Fig. 6. Wedges of white tissue or white roots occur in many sweetpotato varieties.

Meristem-tip Culture and California's Clean Foundation Sweetpotato Program

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Summary. For about 30 years, the Univ. of California has used advanced laboratory techniques in addition to traditional methods to produce pathogen-free and true-to-type sweetpotato seedstock. The effort continues with the varieties important in the marketplace today. This program serves as a model for the use of meristem culture by foundation sweetpotato programs in other states.

California's "clean" sweetpotato seed program began during the 1960s in response to the russet crack disease (Fig. 1), which is caused by a strain of sweetpotato feathery mottle virus (SPFMV). At that time, the Jersey variety was

Literature Cited

Alabama Crop Improvement Assn., Inc. 1990. Official seed certification standards for Alabama. Alabama Crop Improvement Assn., Inc. Auburn University, Ala.

Clark, C.A. and J.W. Moyer. 1988. Compendium of sweet potato diseases. American Pathological Soc.. St. Paul, Minn.

one of the most important commercial sweetpotatoes. Seedstock free of virus had to be planted each year due to the severity of the disease. The virus was eliminated from plants through meristem culture. Once the sweetpotatoes were free of viruses, they were increased in an isolated area, then distributed to growers. Although the program was specifically designed to solve the russet crack problem, it is likely that other systemic pathogens also are excluded by meristem-tip culture. The bacterial soft rot pathogen, *Erwinia chrysanthemi*, and several fungal pathogens, including *Fusarium* species, are other disease-causing microorganisms that are most likely to be present in sweetpotatoes.

The procedure is still used today to provide sweetpotato growers with high-quality seedstock. It begins with the selection of the most-promising plants in the field (Table 1). Roots of individual

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Fig. 1. Roots exhibiting typical symptoms of russet crack disease in sweetpotato (Jersey variety).

Table 1. Chronology of the production of California's foundation sweetpotato rootstock.

Year	Activity
1	Plants or hills in the field are selected according to yield, shape, and exterior and interior color.
2	Each clone is sprouted and passed through meristem culture. Meristemmed plants are indexed three times for the presence of virus by grafting to <i>Ipomoea setosa</i> .
3	Stem cuttings are used to increase planting material in the greenhouse. Field evaluations are made if enough material is available for a replicated trial.
4	Roots are planted in hotbed. Sprouting is evaluated, then the clones are grown in the field in the replicated plots. The best clone is selected. Storage characteristics are evaluated also.
5	The best clone of the clean seedstock is maintained in the greenhouse and increased in the foundation block located in an isolated area.
6	When sufficient seedstock is available, it is distributed to sweetpotato producers.

plants (hills) are examined for trueness-to-type, including exterior and interior color, shape, and yield. Several of the better hills of each variety are selected as candidate clones for meristemming. Meristem-tip culture involves aseptically removing the meristem (usually ≈ 0.5 mm long; Fig. 2) from an apical or a lateral bud of shoots produced in the greenhouse by the candidate clones. The meristems are grown aseptically on synthetic agar

culture media in the laboratory to produce a new plant. After 3 to 12 months in culture (Fig. 3), a regenerated plant with roots and shoots is transplanted to vermiculite in a closed container for a few weeks until it adapts to the normal environment and can be transplanted in the greenhouse and grown out for virus testing (indexing). To determine if the tissue-regenerated plant is free of virus, it is tested three times by grafting to the Brazilian morning glory (*Ipomoea setosa*). If the virus is present in the sweetpotato used for the graft, foliar symptoms develop on the new growth of morning glory within 4 weeks. Once the plant is free of SPFMV, it is placed with the foundation stocks of other cultivars and propagated for replicated trials to evaluate yield and varietal characteristics. These trials are conducted in growers' fields. The best clone is selected for "seed" increase and commercial production. It may take up to 6 years to produce foundation sweetpotatoes in this program.

The Jersey variety is no longer produced commercially in California. However, the California clean seed program continues to provide sweetpotato producers with pathogen-free, high-quality 'Beauregard', 'Jewel', and 'Garnet' seed roots. The California foundation sweetpotato program ensures the phytosanitary condition of its seedstock through the use of the meristem culture with virus indexing on *I. setosa* and production of clean seedstock in areas isolated from commercial sweetpotato fields or weed species that are reservoirs of the virus.

Fig. 2. A sweetpotato meristem without the leaf primordia. The meristem is removed from apical or lateral buds above the leaf primordia and transferred to tissue culture.

Fig. 3. The developmental sequence of meristem tips, beginning with excision from the sweetpotato vine and placement on the medium (far left) to the development of a plantlet (far right). A plantlet can be transferred to vermiculite in covered containers after 3 to 12 months and then to potting soil when it is fully acclimatized.

Louisiana's Sweetpotato Foundation Seed Program

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Summary. Foundation sweetpotato [*Ipomoea 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.

In 1948, state appropriations funded the establishment of a sweetpotato research center for the LSU Agricultural Centers' Dept. of Horticulture. This facility is now known as the LSU Agricultural Center Sweet Potato Research Station located at Chase, La. The primary mission of the research center was the production of high-quality foundation seedstock, maintenance of variety purity, and assistance in the development of new varieties.

About 20 roots of each sweetpotato variety being grown in Louisiana during 1948 were fumigated with methyl bromide by the Louisiana Dept. of Agriculture and Forestry in Baton Rouge, transported to Monroe, and bedded in a greenhouse in early Spring 1949. Sprouts from these roots were

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