

NCSU SWEETPOTATO BREEDING PROGRAM
SUMMARY OF CULTIVAR DEVELOPMENT WORK

for

2000

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

Project Highlights

Highlights of our 2000 activities are as follows.

1. We collaborated with the Micropropagation Unit (MPU) by evaluating nine trials at two sites - The Horticultural Crops Research Station, Clinton (HCRS) and The Cunningham Research Station, Kinston (CRS) - to select superior mericlones of Hernandez, Jewel, Carolina Ruby and Carolina Rose and other specialty varieties for release to NC growers.
2. We collaborated with the MPU to conduct studies of the effect of advanced generations (G0, G1, G2, G3 and G4) and the accumulation of SPFMV and deleterious mutations on Beauregard yield and root quality.
3. We continued our third year of the Grower Participatory Breeding Project in which first year seedlings are selected on-farm with the assistance of growers, Extension Agents and Specialists. In addition, we evaluated advanced lines in unreplicated trials at the same sites. Emphasis in 2001 will be on expanding the number of advanced materials evaluated in multiple locations so we can identify widely adapted material.
4. We planted 55,000 true seed which resulted in 826 seedling selections. Seed from all parents was planted and we use the selection percentage per parent to obtain information on the ability of the parents to produce superior clones. Using this data we can develop improved nurseries and increase our odds of finding superior varieties.
5. We conducted our third season of Streptomyces soil rot (SSR) field screening and evaluated 171 clones for field resistance to SSR. This long-term project will give us a critical tool for assessing the suitability of material for NC growing conditions. All 171 clones were also screened in the greenhouse for confirmation that the tests are complementary.
6. We conducted 9 yield trials of preliminary and advanced clones at the HCRS and the CRS.

A more detailed description of the breeding program's activities are detailed below and provided in the tables following.

2000 Polycross Breeding Nurseries

We established four polycross nurseries in 2000. The Elite Nursery, located at the Horticultural Crops Research Station in Clinton, is designed to produce materials with the potential to become varieties. In this nursery, varieties 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, located at the Central Crops Research Station in Clayton, is dedicated to developing parents with high levels of soil rot resistance. The Parallel Nursery, also at the Clayton station, is designed to develop parents with a combination of soil rot, root-knot nematode resistance, and high dry matter for use in the Elite and SSR nurseries. These three 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.

The fourth nursery was put together to develop lines with high levels of dry matter suitable for industrial purposes including ethanol production. Two early frosts on Oct. 6th and 7th cut short a promising seed season by effectively ending flowering during the heaviest seed-producing month. Despite this, sufficient seed was obtained for next year.

First-Year Seedling Selections

Over 51,000 true seed from the 1999 and 1998 polycross nurseries were grown in the Horticultural Department and Vernon G. James Research and Extension Center greenhouses starting in February. Most of the seedlings from the Elite Nursery (ca. 18,000) and SSR nursery (ca. 29,000) were evaluated for storage root color prior to field transplanting in May. Only those seedlings with a uniform orange, or a pure white flesh color were planted. This step, combined with losses from non-germinating seed, reduced the seedling population by almost 50%. In the field, the seedlings were planted three feet apart so they remained as distinct hills at harvest. Selection at harvest was based on the following criteria: shape, flesh color, skin texture, size distribution, root number, earliness, and observable diseases or defects.

Tables 2 and 3 contain a listing of the selections made by nursery and by maternal parent selected at the HCRS and the CRS, respectively. From the nearly 51,000 seed 712 were selected for further evaluation. This is a selection rate of 1.4%, which is typical. This was a cooler than normal season which would favor the selection of earliness, an important consideration for NC varieties.

As part of the Grower Participatory Breeding Project, three on-farm sites were used to evaluate seedlings from 18,000 of the true seed listed above. The parents and selections are shown in Table 4. Cooperators involved in this project were:

<u>Researchers</u>	<u>Extension</u>	<u>Growers</u>
Jonathan Schultheis	Wilfred R. Jester	Frank Howell
Dennis Adams	William Little	Sonny Scott
	Allan Thornton	Terrill Williams
	Milton Parker	Johnny Williams

Field sites were located within commercial fields and the trials were treated in the same fashion as the commercial fields (fertilizer, 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 which had better appearance than the check variety Beauregard. These selections will be planted at the HCRS and CRS in 2001 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.

A second component of the Grower Participatory program was to evaluate promising breeding lines under commercial conditions. Thirty-six breeding lines and six check lines were grown and evaluated at each location as single-row, 50-100 hill plots spaced 9 inches apart. Notes on how they performed at each location were taken and these will be combined with research station data to determine the potential of each as a variety. A few of the lines (e.g. NC96-61, NC97A-04, NC97-024, NC97-122) performed well in all locations.

Second-Year Selections

In 1999, we made 582 first-year seedling selections. This year they were planted in 20 hill plots at the HCRS and CRS. 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. A few clones rotted in storage or did not sprout in the spring. From these, 33 selections were made at the CRS, and 50 at the HCRS. Thirteen selections were chosen at both sites, for a total of 96 selections remaining. These clones are designated as 99-xxx, having been named when they were selected as single hills in 1999, 99-001 being the first seedling hill selected in 1999. Clones selected at both locations indicate a broader adaptation, it is somewhat disappointing to have so few selected in both locations, however this was expected and their adaptability needs to be tested over many environments in many seasons.

