Sweet Potato Seed Improvement on the Farm

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ABSTRACT

A sweet potato seed improvement program sponsored by the Agricultural Extension Service has resulted in better quality. The purpose of this statewide campaign, called "Yam Alert", has been to dray farmer's attention to the problems of mutations and diseases which occur as a result of poor on-farm seed management. The multi-media approach focuses on an illustrated pamphlet which concisely describes the problem and presents realistic solutions. The pamphlets was mailed to every sweet potato grower in North Carolina. The cover letter accompanying the pamphlet, and other timely grower correspondences, are on a specially designed "Yam Alert" stationery. Growers' meetings feature an eight, two or one projector narrated slide presentation which is entertaining but educational. The "Yam Alert" message is reinforced at meetings by a colorful, table top display. Further reinforcement is provided by radio and television presentations plus timely articles in newspapers and magazines. On-farm tests demonstrate seed improvement principles, especially the importance of careful selection for orange flesh color. Results of grower seed source surveys reveal strengths and deficiencies of individual grower seed management systems.

Sweet potato (Ipomoea batata) production in the United States is limited commercially to the coastal and southern states due to growing season requirements. All sweet potatoes in the United States are produced as annuals, storing seedstock between successive crops.

North Carolina has in the past two decades become the leading sweet potato state, producing more than 40% of the total US production of approximately 500,000 metric tons in 1982. This is possible because of good climatic conditions and excellent soils. However, the competitive edge was due to grower commitment to quality production and good salesmanship. Growers simultaneously extended their shipping seasons by constructing modern storage facilities which provided proper temperature and humidity control and ventilation. North Carolina State University research and extension personnel worked closely with growers in the production and maintenance of quality of sweet potatoes.

Although some white-fleshed sweet potatoes are grown, the most popular varieties in the United States today are the orange-fleshed "yam type," such as Jewel and Centennial. Centennial was developed and released by the Louisiana Agricultural Experiment Station in 1960. Jewel was developed and released by the

North Carolina Agricultural Research Service in 1970. These varieties are widely accepted in the fresh market and for processing. More than 90% of the commercial acreage in North Carolina is Jewel.

Jewel produces high yields of moderately short, chunky roots which keep well in storage, but it is susceptible to flooding damage and flesh and skin mutations. These spontaneous changes in genetic material occur at much higher rates in sweet potatoes than in many other crops because they are genetically unstable. Growers know this as "running out" and are constantly in search of that "perfect variety" to replace jewel.

The sweet potato breeding programs at North Carolina State University have produced more improved varieties, but not a "stable Jewel." Improved techniques and tests have been incorporated into the breeder's seed program. This has resulted in improved Foundation, Registered and Certified Jewel (and other varieties) seedstock being made available to growers. However, the ultimate responsibility for good seed is in the hands of the growers. They cannot save seed from the grade-outs and unmarketable roots of this vegetatively reproduced crop and expect to consistently harvest good yields of high quality sweet potatoes. Growers should have their own sweet potato seed programs and should only utilize seedstock which is free from flesh and skin mutations and has no disease problems.

Because of worsening sweet potato quality situation, a statewide seed improvement campaign was initiated. The "Yam Alert" campaign was to educate farmers on importance of establishing and maintaining their own good seed programs. Farmers are encouraged to use Certified seed. They are urged to select the best seed they can get to produce their annual sweet potato crop. They are reminded that the crop they harvest in the fall can be no better than the seedstock they start with in the spring.

Starting in 1980 farmers were made more aware of their responsibility in maintaining their own good on-farm seed programs through many avenues which reinforce the "back to the basics" message:

1. The Yam Alert Newsletter is sent directly to every sweet potato grower in North Carolina. Two or three letters each spring and one or two letters in the fall provide timely reminders of important factors in the production of quality sweet potatoes. These letters are on specially designed, distinctive stationery.

2. The Yam Alert pamphlet (North Carolina Agric. Exten. Svce. Bull. AG-196) briefly states (and illustrates) the problem. It also provides realistic solutions that can be implemented at the farm level. A copy of this pamphlet was mailed to every grower with an appropriate "Yam Alert" cover letter at the start of this campaign in early 1980.

3. Growers' meetings have featured narrated slide presentations which entertain while they educate:

   a. Multiprojector (8 projectors, 3 screens), or
   b. Single projector -- using the same cued narration on cassette.

4. An attention getting table top display reinforces the message of the Yam Alert pamphlet with brief, straightforward statements and large color photographs. This is used effectively at grower meetings and trade fairs; serving also as a focal point for distribution of Yam Alert pamphlet and other timely publications.

5. Yam Alert on-farm demonstrations in several locations provide real life, visual evidence of the results of using "good" seedstock or "bad" seed stock. Local farmers witness the plot harvests and see for themselves that careful seed selection can result in improvement of orange flesh color in Jewel.

6. Timely articles in newspapers, grower magazines and other periodicals provide further reinforcement. Radio and television are also used whenever appropriate.

