Improving Sweet Potato Production Efficiency

Storage Root Initiation

Background

Sweet potato producers have high expectations every season that every field will return high yields of a uniform crop.

The yield of sweet potatoes involves several components such as stand, planting density and the number of roots per hill. The information provided here will explain, in part, how the number of storage roots per hill is determined.

It is well known that a large amount of variability exists between individual sweet potato plants and the subsequent number of storage roots they produce. Yield variability likely is a function of variability in early transplant establishment. Ninety percent of adventitious roots have the potential to become storage roots.

Recent studies have shown that under optimum field conditions, anatomical features (anomalous cambia around primary and secondary xylem) related to the onset of storage root initiation can be observed to occur as early as 13 days after transplanting. It also has been well documented that the total storage root numbers or the potential sweet potato yield is determined 30-35 days after transplanting. Actual yields realized are dependent on biological, agroclimatic and other management variables interacting early in the growing season.

What is storage root initiation in sweet potatoes?

Storage root initiation is the process under which adventitious roots differentiate into sweet potato storage roots. This process occurs very early after transplanting and can be anatomically observed as early as 13 days after transplanting.

Stages of storage root initiation:

SR1: *Appearance of at least one adventitious root in at least 50 percent of transplants.*

SR3: *Presence of at least one visible storage root (adventitious root with visible localized swelling – 0.5 centimeter at its widest section) in at least 50 percent of plants.*

SR2: *Appearance of anomalous cambium in at least one adventitious root in at least 50 percent of transplants.*

What factors can affect storage root initiation?

Biological (transplant quality), agroclimatic (air and soil temperature, humidity, soil moisture) and other external variables (such as chemical applications to the crop) should be optimized to maximize root initation in sweet potatoes.

There have been many examples of nearly 100 percent yield loss of sweet potatoes at the field level. Research on soil moisture during the past few years has demonstrated yield loss associated with not optimizing soil moisture after planting. By turning off supplemental irrigation during the critical storage root initiation stages (SR1-SR2) and imposing conditions approaching wilting point, researchers induced damage symptoms that caused extensive lignification and resulted in pencil (long, stringy) and misshapen roots.

Other variables such as chemical application and cold soils can influence the root initiation process, as well. Any source of stress during critical storage root initiation stages can lead to lignification.

How do I optimize the root initiation process in my sweet potato crop?

- Maintaining optimal soil moisture before and after planting (50 percent of field capacity).
- Cutting good quality transplants (with five to seven fully opened leaves, sturdy plants, foliage intact).
- Not applying excessive nitrogen fertilizer prior to planting. Research in Louisiana has shown that 35-40 pounds of nitrogen per acre is optimal for sweet potato production and that yield increases often are realized if a portion or all of the nitrogen is side-dressed.
- Reading and following all insecticide and herbicide labels regarding product amounts and application timing for sweet potatoes.

Important terms:

Adventitious roots – *those roots originating from root primordia located on the nodes of a transplant. These roots can differentiate into storage roots under the proper conditions.*

Lignification – *a change that occurs in an adventitious root, which results in long pencil-type roots. Drought stress can result in lignification. Other biological and agriclimatic factors also may influence this process.*

Tara P. Smith, Associate Professor
Sweet Potato Extension Specialist, Sweet Potato Research Station

Arthur Villordon, Professor
Sweet Potato Research Station

Project: Participatory modeling and decision support for improving sweet potato production efficiency, quality and food safety. (2009-51181-06071)

Funding Agency: U.S. Department of Agriculture's National Institute of Food and Agriculture, Specialty Crop Research Initiative

Participants: Louisiana State University Agricultural Center
Mississippi State University
North Carolina State University
University of California Cooperative Extension

www.LSUAgCenter.com

Louisiana State University Agricultural Center
William B. Richardson, Chancellor
Louisiana Agricultural Experiment Station
John S. Russin, Vice Chancellor and Director
Louisiana Cooperative Extension Service
Paul D. Coreil, Vice Chancellor and Director

Pub. 3235A (500) 3/12