



An Introduction to the LSU AgCenter Sweetpotato Foundation Seed Program

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Dr. Christopher A. Clark is a Research Professor in the Department of Plant Pathology & Crop Physiology at the Louisiana State University (LSU), AgCenter with 42 years of experience in research on sweetpotato diseases and 20 years of experience in conducting virus testing and tissue culturing in support of the LSU AgCenter sweetpotato foundation seed program. He has been chair or co-chair of NCPN-SP since its inception, which involves providing leadership and coordination for network activities in producing clean plants in six clean plant centers in the U.S.









Tara Smith – PhD Professor and Director. Dr. Smith currently serves as the Research Coordinator of the LSU AgCenter Sweet Potato Research Station. She is an entomologist and conducts applied entomology research on sweetpotato as well as serving as a primary point of contact for the sweetpotato industry in Louisiana. Dr. Smith also serves as the Regional Director of the LSU AgCenter Central Region where she oversees all LSU AgCenter research and extension programs.



Arthur Villordon





Dr. Villordon has been working with the LA sweetpotato industry for 20 years and in the last 10 years has focused on examining the role of root architecture and storage root formation as the integrator of intrinsic (genetic) and external (management and environmental) cues that influence sweetpotato productivity. To date, collaborative work has provided evidence that abiotic (water and nitrogen availability) and biotic factors like virus presence, nematode infection directly influence lateral root development. Follow-up work has generated evidence of the link between phosphorus availability and storage root length and shape, leading to increased collaboration with growers for enhanced surveillance of soil phosphorus and monitoring of yields.



Theresa Arnold





Theresa Arnold is a Research Associate at the LSU AgCenter Sweet Potato Research Station. She has been there for 10 years and is currently serving as interim Farm Manager. She oversees the foundation seed program that provides clean seed to the sweetpotato industry in Louisiana, and is responsible for domestic and international sales of clean sweetpotato planting stock. Additionally, she coordinates planting and harvest of research plots for off-station researchers, and assists with the sweetpotato breeding program.









Jeffrey Cole Gregorie is a Research Associate for the Sweet Potato Research Station at the Louisiana State University (LSU), AgCenter. He has been an associate for 10 years and specializes in greenhouse management, research plot implementation, drip irrigation, rotational crops, and pesticide management. He is also working towards a doctoral degree in Agronomy with emphasis on soils and Plant Physiology.



Sweetpotato Foundation Seed Program

- History
 - 1940s Louisiana grew ~100,000 acres of sweetpotato and started foundation seed program to manage mutations.
 - 1999 transformed foundation seed program to 'virus-tested' foundation seed program
 - 2015 joined the new National Clean Plant Program Sweetpotato



Hill selection and culling seed roots were used in 1940's to manage mutations.

Louisiana's Sweetpotato Foundation Seed Program

W.A. Mulkey and J.H. Hernandez

Additional index words. breeder seed, mutation, variety purity, flesh color, rogue, vine cuttings

Summary. Foundation sweetpotato [*lpo-moea batatas* (L.) Lam] seedstock has been produced annually at the Sweet Potato Research Station since 1949. Breeder seedstock is selected from superior hills and used for the following year's foundation seedstock. Fields are intensely monitored after planting until harvest to remove off-type plants, mutations, etc. Seedstock is harvested from August through October, stored, graded, and repacked beginning in late January, and then made available to the growers during the early spring.



Fig. 1. Breeder seedstock hill selection.



Fig. 2. Slicing hill selections to check for internal disorders and internal color.



Propagating from storage roots is an exercise in somaclonal variation.



Dennys Diner https://66.media.tumblr.com/4d9b74c 64410af20b7e7b5ea8af340fb/tumblr_ o6lwhazD9J1qez3nzo1_500.gif

The "eyes" on this Yukon Gold seed potato have already begun to sprout. Source: Charlotte Glen, NCSU, CES



Potatoes make tubers that have 'eyes'. Sweetpotatoes make storage roots, <u>not</u> <u>tubers</u>! and do not have eyes with preformed buds.



Mutations were the main worry...



Genetic Variation among Sweetpotatoes Propagated through Nodal and Adventitious Sprouts

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Additional index words. Ipomoea batatas, arbitrary primers, RAPD/AP-PCR, clonal variability, tissue culture

Abstract. Genetic uniformity was assessed among sweetpotato (*Ipomoea batatas*) clones propagated through adventitious and nodal procedures. A single sprout each of 'Jewel,' 'Sumor,' and L87-95 was used as source of clonal plants that were simultaneously propagated through conventional adventitious procedures and a tissue culture-based nodal culture technique. A sample of 15 decamer primers generated 64 scorable amplified fragments in a PCR-based assay, 29 of which were putatively polymorphic across n = 60 samples (10 each of nodal and adventitiously derived plants/genotype). Within adventitiously derived materials, putative polymorphisms ranged from 4,7% to 31.3% depending on the genotypic class. In contrast, putative polymorphisms ranged from 0.0% to 3.1% among nodally derived samples. Marker loci differentiated genotypes as well as putative marker phenotype variants through a multidimensional scaling analysis of the genetic similarity matrix. An 'analysis of molecular variance' shows that genotypic effects accounted for 88.7% of the total molecular marker variability, while propagation effects (within genotypic groups) accounted for 11.3%. Results confirm that clonal plants derived from preexisting meristematic regions are more genetically uniform than plants propagated from adventitious origins.