Professionals in many disciplines have been involved in this campaign; state sweet potato extension specialist, sweet potato breeder, extension vegetable pathologist, North Carolina Department of Agriculture Pesticide and Plant Protection Division specialists and County Agents with horticultural crops responsibilities. County personnel are critically important since they have more frequent contact with growers and can constantly reinforce the basic Yam Alert theme.

For many years North Carolina farmers have been admonished to accept the responsibility for their own sweet potato seed programs. Some do a good job, but many do not. The Yam Alert campaign has been designed to get their attention and sell the concept of on-farm seed management. Many misconceptions have been dealt with directly and positively. For instance, many farmers believe that cutting vines for transplants (or cutting transplants from beds) improves sweet potato quality (including flesh and skin color). Cutting is strongly recomended because it minimizes the transfer of soilborne diseases and insects to the field. Proper selection of seed is the only way to maintain desired flesh and skin color.

Growers are repeatedly reminded that knowing the source of their sweet potato seed is the only way to be sure of quality. Buying plants from other growers is risky and one must always bear in mind that the quality of transplants is not better than the confidence one has in the plant grower.

On-farm Yam Alert demonstrations have been used effectively to demonstrate to farmers that seedstock could be improved through careful selection to eliminate mutations. Grading seedstock eliminates roots of unacceptable orange flesh color and results in production of a high percentage of desirable roots at harvest. Field run seedstock started out with 85% acceptable orange flesh color, but roots produced by plants from this seedstock only had 74% and 43% acceptable orange flesh color, respectively, in the two demonstrations. White mutants used for seedstock clearly resulted in the production of white fleshed sweet potatoes.

Such locally conducted on-farm demonstrations have high impact on the cooperating farmer and his neighbors. The benefits of using good seed and careful selection are reinforced and farmers gain confidence in extension recommendations. Even though it is not always possible or practical to produce statistically significant data from such on-farm demonstrations the farmers personal involvement and reaction is important. Farmers will respond to seed management recommendations more readily if they observe results and differences for themselves. It is, therefore, imperative that such demonstrations be simple, straight-forward and clearly labeled for easy interpretation of results. Using on-farm demonstration

results in local, county and state meetings is useful and important, but less meaningful than getting farmers to visit the demonstration plots at harvest.

In 1982 a Seed Improvement Survey was conducted. Basically, the survey consisted of random collections of 100 transplants from each participating grower's beds. Source of seedstock was identified whenever possible. Transplants were grown on a commercial sweet potato grower's farm. Each grower was assigned a code number for his transplants. At harvest all the roots produced were cut in half and evaluated for flesh color. The coded results were sent to all participants so they could compare their seedstock performance with that of other growers.

Grower interest in this survey aspect of the Yam Alert campaign was good. Several volunteered readily because they were proud of their seed program and confident that their seedstock would compare favorably with that of other growers. Others were not so anxious to subject their seedstock to testing. These were the growers that County Agents focused on because they were likely to benefit the most from knowing more realistically how good (or bad) their seed program was. County Agents used the survey as a tool to introduce good sweet potato seed management concepts and techniques.

The results of the 1982 Yam Alert Seed Improvement Survey indicate that using better seedstock and selecting for orange color pays off. These data reinforce the recommendations to use good seed (Certified if possible) and select for good orange color. Old, unselected seed (Certified 1980 and 1979 and unknown) results in production of a much higher percentage of unacceptable-colored roots. Observe that the range of acceptable orange flesh color is much broader with older and unknown seedstock.

Table 1. Flesh color of harvested sweet potatoes as influenced by source of seedstock. Yam Alert seed improvement survey, North Carolina, 1982.

Source	No. Samples	Percentage roots with acceptable orange color[1] Range	Average
Selected	3	97.2 - 99.4	98.1
Foundation, 1981	3	95.6 - 100	97.5
Registered, 1981	11	96.1 - 100	98.5
Registered, 1980	1	-	92.9
Certified, 1981	12	91.8 - 100	97.2
Certified, 1980	5	75.6 - 100	91.4
Certified, 1979	5	82.3 - 96	91.3
Unknown	9	88 - 99.6	94.9
Overall	49	75.6 - 100	95.8

[1]Acceptable orange flesh color is determined using a scale of 0 to 5; (0 = no orange color, 5 = intense orange color); 0-2 = unacceptable; 3-5 = acceptable.

Conclusions

Acceptable orange flesh color of sweet potatoes can be improved through good seed management, especially selection for this character. Growers can and should perform this task annually. Since the Yam Alert campaign began, North Carolina sweet potato processors have observed generally improved orange flesh color of sweet potatoes, especially from growers who select for color. During the same period some growers' sweet potatoes have continued to deteriorate with regard to orange flesh color. Good on-farm seed management programs compliment the breeder's seed programs and result in improved orange flesh colored sweet potatoes for both fresh markets and processing.

References

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