2002 PROGRESS REPORT
To
North Carolina Sweetpotato Commission

TITLE: Sweetpotato Grower-Participatory Breeding Project Support

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DEPARTMENT: Horticultural Science

REPORT:

Project Objective(s): The overall 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 have high levels of resistance to diseases and insects. The specific objectives of the Grower-Participatory Breeding Project (GPBP) are to 1) collaborate with growers, Extension Agents and Specialists to evaluate seedlings, and preliminary and advanced selections of our most promising lines on-farm with the goal of rapidly selecting and evaluating new varieties for production in NC.

Project Cooperators

Researchers	Extension	Growers
Mr. Wilfred "Bill" Jester	Mr. William Little	Mr. Kendall Hill
Dr. Jonathan Schultheis	Mr. Allan Thornton	Mr. Jim Jones
Mr. Dennis Adams	Mr. Milton Parker	Mr. Terrell Williams
Dr. Zvezdana Pesic-VanEsbroeck	Mr. Mike Wilder	Mr. Johnny Williams

Project Summary:
The Grower-Participatory Breeding Project has been in existence for five 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 then 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. For example, our most promising advanced line, NC98-608, is a product of the first year of this project. It is unlikely that this seedling would have ever been planted had it not been for the GPBP project.

Table 1 provides a summary of the number of lines the GPBP has screened on-farm as part of the GPBP to date. Eleven advanced lines have been selected and evaluated on-farm and at the research stations as a direct result of this project. While eleven advanced lines may not seem like a lot, it is. Four of these lines were used in our breeding nurseries in 2002, and one NC98-608 is being rapidly advanced and will be extensively evaluated in multiple commercial trials in 2003. All have very 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. We expect several other breeding and advanced lines to come from the remaining 1999-2002 selections as well.

Table 1. Number of sweetpotato seedlings planted and number selected over successive years (1998-2002) from on-farm tests.

Year	True seed	Seedlings	2nd Year	3rd Year	Advanced
2002	18000	251	----	----	----
2001	15000	153	22	----	----
2000	15000	303	24	7	----
1999	24000	260	47	10	7
1998	24500	358	22	9	4
Totals	96500	1325	115	26	11

Forty percent of the true seed grown in our breeding program during 2002 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 18,000 seedlings planted, 251 were selected for further evaluation, a rate of 1.4% the same as the overall year average for tablestock material. This is close to the long-term average of 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 under commercial growing conditions is important since these are representative of conditions new varieties must be adapted to.

Selection at harvest was based on the following 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 2003 as unreplicated 20-hill plots for the second cycle of selection.

The second component of the GPBP 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 will be 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 two of the advanced clones performed reasonably well in all grower locations. Their descriptions are as follows:

NC98-608 Rose skin, orange flesh, smooth skin, blocky to elliptic shapes, mid season. High pack-out of No.1's.
Disease Resistances: Resistant to Fusarium wilt, moderately resistant to soil rot, initial screenings put it at moderately susceptible to root-knot nematodes, but no worse than Beauregard.
Status: Looked good in all of our on-farm and research station trials in 2002. NC98-608 will be extensively tested in 2003 in replicated trials and in larger plot on-farm evaluations with commercial growers. We expect around 15 acres total in 1-2 acre blocks, on several different farms. This will give us a wide range of soils and environments to see how it performs across the growing region. After harvest, these sweetpotatoes will then be stored in commercial storage facilities and bedded the following spring. (See the Variety Development report for a more extensive description)

NC98-061 Rose skin, orange flesh, smooth skin, elliptic shapes, eyes a little deep, consistently short length/diameter ratio that makes for nice sized No.1 roots, mid season.
Disease Resistances: Resistant to Fusarium wilt, moderately resistant to moderately susceptible to both soil rot and root-knot nematodes.
Status: Pretty, uniform roots but the problem with this line is that the yield is consistently lower than Beau, around 80% of the marketable yield. This is too low. Being considered as possible parent pending further disease evaluation.

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. As mentioned earlier, our emphasis in 2003 will be on expanding the number of advanced materials evaluated in multiple locations so we can identify widely adapted material and advance it 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 2002.

Maternal parent	# selections	Maternal parent	# selections
Williams Farm, seed from the 2001 Elite nursery			
NC96-27	9	Goldstar	9
NC97A-04	16	Hernandez	21
NCC58	21	L94-96	16
		Total	**92**
Jim Jones Farm			
2001 Elite nursery		*2001 SSR nursery*	
NC96-27	8	NC93-50	8
NC96-61	11	NC97-433	10
		Beauregard	6
		Hernandez	9
		L86-33	4
		L94-96	18
		Patriot	6
		Total	**80**
Tull Hill Farms, seed from the 2001 Elite nursery			
NC97A-04	15	L86-33	1
Hernandez	10	L94-96	28
Jasper	19	W271	6
		Total	**79**
		On Farm Grand total	**251**