

2004 PROGRESS REPORT  
To  
North Carolina Sweetpotato Commission

TITLE: Sweetpotato Grower-Participatory Breeding Project 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 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. The specific objectives of the Grower-Participatory Breeding Project (GPBP) are to work collaboratively with growers, Extension Agents and Specialists to evaluate seedlings, and preliminary and advanced selections of our most promising breeding lines on-farm with the goal of rapidly selecting and developing new varieties.

**Project Cooperators**

Researchers	Extension	Growers
Mr. Bill Jester	Mr. William Little	Mr. George Wooten
Dr. Jonathan Schultheis	Mr. Allan Thornton	Mr. Jim Jones
Dr. Zvezdana Pesic-VanEsbroeck	Mr. Milton Parker	Mr. Roger Lane and
	Mr. Mike Wilder	Pride of Sampson

**Project Summary:**

The Grower-Participatory Breeding Project has been in existence for six years and we now have two primary research objectives. First, we are continuing our efforts to grow and select first-year seedlings on commercial farms. Second, we are evaluating our most promising advanced lines on-farm so that growers can provide input on their commercial potential. Those that perform well can be rapidly increased by growers, and evaluated for field, storage and packing traits on a larger scale.

This collaborative effort has been very successful in that it has increased information exchange between growers, researchers and extension personnel. From a breeding perspective, it has enabled us to better define our breeding goals and prioritize these based on input from growers. For growers, it has allowed us to demonstrate and explain how new cultivars are developed. The effort is beginning to pay off in terms of what we are seeing in our advanced materials. Our most promising advanced line, NC98-608, is a product of this project.

Table 1 provides a summary of the number of clones the GPBP has screened on-farm as part of the GPBP to date. Sixteen advanced clones have been selected and evaluated on-farm and at the research stations in this project during 2003. Four of these clones were used in our breeding nurseries in 2002, and 2 in 2003. Our most promising clone NC98-608 was evaluated by at least five growers in 2003 in small- to medium-sized commercial trials with roughly 40

total acres planted. We have 47 remaining preliminary and advanced clones that appear to have high yields and a mix of good horticultural traits including high pack-out of No.1's, disease resistance, smooth skin and higher dry matter. These will be advanced in 2004 for further evaluations.

Table 1. Number of sweetpotato seedlings planted and number selected over successive years (1998-2003) from on-farm tests.

Year	True seed	Seedlings	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	Advanced	Breeding
2003	15000	157	----	----	----	----
2002	18000	251	10	----	----	----
2001	15000	153	22	5	----	----
2000	15000	303	24	7	5	----
1999	24000	260	47	10	7	1
1998	24500	358	22	9	4	2
Totals	111,500	1482	125	31	16	3

Thirty five percent of the true seed grown in our breeding program during 2003 were grown on three farms with the cooperation of growers, Extension Agents and Specialists. Field sites were located within commercial fields and the trials were treated in the same fashion as the commercial fields (fertilizer, pest control etc., except spacing) (Table 2). From 15,000 seedlings planted, 157 were selected for further evaluation, a rate of 1.05%, slightly lower than the overall year average for tablestock material (1.2%). The long-term average is 1.5%. Growing conditions varied from site to site, which is one of the strengths of this project. All sites yielded selections that had better appearance than the check variety Beauregard.

Selection at harvest was based on the following subjective visual criteria: shape, flesh color, skin texture, relative yield, size distribution, root number, earliness, and observable diseases or defects. These selections will be planted in Clinton and Kinston in 2004 as unreplicated 20-hill plots for the second cycle of selection.

The second component of the GPPB is to evaluate promising breeding lines under commercial conditions. This year ten clones and four check lines were grown in unreplicated 100 foot plots and evaluated at each location where the seedlings were grown. Notes on how they performed at each location are combined with research station trial data and disease screening data to determine the potential of each as a cultivar. Results from one farm to the next varied significantly, and only three of the advanced clones performed reasonably well in all grower locations. Their descriptions are as follows:

**NC98-608** Smooth rose skin, orange flesh, blocky to elliptic shapes, mid season. High pack-out of No.1's.

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

**Status:** Looked good in all of our on-farm and research station trials in 2002 and again in 2003. Several growers tested plants from the Micropropagation Unit with mostly favorable results. It is available to certified greenhouse growers on an experimental basis again in 2004. Sprouting has been slow in our beds in Clinton. This will be the first year for commercial bedding of NC98-608 and growers are being advised to pre-sprout NC98-608 earlier than Beauregard to obtain optimal results. Release will be determined on the basis of performance in 2004. The Variety Development Report provides a more extensive description of this clone.

**NC99-026** Moderately smooth copper-rose skin, orange flesh, elliptic to blocky shapes, lenticels a little prominent, generally short length/diameter ratio that makes for nice sized No.1 roots, early to mid season. Good size distribution and earliness.

**Disease Resistances:** Resistant to Fusarium wilt and root-knot nematodes.

**Status:** Enter into advanced tests in 2004 and on-farm trials. Needs testing for Streptomyces resistance.

**NC99-573** This clone produces smooth skinned, rose-colored roots that are attractively shaped. Yield is high. Growing season about two weeks longer than Beauregard. Lenticels are fairly prominent in wet conditions and it is susceptible to root-knot nematodes. Needs further evaluation.

**Disease Resistances:** Resistant to Fusarium wilt and Streptomyces soil rot, susceptible to root-knot nematodes.

**Status:** Enter into advanced tests in 2004 and on-farm trials.

Please see the Variety Development Report for a more extensive description of each of these clones and yield trial results.

Many other lines performed well in only one or two of the sites, an indication that they are not broadly adapted. When we are limited to testing on the research stations we do not see as many varied environments per season. Thus, the GPBP has enabled us to evaluate the performance of clones under a variety of stresses (e.g. drought, flooding, insect, disease and weed pressure) in a single year. If only a single evaluation site is available this process takes a few years, and we have to carry and increase lines that have serious weaknesses and this lengthens the time to release. Our emphasis in 2004 will be on expanding the number of advanced materials evaluated in multiple locations so we can identify widely adapted materials and advance them as quickly and under as many environmental conditions in a single year as possible.

#### **Acknowledgements**

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Table 2. Number of sweetpotato seedlings selected per female parent on farm in 2003.

Maternal parent	# selections	Maternal parent	# selections
<i>Jim Jones Farm, seed from the 2002 Elite nursery</i>			
NC96-27	15	Bienville	23
NC97A-04	15	Hernandez	4
NCC58	12		
		<b>Total</b>	<b>69</b>
<i>Pride of Sampson</i>			
<i>2002 Elite nursery</i>		<i>2002 SSR nursery</i>	
NC96-61	10	Beauregard	4
NC98-576	8	Bienville	12
L96-117	7	NCC58	8
		L80-62	2
		<b>Total</b>	<b>51</b>
<i>Wooten, seed from the 2002 Elite nursery</i>			
NC96-61	8	Bienville	6
NC97A-04	10	Goldstar	4
NCC58	9		
		<b>Total</b>	<b>37</b>
		<b>On Farm Grand total</b>	<b>157</b>