Third-Year Selections

The 58 second-year selections made in 1999 were planted as unreplicated 100 hill plots at the HCRS and CRS. We selected 25 of these for further evaluation with 8 selected in both locations, 11 at the HCRS and 6 at the CRS. Our evaluation criteria remained the same but we become stricter for any flaws. Also with more plants we get a better idea of the yield in comparison to the Beauregard check rows. 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

Of the advanced selections evaluated this year, the same two that looked good in 1999 looked good again, NC96-61 and NC97A-04. Both seem to have broad adaptability, good yield, Fusarium and soil rot resistance and good eating quality. We plan to enter them into the National Sweetpotato Collaborators yield tests in 2001, as well as evaluating them in multiple locations across NC. A third clone, NC93-17, which was in the National Sweetpotato Collaborators Yield tests for four years is being dropped from variety consideration for lateness and susceptibility to soil rot. Thirty-five additional clones are still being evaluated. 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 5-12. The following are the best based on the last few years of testing:

NC96-61 Dark rose skin, orange flesh, smooth skin, elliptic to blocky shapes, some shallow veins and striations noted occasionally, mid to late season, 21% dry matter. A very sweet baking line, though the baked flesh color is sometimes brownish. Easily picked out in taste tests.

Disease: Resistant to Fusarium wilt, moderately resistant to soil rot and root-knot nematodes, moderately susceptible to russet crack.

Yield: 116% of Beauregard in 11 tests.

Plant production: Late sprouter, but a good number once it does sprout.

Status: Entered into Micropropagation Unit for virus indexing. Further evaluation in 2001, in National Collaborators test, on stations, and in on-farm trials.

NC97A-04 Rose skin, orange flesh, moderately smooth skin, good elliptic to slightly tapered shapes. Sometimes will produce raised lenticels. Dry matter 19%. Very good eating quality.

Disease: Resistant to soil rot and Fusarium wilt, moderately resistant to root-knot nematodes.

Yield: 113% of Beauregard in 9 tests.

Plant production: Late sprouter, but a good number once it does sprout.

Status: Further evaluation in 2001, in National Collaborators test, on stations and in on-farm trials.

NC97-433 This breeding line does not merit variety consideration because it does not have the necessary disease resistance. However, it is worth mentioning here for its ability to stay short. In soil conditions where nearly all clones produce long roots (in excess of 9"), especially Beauregard, this clone does not. Under such conditions it typically ranges between 4-6" in length, and 2-3" in diameter. Packout in the desirable subclass of the number one grade has been very high. This is a characteristic we are actively pursuing, though it may not be perfect. The flip side of the length control is that under conditions where roots tend to be short, this clone can be too short, in the 3-5" length class. Development of a clone that, under length inducing conditions, will have outstanding packout is a breeding goal.

Disease Resistance Screenings

In addition to the selection and yield evaluation trials, we screened 28 advanced, 58 preliminary selections and 20 parental lines for resistance to Fusarium wilt. Twenty of the advanced lines and 45 of the preliminary lines had moderate to high levels of resistance. Twenty-five of the advanced lines had at least moderate resistance to root-knot nematode. In our GH Streptomyces soil rot (SSR) screening 22 of the 28 advanced lines and 30 of the 58 preliminary lines had moderate resistance or better. We have eliminated several clones on the basis of these evaluations.

The establishment process continues for our field SSR screening nursery, now having completed its third year. This year's disease incidence was lower than we hoped for, but we were still able to detect differences in resistance between clones. We will inoculate again next year to further increase the disease level to make the screening more stringent. When the disease pressure is high and uniform, we will use this field to measure yield reduction caused by SSR on advanced clones being considered for release. This 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.

2000 National Sweetpotato Collaborator Trial

A cool spring resulted in plants ready a little later than normal. The summer was also on the cooler side, with rainfall well distributed in timing and amount. An early frost on Oct. 7 did moderate damage to the foliage and slowed growth. Culls were primarily for shape and because of russet crack in a number of clones. Overall appearance rating is a subjective rating on a 0-9

scale, 0-1=very poor, 2-3 poor, 4-5 fair, 6-7 good, 8-9=excellent.

Description of Official Entries

Beauregard (B94-14 G2)- rose skin, orange flesh, moderately smooth skin, blocky uniform shapes, significant russet crack, 19% dry matter, overall appearance = 7.

L94-96 - rose skin, orange flesh, moderately smooth skin, shapes somewhat mixed including blocky, elliptic and round elliptic, some russet crack present, 20% dry matter, overall appearance =5 .

L97-119 - light rose skin, orange flesh, moderately smooth skin, blocky and elliptic shapes, severe russet crack accounting for most of the culls, 14% dry matter, overall appearance =4.

W311 - rose skin, orange flesh, smooth skin, elliptic shapes but many poor, a lot of veins, many culls for shape, 20% dry matter, overall appearance =4.

W328 - copper-rose skin, orange flesh, moderately smooth skin, shapes somewhat variable - elliptic, round elliptic and blocky, but many good, 26% dry matter, overall appearance =6.

W334 - rose-copper skin, orange flesh, smooth skin, variable shapes - elliptic, round elliptic and ovate, 20% dry matter, overall appearance =5.

W346 - dark rose skin, orange flesh, moderately smooth skin, shapes round-elliptic to elliptic, culls for cracking, low yields, 21% dry matter, overall appearance =2.

