

CYTOGENETIC STUDIES IN UPLAND COTTON

J. E. Endrizzi and W. Whiting, Head Department  
of Plant Breeding and Assistant in Research

A. Genetic Studies

Previous independent studies had shown that the mosaic leaf mutant (ml) and the club stigma mutant (st<sub>1</sub>) were located on chromosome 6 of the A genome of G. hirsutum. The fact that both mutant loci are located on the same chromosome means that they form a linkage group. Therefore, to determine the map distance that separates the two markers, a cross was made between T583 mlml St<sub>1</sub>St<sub>1</sub> and the AG1 MlMl st<sub>1</sub>st<sub>1</sub>. The Ml allele in combination with the ml allele exhibits complete dominance, whereas the St<sub>1</sub> allele with the recessive st<sub>1</sub> allele exhibits incomplete dominance. Therefore, the following genotypes and their related phenotypes can be distinguished in a segregating population:

MlMl, Mlml	=	normal green plant
mlml	=	mosaic plant (sections of leaf contain areas with defective chlorophyll)
St <sub>1</sub> St <sub>1</sub>	=	normal stigma and boll shape
St <sub>1</sub> st <sub>1</sub>	=	stigma approximately 1/2 length and long pointed bolls
st <sub>1</sub> st <sub>1</sub>	=	very short or club stigma and bolls absent

The F<sub>1</sub> was backcrossed to T583, the mosaic leaf parental line and the backcross population segregated as shown in the following table.

T583	$\frac{mlSt_1}{mlSt_1}$	X F <sub>1</sub>	$\frac{mlSt_1}{Mlst_1}$	
Mosaic leaf	Mosaic leaf	Green leaf	Green leaf	
Normal boll	Long boll	Normal boll	Long boll	
$\frac{mlSt_1}{mlSt_1}$	$\frac{mlSt_1}{mlst_1}$	$\frac{mlSt_1}{Mlst_1}$	$\frac{mlSt_1}{Mlst_1}$	Total
49	24	34	42	149

These results show that the two mutant loci are separated from each other by  $39 \pm 3.99$  crossover units. A larger population will be grown in 1970 in an effort to obtain additional information on their linkage relationship.

## B. Monosomic Studies

Twenty monosomic lines each of different origin were planted out for reisolation of monosomics in each line. Monosomics for only six lines were recovered. One of the six monosomic lines, in crosses with translocations marking specific chromosomes, was identified as monosomic for chromosome 3 of the A genome.

In a cytogenetic study involving monosomes for eight different chromosomes and the Smooth plant character  $Sm_2$ , the  $Sm_2$  locus was found to be located on chromosome 6. This not only placed the marker on its respective chromosome but also identified the locus as an A genome marker.

Segregating families revealed that the mutant characters virescent plant (v), cup leaf (cu), frego bract (fg) and glandless stem and boll ( $gl_1$ ) segregated independently of the monosomes for chromosomes 7 and 16. This establishes that these four markers are not located on these two chromosomes.

Two groups of reciprocal test crosses were made between  $F_1$  monosomics and parental marker lines. The first group consisted of test crosses of the double-palisade mutant  $lp_1lp_1lp_2lp_2$  and  $2n-1 F_1$  plants monosomic for chromosomes 1, 2, 4, 6, 7, 16, 17, and 18. The second group of reciprocal test crosses involved the A genome marker Hirsute,  $H_1$ , and  $2n-1 F_1$  plants monosomic for the A genome chromosomes 1, 2, 4, 6 and 7.