

HEXAPLOID COTTON

H. Muramoto, Associate Plant Breeder
W. E. Bryan, Plant Breeder

Hexaploid cotton plants (n=78) were created by hybridizing the Australian wild cotton G. sturtianum (n=26) with American cultivated cottons G. hirsutum, variety A-44 (n=52) and doubling the chromosome number of the sterile hybrid with colchicine.

The hexaploid plants are now in the third generation of selection. Fertility is improving and sufficient quantity of seed has been harvested this past year to make a sizeable planting in 1968.

The fiber properties of the hexaploid cotton harvested in 1967 are now being determined in the fiber laboratory. Microspinning samples will be sent to the USDA Cotton Spinning Laboratory in Knoxville, Tenn. for evaluation of spinning qualities.

Preliminary observations on cold tolerance and insect resistance are very encouraging. Cold tolerance of the hexaploid plants is good. The plants also seem to have some degree of tolerance to the cotton leaf perforator (Buccatrix thurberiella Busck).

Gross morphological examination of the root system of the hexaploids shows a root system different from the normal tap root of the cotton plant. The roots appear more closely resembling a fibrous root system. Extrapolating from these observations, there is evidence that there may be some cotton root-rot (Phymatotrichum omnivorum) tolerance based upon such a root system. Plans are now being formulated to grow the hexaploid plants in cotton root-rot infested soils.

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EVOLUTIONARY ASPECTS OF GOSSYPIUM

Frank Katterman, Associate Plant Breeder

Our main objective is to determine genetic differences and gene action of the cultivated tetraploids on a biochemical level. We have initially approached this problem by attempting to determine the possible ancestral diploids of these cottons by means of electrophoretic patterns of seed proteins. This in turn should lead us to some concept of the evolutionary development of gene action with respect to protein and enzyme formation.

By a comparison of banding patterns and intensities, we found that by superimposing various combinations of diploid A and D genomes, the combination of herbaceum and raimondii bands matched the cultivated species somewhat with respect to pattern but differed quite markedly with intensity of banding. When compared to a more primitive and uncultivated tetraploid, however, this

superimposition nearly matched the latter in both pattern and intensity. Thus we see a tentative direction taken by some of these proteins (possibly representing certain critical enzymes of metabolism) during evolution to the cultivated state and hence a reflection of gene action and genetic differences.

We would like to continue and amplify some of these observations by comparing and studying in detail specific enzyme systems as a function of their appearance and complexity in natural and artificially induced tetraploids and their ancestral forms. In addition we will study the function and complexity of particular enzyme systems with respect to induced ploidy; thus hoping to gain a further insight into genetic mechanisms.

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MOSAIC OR VARIEGATED LEAF MUTANTS

J. E. Endrizzi, Head, Department of Plant Breeding

Several mosaic or yellow-white variegated mutant plants were found in breeding blocks of Acala cotton in 1964. Up to 1966 and 1967 studies were conducted with these mutants primarily in an attempt to produce true-breeding lines and to obtain preliminary information on the possible mode of inheritance of the character. In 1965 the variegated character was found to be quite common in one variety in a particular field.

In 1966, progeny of two of the original 5 variegated plants were selected for a more detailed study. The pedigrees of these progeny (E2A-1966 and E2B-1966) are given below.

Pedigree of E2A and E2B - 1966 (Acala):

AG12 variegated terminals

↓
OP Seed

↓
1 normal green
26 yellow lethal
8 variegated

↓
D14A-2-64 (Selfed)

↓
4 normal green
8 yellow lethal
6 variegated

↓
E1C-1-65 (Selfed)

↓
8 normal green
10 yellow lethal
5 variegated

↓
E2A-66 (AZ145)

↓
Plants No. 4 and 5
variegated

AG13 variegated

↓
OP Seed

↓
16 normal green
1 yellow lethal
6 variegated

↓
D15-19-64 (Selfed)

↓
7 normal green
3 yellow lethal
5 variegated

↓
E1D-1 & 2-65 (Selfed)

↓
14 normal green
4 yellow lethal
6 variegated

↓
E2B-66 (AZ146)

↓
Plants No. 3, 6, and 10
variegated