

Pima Cotton Breeding and Genetics

Pima Cotton Genetics

R. G. Percy and E. L. Turcotte

ABSTRACT

Maintenance and evaluation of a collection of primitive Gossypium barbadense L. cottons progressed in 1987. Conversion of the non-flowering tropical cottons to a flowering, day-neutral habit progressed. So did efforts to incorporate potentially useful biological and environmental stress tolerant traits into agronomic Pima backgrounds. Six cottons of the primitive cotton collection were found to potentially possess bacterial blight resistance. Genetic populations were developed to investigate the inheritance and distribution of two mutant marker traits in cotton. Interspecific F₁ hybrid populations were developed for evaluation in 1988.

INTRODUCTION

The Pima genetics program is a long-term project with numerous objectives which include: maintaining and evaluating a collection of primitive Gossypium barbadense L. cottons for potentially useful agronomic traits; transferring genetic traits that confer tolerance to environmental and biological stresses to Pima breeding lines; and investigation of genetic systems in G. barbadense to provide information on the inheritance and relationships of genetic systems in cotton.

MATERIALS AND METHODS

To maintain and evaluate the G. barbadense collection, cottons are grown each winter at Tecoman, Mexico. At Tecoman, data and descriptive information are collected; seed from the cotton accessions are harvested for collection maintenance; and fiber samples are collected for analysis. At Maricopa, AZ, an evaluation of the collection for bacterial blight resistance is conducted annually in the greenhouse using races 1, 2, 7, and 18 of the Xanthomonas campestris p.v. malvacearum pathogen.

A program to convert short-day to day-neutral, using a backcross scheme, is in progress at both Tecoman, Mexico and Maricopa, AZ. Genetic traits currently being transferred to good agronomic Pima backgrounds at Maricopa, AZ, include the glandless, nectariless, okra leaf, frego bract, and cytoplasmic male-sterility restorer traits. Transfer is accomplished primarily through a backcross and selection scheme.

Genetic traits currently under investigation include a male sterility factor and ovate leaf, a mutant leaf trait. The male sterility trait has been crossed to cottons carrying other mutant markers and the segregating progeny will be analyzed to determine the inheritance of the new trait and its linkage relationship to previously described traits. The ovate leaf trait has been crossed to a sample of the primitive cotton collection. Segregating progeny of these crosses could yield information on the taxonomic and geographic distribution of variability within the collection.

Another goal of the genetics program has been to create short-statured, early maturing, and short, coarse-fibered Pima cottons to serve as parents in interspecific hybrid cottons. Progress has been made toward this goal and in 1987, three lines were selected for crossing to four upland cultivars. The resulting F₁ hybrid seed will be planted in replicated tests at Maricopa and Safford, AZ in 1988 for evaluation.

RESULTS

In 1987, seed from 170 cottons of the primitive cotton collection were renewed at Tecoman, Mexico. Descriptor notes and/or fiber data were obtained from 102 cottons. A screen of 72 cottons for bacterial blight resistance yielded preliminary evidence of resistance in six of these accessions. In the backcross program to

convert tropical, non-flowering cottons to a day-neutral flowering habit, 80 new cottons were introduced into the program and 56 cottons were advanced one generation. The most advanced materials in the conversion program are in the BC₂F₂ generation.

Among cottons carrying traits to be transferred to Pima backgrounds, individual and progeny row selections were made and fiber samples taken for analysis. Cottons carrying the cytoplasmic male sterility restorer trait were bulk harvested and large fiber samples taken for fiber and microspin analysis. Preliminary data obtained for the potentially new male sterility factor indicated it is inherited as a single gene recessive trait. The new sterility factor was crossed with 25 other mutant marker stocks for linkage analyses.

The ovate leaf trait has been crossed with 55 accessions of the primitive cotton collection and segregating F₂ populations will be grown at Maricopa in 1988. Crosses of early, short statured, short and coarse fibered Pima cottons with four upland cultivars have produced 16 interspecific F₁ hybrid populations to be evaluated in 1988 for yield, plant height, earliness and fiber qualities.