Sweetpotato 'Beauregard' Mericlones Vary in Yield, Vine Characteristics, and Storage Root Size and Shape Attributes

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Abstract. Yield tests and evaluation of selected storage root and vine characters were conducted among 12 'Beauregard' sweetpotato [*Ipomoca batatas* (L.) Lam.] mericlones. Maximum yield differences were 43%, 48%, 79%, and 40% for U.S. #1, canners, jumbos, and total marketable yield, respectively. Additive main effect and multiplicative interaction (AMMI) biplot analysis was useful in graphically presenting the yield differences and stability patterns of mericlones. Differences were also detected in vine length, internode diameter, and internode length. Digital image analysis of U.S. #1 storage roots also revealed differences in storage root minor axis length, roundness, and evaluation attributes. The results provide valuable information for enhancing current methods of evaluation and selection of mericlones for inclusion in sweetpotato foundation seed programs.



Sweetpotato Foundation Seed Program

SPCSV is not usually found in U.S., hence SPVD is not an issue.

Beauregard



Virus-tested



Sweetpotato Foundation Seed Program

- Limitations
 - Must use existing facilities which also support sweetpotato breeding and research programs
 - Rapid plant increase occurs during winter with cool temperatures, short days, and often low light intensity
 - Sweetpotato weevil quarantine
 - No certified seed growers, foundation seed sold directly to farmers
 - Still in learning process on how to deliver clean plants to farmers

Seed is produced in weevil-free area



Baton Rouge

Sweetpotato weevils do not survive winter well in parishes in white (green tag areas). Therefore, sweetpotatoes are not allowed to be shipped from parishes in red (pink tag areas) to parishes in white. The Sweet Potato Research Station is located in Franklin Parish to allow shipment of seed to anywhere in the state.



Sweetpotato Foundation Seed Program



Emerging non-traditional purple flesh, ornamental-edible

















Department of Plant Pathology & Crop Physiology (PPCP) Foundation greenhouses Foundation 'seed' production in field Breeding line evaluations Cultural practices research

Virus therapy Virus testing Tissue culture: maintenance micropropagation

Learn More





Foundation seed production is focused on production of sweetpotato varieties developed by the LSU AgCenter, but also includes small amounts of heirloom cultivars such as Porto **Rico and Heartogold. Each year,** approximately 20,000 bushels of 'seed' were sold to sweetpotato growers. Sales of vine cuttings from the greenhouses are increasing and efforts are ongoing to expand this aspect of production.

Take a virtual tour online at NCPN website:



A Virtual Tour of the Sweetpotato Clean Plant Center at The Louisiana State University Agricultural Center





The Louisiana State University Agricultural Center

Sweetpotato Clean Plant Center A Virtual Tour

Click on the image to download the PowerPoint File







SPRS Greenhouses



Foundation 'seed' plantings in the field



Tissue cultures in aeroponics, plants in beds



Foundation 'seed' harvest



Micropropagation



Each year, those cultivars and breeding lines that will be grown commercially or used in research at SPRS are increased by micropropagation by joint effort with Certis, USA in their lab on the LSUAC campus in **Baton Rouge.** Tissue cultures are bar coded and tracked through the process. The micropropagated tissue culture plants are then transported to SPRS in Chase...









From December through April, the number of plants in the greenhouses is increased by repeated transplanting of vine cuttings.





- The Sweet Potato Research Station has about 320 acres of cultivated land with an additional 20 acres in use at the Macon Ridge Station four miles north.
- In accordance with certified seed law, sweet potato foundation seed is grown in a three year rotation: wheat, soybean, sweetpotato.
- Each year, about 45 acres of land are used for foundation seed production.







To further increase production, vine cuttings are also taken from early field plantings to plant late field plantings...















The Sweet Potato Research Station has a storage facility with six bays that allows proper curing and storage of up to 15,000 bushels of sweetpotato seed. The seed is stored from harvest until it is distributed to growers in February to March.





Foundation greenhouse

Tissue culture

Once plants leave the greenhouse, virus reinfection starts and is difficult to manage.



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On farm increase