W352 - light copper skin, orange flesh, smooth skin, elliptic and round elliptic shapes, many with tails, many culls for shape, 23% dry matter, overall appearance =4.

W359 - rose skin, orange flesh, smooth skin, elliptic and ovate shapes, prominent lenticels and pimples, some russet crack, 23% dry matter, overall appearance =4.

Unofficial entries in the 2000 National Sweetpotato Collaborator Trial for comparison:

Hernandez - orange skin, deep orange flesh, moderately smooth skin, elliptic shapes, moderate pimples, 21% dry matter, overall appearance =6.

NC96-61 - dark rose skin, orange flesh, smooth skin, blocky to elliptic shapes, some shallow veins, some russet crack, 20% dry matter, overall appearance =8.

NC97A-04 - rose skin, orange flesh, smooth skin, elliptic shapes, moderately prominent lenticels, 18% dry matter, overall appearance =7.

Table 1. Sweetpotato True Seed Harvested in 2000.

Maternal Parent	No. Seed/Polycross Nursery			Total
	Clinton Elite	Clayton SSR	Clayton Parallel	
NC1528	1880	--	--	1880
NC91-14	1270	396	--	1666
NC92-08	--	119	--	119
NC93-50	--	443	--	443
NC94-03	240	--	--	240
NC96-13	--	1101	--	1101
NC96-27	538	--	--	538
NC96-61	--	1119	--	1119
NC97A-04	2315	--	--	2315
NC97A-45	--	666	--	666
Beauregard	2180	476	--	2656
NC C-58	--	1405	--	1405
Eureka	--	697	--	697
Excel	1455	600	--	2055
FT92-36	--	380	--	380
Goldstar	1480	--	--	1480
Hernandez	840	259	--	1099
L78-21	--	348	--	348
L80-62	580	1023	--	1603
L84-74	--	7360	--	7360
L86-33	35	16	--	51
L94-96	1340	794	--	2134
L95-95	400	--	--	400
NC412	795	2076	--	2871
So. Delite	--	4190	--	4190
W99	4660	4945	--	9605
W271	4287	6546	--	10833
NC93-11-11	--	--	995	995
NC93-15-5	--	--	7060	7060
NC93-65-14	--	--	135	135
NC93-71-17	--	--	1314	1314
NC93-92-10	--	--	1113	1113
A193-14	--	--	1021	1021
A208-12	--	--	101	101
DW8-3	--	--	619	619
Eureka-2	--	--	0	0
FT92-36-12	--	--	0	0
GoldenSweet-17	--	--	4000	4000
Hernandez-8	--	--	3976	3976
L86-33-1	--	--	1264	1264
L87-95-16	--	--	1513	1513
L87-105-14	--	--	3570	3570
MD810-13	--	--	3960	3960
Resisto-8	--	--	2220	2220
Sumor-19	--	--	1497	1497
W268-5	--	--	1434	1434
W271-2	--	--	2656	2656
				0
Total	24295	34959	38448	97702

--indicates that the line was not in this nursery.

Table 2. 2000 Sweetpotato seedlings selected at Clinton.

Maternal parent # selections		Maternal parent # selections	
<i>Seed from 1999 Elite nursery</i>			
NC1528	4	L80-62	1
NC91-14	11	L84-74	2
NC92-08	1	L86-33	1
NC94-03	13	L94-96 offtype	12
Beauregard	10	L95-95	4
Excel			
Goldstar			
Hernandez	3		
10			
2	W271		
W274	5		
3			
		Total	82
<i>Hernandez seed from 1998 nurseries</i>			
SSR	8	Kinston Elite	4
Parallel	7	Total	19
		Grand total	101

101

Table 3. 2000 Sweetpotato seedlings selected at Kinston.

Maternal parent # selections		Maternal parent # selections	
<i>Seed from 1998 Elite nursery</i>			
NC1528			
NC91-09			
NC91-14			
NC93-11			
NC93-15			
Beauregard			
Car. Ruby			
Excel			
Goldstar			
Hernandez			
L80-62			
L81-10			
	6		
0			
5			
4			
3			
8			
4			
6			
8			
4			
9			
0			
	L84-74		
L86-33			
L89-110			
L91-80			
L91-189			
So. Delite			

Table 4. 2000 Sweetpotato seedlings selected on farm.

Parent	Nursery	Howell	Scott	Williams
NC93-15	99 SSR	26	7	17
NC93-50	99 SSR	30	7	23
Beauregard	99 SSR	33	19	48
L84-74	99 SSR	12	8	24
L86-33	98 SSR	14	12	23
	Totals	115	53	135
Grand total				303

Table 5a. 2000 National Sweetpotato Collaborators yield trial, HCRS, Clinton, NC
Planted: 13Jun00; Harvested: 03Oct00; Days to Harvest: 113.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)			
		bu/A	% Beau	No.1's	Canners	Jumbo's	Culls
NC96-61	798	693	115	54	22	10	14
NC97A-04	862	734	122	52	25	9	15
B94-14 G2	763	605	.	58	11	11	20
Hernandez	777	691	114	60	16	12	11
L94-96	627	534	86	53	15	17	15
L97-119	1035	678	110	41	9	15	35
W311	781	518	86	48	13	5	34
W328	831	726	121	63	9	15	13
W334	634	540	88	57	21	7	15
W346	364	223	36	28	32	0	40
W352	588	424	70	45	23	4	28
W359	698	580	96	53	17	13	17
Grand mean	745	591	97	52	17	10	21
CV	14	17	18	16	28	53	35
LSD (p<0.05)	132	133	23	11	6	7	10

Table 5b. 2000 National Sweetpotato Collaborators yield trial, HCRS, Clinton, NC. - quality data.

