	187	37	30	15	13	13	18

Comments: A mixture of soil rot, circular spot, and cracking produced very high numbers of culls.

Keys to Tables

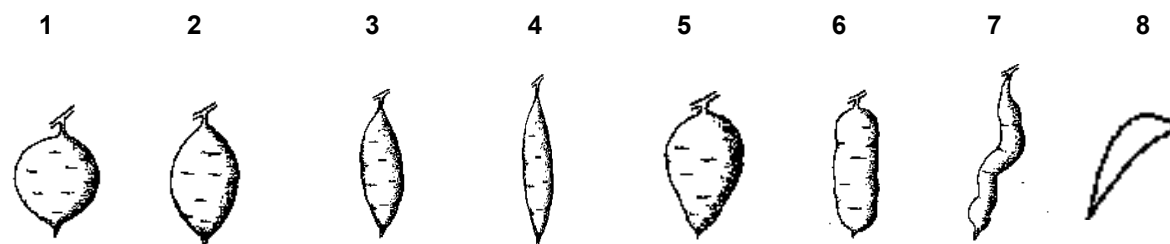
Storage root data: **MAT**=maturity E=early, M=mid and L=Late; **DM**=percentage dry matter; **L/D**=length/diameter ratio; **SKC**=skin color clr=clear cu=copper, lt=light, or=orange, pi=pink, pu=purple, rd=red, rs=rose, tn=tan wh=white; **SKT**= skin texture, m fl= moderate flakiness of skin, l fl= 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; **BRD**=breeding only; **BSR**=bacterial soft rot; **CR**=cracking; **CRK**= crooked shapes; **CS**=circular spot; **CV**=skin color variation end to end; **D**=drop; **ESC**=Early season cracking; **EY**=deep eyes; **FB**=fleabeetle damage; **FS**=Fusarium root rot; **G**=Geotricum; **GR**=grooves; **HC**=horizontal constrictions; **ID**=unspecified insect damage; **IR**=insect resistance; **IRR**=irregular; **JL**=jumbo's for length; **L**=long; **LE**=lenticels; **LG**=longitudinal grooves; **LR**=Lateral rings; **LT**=latex; **MSH**=misshapen 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; **RND**=round; **RSK**=rough skin; **RT**=rot; **SC**=scurf; **SD**=skin discoloration; **SF**=surface Fusarium; **SG**=string roots; **SH**=sheen; **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; **WB**=whitefringed beetle; **WG**=white grub; **WW**=wireworm; **YCR**=yellow cortical ring; **YLD**=yield; **2°R**=secondary roots.

^ = lots or high amount of, ~ = moderate or some, ↓ = little or poor

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

Shapes



Acknowledgements

The continued support of the NC SweetPotato Commission is gratefully acknowledged. The exceptional technical expertise and assistance of Meri Reeber, Jarred Driscoll and Mark Clough, Research Technicians with the sweetpotato and potato breeding programs, respectively is acknowledged. We also thank the research station staff at the HCRS, CCRS and CRS, and Alan Westerman and Anthony Ostertag our summer helpers for excellent support, and Graduate Students Jim Carlos Cervantes and Per McCord, for their assistance during the year.