Diallel Analysis of some Important Fibre Characteristics of *Gossypium hirsutum* L.

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ABSTRACT

A complete diallel cross experiment involving four indigenous genotypes was conducted to study the inheritance of lint index, seed index, lint percentage and staple length of *Gossypium hirsutum* L. The results showed over-dominance type of gene action controlling inheritance of all these characters. Absence of non allelic interaction was noted for the manifestation of these traits.

Key Words: *Gossypium hirsutum* L.; Diallel cross; Over-dominance

INTRODUCTION

Raw cotton and its by products contribute about 69% of the total foreign exchange earnings annually. The information on genetic control of various attributes under different agro-climatic conditions may be helpful for bringing further improvement in the genetics of cotton plant. The use of genetic information in the development of an efficient breeding programme has been advocated by several researchers (Azhar *et al.*, 1994; Rauf *et al.*, 1995; Carvalho, 1995; Keerio *et al.*, 1995; Khan *et al.*, 1995; Tariq *et al.*, 1995; Iqbal & Khan, 1996; Sayal & Sulemani, 1996; Ahmad *et al.*, 1997). In the present investigation, the inheritance pattern of lint index, seed index, lint percentage and staple length was studied using F_1 generation. The information derived from the study may help cotton breeders for continued improvement in genetic architecture of cotton plant.

MATERIALS AND METHODS

The plant material was developed by crossing four cotton varieties namely, CIM-1100, CIM-443, VH-57 and CIM-444 according to diallel fashion during the year 1997-98 in the department. All necessary precautions were made in order to avoid contamination of foreign pollens. The seeds of 12 F_1 hybrids along with their parents were field planted in a triplicated RCBD. Each row contained eight guarded plants spaced 30 cm apart within a row. The row to row distance was 75 cm. After picking seed cotton on each plant lint index, seed index, lint percentage and staple length were dertermined. The data on each of the character were analyzed in order to obtain the significance of differences among the 16 families. The analysis of variance was done following Steel and Torrie (1980).

Genetic analysis of the characters was done following the genetic model developed by Hayman (1954a; 1954b)

and Jinks (1954).

RESULTS AND DISCUSSION

Analysis of variance revealed significant differences among the parents and their F_1 progenies for all the four characters (Table 1), while the variance (Vr) and

Table I. Mean squares obtained from analysis of variance of following characters of *G. hirsutum* L.

S.O.V.	df	Lint index	Seed index	Lint percentage	Staple length
Replication	2	0.048	0.003	0.116	0.328
Genotypes	15	0.048**	0,249**	6.011**	1.781**
Errors	30	0.019	0.007	0.279	0.182

covariance (Wr) graphs for the characters are shown in Figs. 1 to 4.

Fig. 1. V_r-W_r graph for lint index (g)

From Fig. 1, it is evident that regression line intercepted Wr-axis below the origin, signifying overdominance type of gene action for lint index. 'b' value and SE(b) indicated significant deviation resulting absence

of non-allelic interactions. The distribution of array points revealed that CIM-443 contain dominant genes for the character and CIM-444 carried recessive.

Fig. 2. V_r-W_r graph for seed index (g)

For seed index, the relationship of Vr/Wr (Fig.2) indicated overdominance type of gene action for the character. Since the regression slope is of unity, therefore the presence of epistatic effect not revealed. The array position indicated that CIM-443 being closer to the origin contained most dominant genes and VH-57 being away from the origin carried most recessive genes for seed index.

The variance and covariance graph (Fig.3) revealed

Fig. 3. V_r-W_r graph for lint percentage

that over dominance type of gene action was present in the inheritance of lint percentage. Since the regression line did not deviate significantly from the unit slope, thus indicating the absence of non allelic gene interaction. The distribution of the array points along the regression line suggested that CIM-443 being closest to the point of origin, had maximum number of dominant genes and in contrast CIM-

444 being away from the origin carried the maximum number of recessive genes for lint percentage.

Gene action controlling the inheritance of staple length was also of overdominance type as regression line (Fig.4) passes through Wraxis below the origin. Absence of non allelic interaction indicated that regression line does not deviate significantly from the unit slope. It was observed from the position of array points that CIM-1100 being in close proximity to the origin, possessed the maximum concentration of dominant alleles, while reverse was the case for CIM-443 which had the greatest number of recessive alleles.

The results of the study showed that overdominance

Fig. 4. V_r-W_r graph for staple length (mm)

type of gene action was involved in the inheritance of all the traits and this knowledge may be helpful for the development of hybrid varieties having superior characters. The similar suggestions had been also given by Azhar *et al.* (1994), Carvalho (1995), Keerio *et al.* (1995), Khan *et al.* (1995), Rauf *et al.* (1995), Tariq *et al.* (1995), Iqbal and Khan (1996), Sayal and Sulemani (1996) and Ahmad *et al.* (1997) while studying the pattern of genetic controlling mechanism in the plant material developed by crossing local and exotic germplasm.

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