CLONE	Bedding data ¹			Storage Root data ²								Comments ³	
	EA	PP	UN	SH	SHV	SKC	SKT	FL	EYE	LEN	APP		
NC96-61	1	--	--	6,3	7	dk	rs	sm	3.25	8	8	8	~VN,~RC
NC97A-04	2	6	8	3	6	rs	sm	3	8	5	7	CLSH	
B94-14 G2	2	6	6	6	7	rs	ms	3	8	7	7	~RC, CLSH	
Hernandez	1	3	5	3	7	or	ms	3.5	7	6	6	~PI, CLSH	
L94-96	N/A	N/A	N/A	3,6,2	5	rs	ms	3.25	8	6	5	~RC, CLSH	
L97-119	N/A	N/A	N/A	3,6	5	lt	rs	ms	3	8	7	4	^^RC, CLSH
W311	1	3	--	3	4	rs	sm	3	8	6	4	^VN,^junk	
W328	1	3	--	3,6,2	4	cu-rs	ms	3	8	7	6	CLSH	
W334				3,2,5	6	rs-cu	sm	3	8	7	5	~shapes	
W346	1	--	--	2,3	4	dk	rs	sm	3		2	CR	
W352	1	4	3	3,2	5	lt	cu	sm	3	8	5	4	T, CLSH
W359	1	--	--	3,5	5	rs	sm	3.25	6	3	4	4	^PI/LE, RC

Table 6a. 2000 Advanced Yield Trial at HCRS, Clinton, NC. Planted: 01Jun00; Harvested: 22Sept00; Days to Harvest: 114.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)			
		bu/A	% Beau	No.1's	Canners	Jumbo's	Culls
NC93-17	826	723	134	57	22	8	12
NC96-09	721	550	103	40	5	32	24
NC96-40	825	595	121	48	12	12	28
NC96-61	601	443	86	51	20	3	26
NC97A-04	796	648	118	59	15	7	19
NC97A-06	503	170	32	19	5	10	66
NC97A-13	538	293	50	36	10	7	47
NC97A-36	641	194	39	18	10	4	69
NC97A-41	336	89	19	18	6	2	73
NC97A-45	756	449	83	37	6	16	41
B94-14G2 Beau	790	580	.	30	7	35	28
Hernandez	545	433	84	56	18	5	21
Grand Mean	664	446	81	40	12	12	36
CV (%)	13	19	25	18	33	42	18
LSD (p=0.05)	134	129	31	11	6	8	10

Table 6b. 2000 Advanced Yield Trial at HCRS, Clinton, NC - quality data.

CLONE	Bedding data ¹			Storage Root data ²				FL	EYE	LEN	APP	Comments ³
	EA	PP	UN	SH	SHV	SKC	SKT					
NC93-17	2	4	4	3	5	rs	sm	3.5	8	8	6	~VN, mix sh
NC96-09	2	6	7	2	6	rs	sm	3.25	6	7	5	VN,short
NC96-40	2	7	8	3	6	rs	sm	3.5	8	6	5	CLSH
NC96-61	1	--	--	3	7	rs	sm	3	8	8	6	RC,sh VN
NC97A-04	2	6	8	3	7	rs	sm	3.25	8	6	7	
NC97A-06	2	7	8	3	6	rs	sm	3	6	7	3	VN, junk
NC97A-13	1	5	8	3,4	5	lt	cu ms	3	6	7	3	SSR?,VN,B
NC97A-36	2	7	5	3,2	4	rs	ms	3.25	7	7	2	RC,SPR
NC97A-41	2	7	7	3,4	5	cu	sm	3.5	6	4	4	RC,GR
NC97A-45	2	7	7	3,6	7	cu	sm	3.25	8	6	7	air CR
B94-14 G2	2	6	6	6,2	7	rs	sm	3	8	7	7	CLSH
Hernandez	1	3	5	3	6	cu	sm	3.5	6	6	6	CLSH,SPR

Comments: Stands were only fair in this test. Appearance was fair overall, with some clones being primarily culls for shape.

Table 7a. 2000 Advanced yield trial at CRS, Kinston, NC. Planted: 08Jun00; Harvested: 12Oct00; Days to Harvest: 126.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)			
		bu/A	% Beau	No.1's	Canners	Jumbo's	Culls
NC93-17	786	502	81	25	38	1	36
NC93-50	623	433	68	30	34	5	31
NC96-09	1023	864	141	39	8	37	16
NC96-13	489	417	69	18	67	1	14
NC96-61	787	656	108	31	49	3	17
NC97A-04	678	539	87	37	42	1	20
NC97A-06	525	401	64	27	14	35	23
NC97A-36	531	373	63	31	37	2	30
NC97A-41	324	213	35	25	38	2	35
NC97A-45	656	543	88	44	19	21	17
B94-14 G2	828	630	.	47	13	15	24
Hernandez	625	468	77	40	34	1	25
Grand mean	656	503	80	33	33	10	24
CV	12	14	17	20	15	40	24
LSD (p<0.05)	110	102	19	9	7	6	8

Table 7b. 2000 Advanced yield trial at CRS, Kinston, NC - quality data.

