NEMATODE SUSCEPTIBILITY RANKINGS FROM SOFT-TISSUE X-RAY IMAGING

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Abstract

A new method of cotton susceptibility and resistance determination to reniform nematode is presented. The method is based upon soft-tissue X-ray imaging. The entire root volume of a plant is captured in a single X-ray image at high resolution. Six cotton lines from the Auburn University reniform nematode resistance breeding program and two resistant USDA germplasm lines (LONREN-2 and BARBREN-713) were grown under greenhouse conditions at the University of Tennessee in soil infested with reniform nematodes extracted from West Tennessee cotton fields. Four of the lines were known to be susceptible and four were resistant. The plants were planted in containers with 500 cc of soil and ~7,500 nematodes. The plants were grown for six weeks. The plants were excavated with their roots carefully washed, preserving egg masses and embedded females. They were then subjected to X-ray imaging and evaluated with digital imaging software. Egg masses were counted and their locations on the root system were documented from the X-ray images. The overall root system of each plant was characterized to determine the root system architecture of the infected plants. Each cotton variety had a unique distribution of roots as a function root diameter and as a function of root depth. Each cotton variety also had a unique distribution of nematode feeding sites along its root system. Two resistant lines from the Auburn program demonstrated low egg mass counts per unit length of plant root. The USDA line BARBREN-713 gave high nematode egg mass counts per unit length of plant root.