USE OF HAPLOIDS IN *GOSSYPIUM BARBADENSE* L. AS A SOURCE OF ANEUPLOIDS

J. E. ENDRIZZI

Plant Breeding Department, College of Agriculture, The University of Arizona, Tucson, Arizona

THE immense value of chromosome-deficient lines for the genetic analysis of individual chromosomes as well as for the analysis of the genetic structure of the whole genome has been well established in wheat and tobacco.

In the last few years efforts have been underway to assemble a complete series of monosomes for the 26 chromosomes of the cultivated tetraploid cottons, *Gossypium hirsutum* L. and *G. barbadense*. A number of monosomes have been isolated in *G. hirsutum*, but almost all of these were recovered from source material not originally designed for isolating chromosome deficiencies.[1] So far none of these sources in cotton have yielded monosomes at a frequency comparable to some of the sources used in wheat,[2] tobacco,[3] and oats[4,5] for recovering monosomes. Furthermore, most sources in cotton were specific for the kind of monosome they yielded, thereby prohibiting their further use for isolating monosomes representing other chromosomes of the series. Monosomes for seven of the 26 chromosomes in cotton have been identified and reported.[6]

At least two laboratories are currently experimenting with various techniques and materials to find a means of producing a high frequency of monosomes in cotton to complete the chromosome-deficient series. This report describes the results of testing one kind of material, *i.e*, haploids, as a means for recovering a high frequency of monosomes.

One of the chief sources of monosomes in wheat was found in the analysis of the progeny of haploid plants pollinated with pollen from normal wheat.[2] Haploids from five different lines of *G. hirsutum* were pollinated over a long period with pollen from normal plants but not a single seed was produced.[7] It is the general concurrence among cotton workers that haploids of *G. hirsutum* are completely sterile ; however, haploids of *G. barbadense* on the other hand are partially fertile and will produce a few seeds when pollinated with normal pollen.

The doubled haploid line 57-4, of *G. barbadense*, produces as high as 61% haploids in its progeny.[8] In 1964, 50 seeds of 57-4 were planted singly in peat pots and 45 seedlings were transplanted to the field. Of the 45 plants, 22 were haploids and 23 were diploids ($2n = 4X = 52$). When the haploids commenced flowering, open blossoms were hand-pollinated daily throughout most of the season with pollen from a normal line of *G. barbadense*, 3-79. Three hundred and twenty-five normal-sized seeds having dark testa were harvested from the 22 haploid plants, which is an average of approximately 15 seeds per haploid plant. The number of bolls with one to four seeds are as follows : 209 bolls with one seed, 49 with 2 seeds, 7 with 3 seeds and 1 with 4 seeds. As expected boll size is proportional to the number of seeds in a boll.

The 325 seeds were planted singly in peat pots and 189 germinated. The non-germinated seeds were dug up, dissected and found to be empty. The 189 seedlings were transplanted to the field where only 160 survived. Table I shows the results of analysis of 121 of the 160 plants. Only three simple monosomes were recovered. One plant showed 24 II + chain of III at meiosis (Table I). It is believed that the

TABLE I

Cytotypes and their frequency in the progeny of haploids of G. barbadense

n*	26 II	$2n$-I	24 II + III	25 II + telosome	25 II + III	24 II + IV
21	91	3†	1	1	2**	2

* n = haploid.

† One plant was 24 II + telesome + I.

** The extra chromosome in one plant was a telosome.

pairing relationships in this plant can be better explained by a chromosome interchange accompanied by a loss equivalent to a whole chromosome rather than by the duplication and deficiency of whole chromosomes. If a duplication-deficiency phenomenon was involved, such a plant would be nullisomic for one pair of chromosomes and trisomic for another pair. This is highly unlikely in view of the fact that nullisomics have not been recovered in cotton.

On the assumption that an interchange is involved in the chain of III and that a normal set of chromosomes was contributed by the male gamete, the deficiency, therefore, involves portions of two chromosomes. The recovered monosomes in the progeny of 57-4 haploids represent about 2 to 3% of the analyzed population, which is a rather low frequency. The 57-4 haploids, therefore, are not a very efficient source for recovering whole chromosome deficiencies. Since Sears[8] found 16 monosomes among the 13 immediate progeny of a wheat haploid pollinated with normal pollen, it was disappointing to find such a low frequency of monosomes in the progeny of the cotton haploids. It is possible that since the haploid-including mechanism is genetically controlled[8] and expressed in haploids, as well as diploids, the mechanism itself may preclude a high production of monosomes.

Other chromosomal structural types recovered from the cotton haploid were telosomes, trisomes, and translocations. Since trisomes and translocations were also recovered in the progeny of the wheat haploid, the cotton and wheat results are related. Therefore, it is assumed that the aberrations recovered in the progeny of the cotton haploids originated in a manner similar to that proposed by Sears[9] for the origin of the aberrations recovered in the progeny of the wheat haploid.[10]

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ACTION OF ALKALINE HYDROGEN PEROXIDE ON α-METHOXY CHALKONES

A. C. JAIN, V. K. ROHATGI AND T. R. SESHADRI
Department of Chemistry, University of Delhi, Delhi-7

2'-HYDROXYCHALKONES are well known to undergo cyclisation to give flavanones both by acid and by alkali.[1–6] However, the presence of an α-methoxy group directs the cyclisation to give a coumaran-3-one derivative. Though α-methoxy-2'-hydroxychalkones have been isolated from chalkone condensations which required alkaline conditions, they undergo change if left in contact with dilute alkali for a long time and the products are 2-methoxy-2-benzyl coumaran-3-one derivatives.[7] The same products are also formed when the chalkones are heated at 200° *in vacuo*.[8] α, 2'-Dihydroxy chalkones are rather difficult to isolate in chalkone condensations and the product is generally a 2-hydroxy-2-benzylcoumaran-3-one derivative.[9] Under acidic conditions demethylation is possible and α-methoxy-2'-hydroxychalkones give two products, *viz.*, 2-methoxy-2-benzyl coumaran-3-one derivative and the corresponding 2-hydroxy compound.[7,10]

2'-Hydroxychalkones undergo oxidation with alkaline hydrogen peroxide called Algar-Flynn-Oyamada oxidation or simply A.F.O. reaction and the nature of the products depends on the substituents and the temperature.[11,12] When there is no 6'-substituent in the chalkone, flavonols are the main products; aurones are formed only in small amounts. However, if a 6'-substituent is present and there is no free hydroxyl in 2 and 4 positions, aurones are major products and flavonols are the minor ones. The situation is reversed if there is a free hydroxyl in either 2 or 4 position, though there may be a