CLONE	Bedding data ¹			Storage Root data ²								Comments ³
	EA	PP	UN	SH	SHV	SKC	SKT	FL	EYE	LEN	APP	
NC93-17	2	4	4	3	6	rs	sm	3.25	6	7	5	late, CLSH
NC93-50	2	6	5	6	7	pi	sm	2.75	9	8	6	long, CLSH
NC96-09	2	6	7	2,6	7	rs	ms	3	6	5	6	E, chunky
NC96-13	2	8	7	3	6	rs	ms	2.5	6	6	5	late, CLSH
NC96-61	1	--	--	3	7	rs	sm	3	8	7	7	g sh, short
NC97A-04	2	6	8	3,6	6	rs	ms	3	8	5	5	PI
NC97A-06	2	7	8	3,6	5	cu-rs	sm	3	6	6	4	B, ~PI
NC97A-36	2	7	5	3,5	4	rs	ms	3	8	6	3	club sh, RC
NC97A-41	2	7	7	3,6	5	rs	sm	3.25	7	5	3	PI=3, RC,CR
NC97A-45	2	7	7	6	7	lt cu	ms	3.25	7	7	6	PI=6, CR
B94-14 G2	2	6	6	6,3	7	rs	ms	3	8	7	7	^g sh
Hernandez	1	3	5	3	6	or	ms	3.5	6	7	5	PI=4, SPR

Comments: Stands were good in this test. Sizing seemed slow, and most of the clones were harvested early as indicated by the percentage of canners. The soil was a little clayey which accounts for many of the culls for shape.

Table 8a. 2000 Preliminary 1 yield trial at HCRS, Clinton, NC. Planted: 23May00; Harvested: 21Sept00; Days to Harvest: 121.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)			
		bu/A	% Beau	No.1's	Canners	Jumbo's	Culls
NC94-21	745	554	79	40	34	1	25
NC94-34	751	591	79	47	25	6	23
NC95-01	707	412	57	40	14	5	41
NC95-17	734	620	89	57	15	11	16
NC96-13	682	543	78	40	34	5	20
NC96-17	536	426	59	53	26	1	20
NC96-20	631	534	75	46	33	5	16
NC96-26	635	448	65	44	24	3	30
NC96-31	678	493	72	46	23	2	28
NC96-34	532	322	45	35	23	2	39
NC96-40	553	401	56	38	31	5	26
NC97A-16	651	499	71	42	29	3	25
NC97A-18	651	553	76	50	26	8	15
NC97A-19	477	401	56	53	23	8	16
NC97A-25	408	283	40	44	22	2	32
NC97A-32	569	441	63	40	36	1	23
B94-14 G2	804	729	.	64	11	16	9
Diane	703	469	67	41	15	11	33
Hernandez	682	553	76	48	18	14	19
L95-95	776	618	86	54	14	12	20
Grand Mean	645	495	68	46	24	6	24
CV (%)	19	23	25	20	39	72	33
LSD (p=0.05)	172	163	24	14	13	6	11

Table 8b. 2000 Preliminary 1 yield trial at HCRS, Clinton - quality data.

CLONE	Bedding data ¹			Storage Root data ²								Comments ³
	EA	PP	UN	SH	SHV	SKC	SKT	FL	EYE	LEN	APP	
NC94-21	2	6	7	3	7	rs	ms	3	7	6	5	CR, late
NC94-34	2	6	6			cu-or	vsm	3	9	9	5	^LT
NC95-01	2	8	8	3	4	cu-rs	ms	3.5	8	7	3	CLSH, SR
NC95-17	2	4	6	3	6	tan	sm	3.5	5	6	5	RC, VN
NC96-13	2	8	7	3	6	dk rs	ms	3	8	8	5	~RC
NC96-17	2	6	7	3	6	cu	sm	3 u	8	8		^FB,CS
NC96-20	1	--	--	3	6	rs	ms	3	7	8	5	CLSH
NC96-26	2	5	5	3	5	rs	ms	3	5	8	4	SD-RC?,RE
NC96-31	2	2	2	3	6	rs	ms	3	7	7	6	skins
NC96-34	1	5	6	4	7	cu-rs	ms	3.5	8	8	3	^CR
NC96-40	2	7	8	3,4	4	rs	sm	3.25	7	6	4	CLSH, SR
NC97A-16	2	7	8	3	6	rs	ms	3.25	8	6	6	LE, CLSH
NC97A-18	1	5	5	3	7	dk rs	ms	3.25	8	7	7	↓skining
NC97A-19	1	7	7	3	7	lt cu	sm	3.25	9	6	8	some VN
NC97A-25	2	6	5	3	6	cu-rs	ms	3.25	8	7	6	CLSH
NC97A-32	2	7	7	3	6	rs	ms	3	8	7	6	~FB
B94-14 G2	2	6	7	3,6	7	rs	ms	3	8	7	7	short,FB
Diane	2	5	5	5	6	rs	sm	3.25	6	8	4	SD, CLSH
Hernandez	1	3	5	2,3	6	cu	ms	3.5u	6	7	6	~PI, CLSH
L95-95	1	--	--	3	7	rs	ms	3.25	9	7	8	CLSH

