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THE CROPS GENETIC RESEARCH FACILITY AT THE TEXAS A&M RESEARCH AND EXTENSION CENTER AT LUBBOCK, TX SCREENS WILD COTTON GERMPLASM FOR RESISTANT TRAITS

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Abstract

Screening of obsolete race stocks and wild cottons for resistant traits is being conducted at the Crops Genetic Research Facility at the Texas A&M Research and Extension Center in Lubbock, Texas. Currently screening for resistance to pathogens, drought, salt, nematodes and insect pests is underway and even at this early stage of the program several cottons have shown some degree of resistance. Screening will be expanded as the methodologies for testing for resistance to each factor are refined.

Introduction

Greater genetic diversity is expected in the wild cottons and obsolete cotton race stocks stored in the various collections around the world than in inbred commercial cottons. Identification of any resistance in these plants would provide valuable germplasm to cotton breeding programs. This program initiates a multi-disciplinary effort including pathology, plant physiology, entomology and plant breeding to identify and make available resistant germplasm.

Disease Resistance

Bacterial blight

Cottons are being tested for resistance to bacterial blight (*Xanthomones campestris* pv. *malvacearum*), which causes boll rot, leaf spotting and defoliation. Leaves are exposed to the pathogen by placing the leaf in contact with an inoculum containing 10^6 bacteria per ml using the procedure described by Kangatharalingam et al. 2003. Symptoms develop after one week and plants are evaluated for resistance.

Environmental Tolerance

Drought

Cotton accessions are planted in fritted clay and evaluated at 20 days. Root development is observed following application of different water levels. One method being tested is using 3' PVC pipe for planting to evaluate tap root length. Root and shoot length, lateral root number, and fresh and dry root and shoot weights are being measured. Leaf wilting and plant recoverability will also be a factor in determining drought tolerance. Preliminary results indicate significant differences among these cottons.

Salt

Tolerance studies are being conducted by planting seeds in germination towels soaked in various salt concentrations. Differing salt concentrations are being sprayed on leaves to test tolerance to salt splash and drift. Cotton seedlings are being grown in differing salt solutions using hydroponics. Stunting and burning of plants are being used as a measure for tolerance. Preliminary results indicate significant differences among these cottons.

Insect Pest Resistance

Thrips

Thrips screening is being conducted using seedling cotton plants, the growth stage damaged by thrips in the field. Plants are placed next to dying wheat plants grown in trays and allowed to suffer damage until reaching the fourth true-leaf stage. Plants are then collected and examined for thrips colonization using a washing method (Rummel and Arnold 1989). Surface area of leaves is then measured using a Li-Cor surface area meter. The different cottons have leaves of different sizes so a set of plants of each test cotton is grown, kept clean of thrips using insecticide, and used to calculate any reduction in leaf area suffered by the test plants due to thrips (Quisenberry and Rummel 1979). Numbers of immature thrips and leaf surface area reduction are standardized to a percentage increase or

decrease over a susceptible control then combined to create a multiple resistance score. The methodology to be used in the large amount of screening that is planned is still being refined, but resistance has already been observed. One test cotton suffered 41.6 % less leaf surface area reduction due to thrips injury than the susceptible control. Once several good candidates for resistance have been identified and results verified, choice and no-choice tests will be conducted to identify the mechanism of resistance.

Cotton aphids

Cotton aphid screening will begin in the spring of 2005 using the method described by Henson (2004). Individual viviparous cotton aphids will be caged on cotton leaves using a plastic clip cage, allowed to produce one progeny, then removed. The young aphid will not be touched but will be examined daily. Mortality, molts, and fecundity of this aphid will be recorded giving an indication of antibiotic resistance.

***Lygus* bugs**

Screening for *Lygus* resistance will begin in 2005. *Lygus* bugs will be reared in the lab in plastic tubs using green beans, a meridic diet (Debolt 1982), and oviposition gel packs. *Lygus* bugs will be confined on individual pieces of cotton fruit of varying ages using mesh, drawstring-closed cages and damage to fruit will be quantified. This technique has been used successfully to examine *Lygus* damage to bolls (Cranmer 2004). Any effect of the cottons on *Lygus* oviposition will also by examined by caging female *Lygus* adults on suitable oviposition sites, then counting the number of young that emerge.

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