Table 9a. 2000 Preliminary 1 yield trial at CRS, Kinston, NC. Planted: 01Jun00; Harvested: 09Oct00; Days to Harvest: 130.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)			
		bu/A	% Beau	No.1's	Canners	Jumbo's	Culls
NC95-01	942	794	132	31	19	34	16
NC96-13	810	728	118	45	32	13	10
NC96-17	690	603	101	46	41	1	12
NC96-61	1113	934	156	49	24	11	16
NC97A-04	939	847	143	40	33	17	10
B94-34 G2	805	621	.	28	8	41	23
Hannah	430	366	62	35	20	30	15
Hernandez	647	585	97	44	18	28	10
L95-95	791	600	100	45	14	17	24
Grand mean	797	677	114	40	24	21	15
CV	12	13	11	16	25	30	29
LSD (p<0.05)	147	131	19	10	9	10	6

Table 9b. 2000 Preliminary 1 yield trial at CRS, Kinston, NC - quality data.

CLONE	Bedding data ¹			Storage Root data ²				FL	EYE	LEN	APP	Comments ³
	EA	PP	UN	SH	SHV	SKC	SKT					
NC95-01	2	8	8	4,7	4	cu-rs	ms	3.5	5	5	4	CLSH
NC96-13	2	8	7	3	5	rs	ms	2.75	7	7	5	long,CLSH
NC96-17	2	6	7	3	7	lt rs	sm	3.5	7	6	7	late,CLSH
NC96-61	1	5	6	3	7	dk rs	sm	3.25	8	7	7	RC, VN
NC97A-04	2	6	8	4	7	rs	sm	3.25	6	6	4	long
B94-34 G2	2	6	7	3,6	5	rs	sm	3	7	6	5	CLSH
Hannah	2	5	5	4,3	5	wh	ms	2	7	7	4	jum-length
Hernandez	1	3	5	3	6	cu-or	ms	4	6	6	5	PI=5
L95-95	1	--	--	3,4	6	pi	sm	3.5	6	6		RE, CLSH

Comments: Good stands. High total yields for many clones, but poor size distribution. Many canners or jumbo's for some clones. Shapes tended to be long and thin, and many of the jumbo were there because they exceeded the 9" length restriction for the No'1 class. Likewise there were many canners near the 7" size limit.

Table 10a. 2000 Preliminary 2 yield trial at HCRS, Clinton, NC. Planted: 23May00; Harvested: 21Sept00; Days to Harvest: 121.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)			
		bu/A	% Beau	No.1's	Canners	Jumbo's	Culls
NC97-003	821	547	65	53	13	1	33
NC97-013	594	454	54	50	22	4	24
NC97-075	715	553	66	57	12	8	23
NC97-081	773	632	78	52	5	25	18
NC97-091	720	524	63	51	18	4	28
NC97-092	533	470	55	44	44	0	12
NC97-145	694	503	60	50	22	2	26
NC97-166	895	723	87	48	6	27	19
NC97A-04	880	769	93	62	14	12	13
NC97A-40	652	422	50	33	31	1	35
NC97A-43	598	469	55	45	29	3	22
B94-14 G2	901	839	.	58	5	30	7
Goldstar	675	449	54	43	21	2	34
Hernandez	762	710	86	61	14	18	7
Williams White		591		468	56		55
1	21						23
Grand Mean	717	565	65	51	19	8	22
CV (%)	15	17	18	15	31	60	29
LSD (p=0.05)	162	145	18	12	9	8	10

Table 10b. 2000 Preliminary 2 yield trial at HCRS, Clinton, NC - quality data.

CLONE	Bedding data ¹			Storage Root data ²								Comments ³
	EA	PP	UN	SH	SHV	SKC	SKT	FL	EYE	LEN	APP	
NC97-003	1	7	7	6,3	6	pu	sm	3	7	7	6	short, ~AT
NC97-013	1	6	7	3,5	5	rs	sm	3	7	6	4	B
NC97-075	1	7	6	3,6	6	dk rs	sm	3	7	7	6	sweet fresh
NC97-081	2	7	7	3,2	6	red	ms	3.25	8	5	5	LE, chunky
NC97-091	2	7	7	4	6	wh	sm	1.5	6	7	5	long
NC97-092	1	7	7	3,4	7	wh	sm	1	7	6	6	many long
NC97-145	2	5	5	3	6	rs	ms	3.75	7	7	6	STR
NC97-166	1	6	7	3,2	6	rs	sm	3.5	6	7	6	Chunky
NC97A-04	2	6	8	3	6	rs	sm	3	7	6	6	Scat. LE
NC97A-40	2	5	6	4	6	rs	ms	3	8	7	4	long, RC
NC97A-43	2	7	8	3	5	dk rs	sm	3	8	7	5	short, CLSH
B94-14 G2	2	6	7	3	6	rs	sm	3	8	8	7	short
Goldstar	3	7	8	3,5	4	cu-or	sm	3	7	7	5	~CR
Hernandez	1	3	5	2,3	6	or	sm	3.25	8	6	6	~PI
Williams White	2	4	5		3	8	wh	sm	1.5	w/or	6	7

looks good
 Comments: Norfolk and Orangeburg sandy loams. Stands good. Beaufort the winner for yield and appearance. Many clones had culls for shape.

Table 11a. 2000 Preliminary 2 yield trial at CRS, Kinston, NC. Planted: 30May00; Harvested: 09Oct00; Days to Harvest: 130.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)			
		bu/A	% Beau	No.1's	Canners	Jumbo's	Culls
NC97-003	979	769	99	41	31	7	21
NC97-013	643	603	77	42	50	1	6
NC97-024	838	653	82	39	23	16	22
NC97-075	701	624	79	46	34	9	11
NC97-079	724	627	79	50	25	12	13
NC97-081	676	546	69	46	21	15	19
NC97-091	733	626	80	21	44	20	15
NC97-122	875	697	82	48	29	3	20
NC97-166	973	802	101	38	16	29	18
NC97A-04	803	688	89	30	38	18	14
B94-14 G2	973	801	.	39	10	34	18
Hernandez	910	833	105	54	19	19	9
Williams White		655		533	70		46
14	18						22
Grand mean	805	677	84	41	28	15	16
CV	15	15	14	19	29	59	29
LSD (p<0.05)	171	146	17	12	12	13	7

Table 11b. 2000 Preliminary 2 yield trial at CRS, Kinston, NC - quality data.

CLONE	Bedding data ¹			Storage Root data ²								Comments ³
	EA	PP	UN	SH	SHV	SKC	SKT	FL	EYE	LEN	APP	
NC97-003	1	7	7	6,4	6	red	sm	3	8	6	5	~LE
NC97-013	1	6	7	3	6	dk rs	sm	3	8	5	6	short, ~rot
NC97-024	1	6	7	3,6	4	rs	sm	3	8	5	6	curves
NC97-075	1	7	6	3,6	6	pi-rs	sm	3	6	6	6	CLSH
NC97-079	1	7	7	3	6	rs	ms	3.5	7	6	6	skins
NC97-081	2	7	7	4,6,7	4	red	ms	3	7	7	4	long, ~RC
NC97-091	2	7	7	4,7	5	wh	sm	1.5	7	7	2	~PI
NC97-122	2	8	7	3,6	7	rs	ms	3	6	7	6	GR, CLSH
NC97-166	1	6	7	4,6	5	rs	sm	3.5	6	6	5	long, CLSH
NC97A-04	2	6	8	4,6	8	rs	sm	3	8	6	4	long
B94-14 G2	2	6	7	6	7	rs	ms	3	8	7	7	CLSH
Hernandez	1	3	5	3,6	7	cu-or	ms	3.25	7	8	6	PI=6
Williams White	2	4	5		6	6	wh	ms	2w/	or	6	6

Comments: Stands were good. Many clones were not ready to harvest for optimal No.1 production, and with the frost doing significant damage to the leaves, would probably not have sized up much more.

Table 12a. 2000 Preliminary 3 yield trial at HCRS, Clinton, NC. Planted: 24May00; Harvested: 21Sept00; Days to Harvest: 120.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)			
		bu/A	% Beau	No.1's	Canners	Jumbo's	Culls
NC93-50	952	854	161	61	18	9	11
NC97-242	406	398	76	81	14	4	2
NC97-245	790	687	134	61	18	7	13
NC97-290	769	723	137	65	26	3	6
NC97-433	440	423	80	69	18	9	4
NC97-539	655	592	115	66	16	9	10
NC97-557	490	383	72	36	39	2	22
NC97-627	541	386	76	48	17	7	28
NC97-709	643	417	80	49	9	7	35
NC97-743	563	434	86	56	21	2	22
NC97-753	667	516	92	50	23	4	23
NC97-753A	597	462	89	43	31	4	22
NC97-762	650	504	99	55	16	7	23
NC97-835	728	595	113	55	25	3	17
NC97-883	719	410	80	38	10	6	46
NC97A-45	464	407	78	65	18	6	12
B73 G2 Beau	617	524	.	59	8	17	15
Hernandez	620	544	105	63	15	10	12
L89-72	809	662	132	50	5	27	18
Grand Mean	637	522	101	56	18	8	18
CV (%)	22	25	25	12	35	73	37
LSD (p=0.05)	205	184	36	10	9	8	9

Table 12b. 2000 Preliminary 3 yield trial at HCRS, Clinton, NC - Quality data.

CLONE	Bedding data ¹			Storage Root data ²								Comments ³
	EA	PP	UN	SH	SHV	SKC	SKT	FL	EYE	LEN	APP	
NC93-50	2	6	5	3,4	7	pi	sm	3	9	9	8	long, smooth
NC97-242	2	7	7	3	6	red	sm	2	7	5	5	RC?, Bon, LE
NC97-245	2	7	7	3	6	lt cu-br	sm	3	u	7	6	7
~RC, ^FB												
NC97-290	1	6	6	3	6	dk rs	sm	3	8	6	7	
NC97-433	1	7	8	2,1	7	rs	sm	3	8	6	5	round
NC97-539	1	7	7	3	7	bu	sm	3	u	7	5	~LE
NC97-557	1	7	7	3,6	5	red	ms	3.5	7	6	5	~crooks
NC97-627	1	7	6	3,5	5	rs	sm	3.5	7	6	5	poor shapes
NC97-709	1	7	4	3	5	rs	ms	3.25	7	6	5	~LE, GR
NC97-743	1	5	5	3	5	rs	ms	3	u	7	6	poor shapes
NC97-753	2	7	7	3	7	rs-cu	sm	3	7	6	6	g avg shape
NC97-753A	2	7	6	3	7	rs-cu	sm	3	6	6	6	CLSH
NC97-762	2	7	7	3	5	tan	sm	1.5	7	7	5	RC, CR, T
NC97-835	1	7	6	3	7	rs	mr	3.25	7	6	6	CLSH
NC97-883	2	6	6	3	3	red	ms	3.25	7	7	3	^Junk, skins
NC97A-45	2	7	7	6	8	cu	sm	3	8	7	7	FB, WW
B73 G2	2	6	7	3	7	rs	sm	3	8	6	7	CLSH
Hernandez	1	3	5	3	6	or	ms	3.25	7	6	6	
L89-72	1	5	6	3	7	rs	sm	3	8	6	6	skins ^

Comments: Soils were Orangeburg and Norfolk sandy loams. Stands were good as was the length of most roots. Poor shapes were the main reason for culls.

Table 13a. 2000 Preliminary 3 yield trial at CRS, Kinston, NC. Planted: 01Jun00; Harvested: 13Oct00; Days to Harvest: 134.

CLONE	Total Yield bu/A	Marketable Yield		Size Distribution by Class (% of total yield)			
		bu/A	% Beau	No.1's	Canners	Jumbo's	Culls
NC93-50	920	705	72	28	16	33	24
NC97-245	1039	795	80	20	33	24	24
NC97-290	924	744	75	36	35	11	19
NC97-433	617	602	58	55	36	7	2
NC97-709	1263	1038	107	34	7	40	18
NC97-753	1577	1064	108	22	43	3	33
NC97-753A	974	788	81	51	18	12	18
NC97-829	975	780	79	40	16	24	20
NC97A-45	666	544	56	39	32	10	18
B73 G2	1167	1031	.	53	12	23	12
Hernandez	1015	853	86	44	32	9	16
Grand mean	805	677	84	41	28	15	16
CV	15	15	14	19	29	59	29
LSD (p<0.05)	171	146	17	12	12	13	7

Table 13b. 2000 Preliminary 3 yield trial at CRS, Kinston, NC - quality data.

CLONE	Bedding data ¹			Storage Root data ²								Comments ³
	EA	PP	UN	SH	SHV	SKC	SKT	FL	EYE	LEN	APP	
NC93-50	2	6	5	6	5	pi	sm	2.5	8	8	4	LONG, ~CR, skins
NC97-245	2	7	7	4,7	4	bu	sm	3	6	7	3	LONG, ~SPR, irr. Sh
NC97-290	1	6	6	3,6	5	rs	ms	2.75	8	6	5	LONG, late
NC97-433	1	7	8	6	8	rs	sm	3	7	7	8	SHORT, exc. Shapes, SPR
NC97-709	1	7	4	3	6	rs	ms	3.25	6	4	5	Early, g. skin, ^LE
NC97-753	2	7	7	3,7	5	lt cu-rs	sm	3	u	6	6	2
NC97-753A	2	7	6	3	6	lt cu	sm	3.5	5	6	4	LATE, long, Tapers PI=4
NC97-829	2	7	5	3	6	rs	lt fl	3	7	6	4	PI=4, CLSH
NC97A-45	2	7	7	6	7	lt cu	sm	3	7	6	4	LONG, air CR
B73 G2	2	6	7	6,3	7	rs	ms	2.75	8	7	7	CLSH
Hernandez	1	3	5	3,4	7	cu-or	ms	3.25	6	7	6	PI=4

Comments: Good stands. High total yields for many clones, but poor size distribution. Many canners or jumbo's for some clones. Shapes tended to be long and thin, and many of the jumbo were there because they exceeded the 9" length restriction for the No'1 class. Likewise there were many canners near the 7" size limit. 97-433 stood out for staying short and having nice shapes, but yield was low relative to other clones.

Keys to tables

¹**Bedding data:** **EA**=earliness 1=late, 3=early; **PP**=plant production 0=no sprouts, 1=few, 9=profuse; **UN**=uniformity 0=highly variable, 9= uniform.

²**Storage root data:** **SH**=Shape (see diagram); **SHV**=shape variability(0-9); **SKC**=skin color cu=copper, lt=light, or=orange, pi=pink, pu=purple, rd=red, rs=rose, tn=tan; **SKT**= skin texture, lt 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); **APP**=overall appearance (0-9).

³**Comment codes:** **AT**=tough attachment; **BSR**=bacterial soft rot; **CR**=cracking; **CS**=circular spot; **CV**=skin color variation end to end; **FB**=fleabeetle; **HC**=horizontal constrictions; **ID**=unspecified insect damage; **LG**=longitudinal grooves; **LR**=Lateral rings; **LT**=latex; **MSH**=misshappen roots; **PI**=pimples (0-9); **R**=rodent; **RC**=russet crack; **RKN**=root-knot nematodes; **SD**=skin discoloration; **SG**=string roots; **SPR**=sprouts; **SR**=soft rot; **SSR**=streptomyces soil rot; **STR**=Striations; **T**=tails; **VN**=viens; **SC**=scurf; **SF**=surface Fusarium; **WB**=whitefringed beetle; **WG**=white grub; **WW**=wireworm; **YCR**=yellow cortical ring.

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

Shapes

