GENETIC ANALYSIS OF UPLAND COTTON UNDER FAISALABAD CONDITIONS. II. GINNING OUTTURN PERCENTAGE AND FIBRE CHARACTERS

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Gene action was studied for ginning outturn percentage, staple length and fibre fineness in a diallel cross of six cotton cultivars *viz.* Allepo-45, Okara, Cocker 5110/III, Brace 81/6, BPA/66 and 272/79. Additive type of gene action was observed in the inheritance pattern of all the characters mentioned above.

INTRODUCTION

Our textile industry consumes 4 million bales of locally produced cotton. Pakistan at present is producing 8.25 million bales which is over and above its needs (Anonymous, 1989). The surplus is exported. Over production does not mean to stop the process of our varietal improvement for their yield and quality. Apart from increasing the yield potential of our prevailing germ plasm it is now imperative to improve its quality traits. The fibre traits such as staple length, fibre fineness, strength and maturity go a long way in determining the demand of a cotton variety in the textile industry (Afzal and Khan, 1961). Such improvements can be imparted in our varieties through breeding, but some prior necessary genetic informations about the characters to be improved are needed (gururaja Rao, 1975). The present studies were therefore, initiated for investigating the gene action controlling some of the characters of the above mentioned importance.

MATERIALS AND METHODS

The experiment was conducted in the Department of Plant Breeding and Genetics, University of Agriculture, Faisalabad during the year 1985-86. The experimental material consisted of six cultivars of cotton (*Gossypium hirsutum* L.) including one local (272/79) and five exotic *viz.* Allepo-45, Okara, Coker 5110/III, Brace 81/6 and BPA/66.

The material fulfilled the assumptions of diallel analysis. The homozygosity of the cultivars was maintained by the researchers in the department for three years. It was assumed that inheritance of the characters would be Mendelian and diploid, and that the genes would be independently distributed in the parents. No multiple allelism and reciprocal differences could be there.

These varieties were grown in 30 x 30 cm earthen pots during November 1985 placed in the greenhouse. The temperature within the greenhouse was maintained between 60°C to 100°C throughout the growing period. At flowering these varieties were crossed in all possible combinations to have a complete diallel set of crosses. The seed of the 36 genotypes thus obtained was

sown in the field during May 1986 in a Randomized Complete Block Design with 4 repeats. Each genotype comprised of a single line of 10 plants spaced 30 cm apart, keeping 75 cm distance between the lines. The middle 6 plants from each line were observed for the studies and two on either side were left as non-experimental. All the recommended production practices were followed from sowing till harvesting of the crop. After the crop was harvested, information with respect to ginning outturn percentage, staple length and fibre fineness was obtained from each of the plant. The data collected for the above mentioned characters was statistically analysed for its variance following Steel and Torrie (1980). For genetic analysis, diallel cross technique developed by Hayman (1954), Jinks (1955) and Khan (1963) was used.

RESULTS AND DISCUSSION

The mean square values (Table 1) showed highly significant variance for all the characters among the parents and the F_1 hybrids. The mean values of the selfs and F_1 hybrids are presented in Table 2 while the variance (Vr)/co-variance (Wr) graphs for the characters are shown in Fig. 1 to 3.

Table 1. Mean squares values of the characters

S.O.V.	Df	Ginning outturn (%)	Staple length (mm)	Fibre fineness (μg/inch)
Varieties	35	9.92**	2.84**	0.608**
Replications	3	5.29	13.15	1.67
Error	105	2.05	0.712	0.078

Significant at P = 0.01.

Ginning outturn (Fig. 1) indicated additive type of gene action with partial dominance controlling the inheritance pattern of this character as the regression line with a unit slope intercepted the Wr axis above the origin. From the position of array points on the regression line it was seen that Brace 81/6 possessed maximum dominant genes because of its proximity to the origin, while Coker 5110/III being away from the origin had the recessive genes. Gururaja Rao (1975) reported additive type of gene action. This type of gene action reveals the possibility of improvement in this character by simple selection procedures.

Staple length (Fig. 2) revealed additive type of gene action along with partial dominance involved in the phenotypic manifestation of staple length because the regression line with a unit slope cut the Wr axis above the origin. Brace 81/6 having the position nearer the origin had the maximum dominant genes, while variety 272/79 due to its distal position secured the recessive genes for this character. Kalsy (1980) and Percival (1982) reported additive type of gene action controlling the inheritance of staple length in their studies. The present results thus support the observations of these workers.

Fibre fineness (Fig. 3) again revealed additive type of gene action controlling the inheritance of this character as the regression line with a unit slope intercepted the Wr axis above the origin. From the position of the array points on the regression line, BPA/66 indicated the possession of dominant and Brace 81/6 the recessive genes due

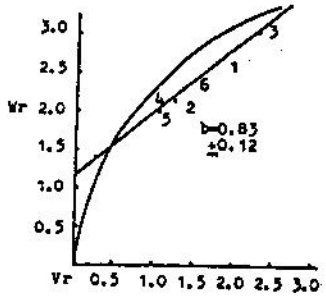

Fig. 1. Vr/Wr graph for ginning outturn %.

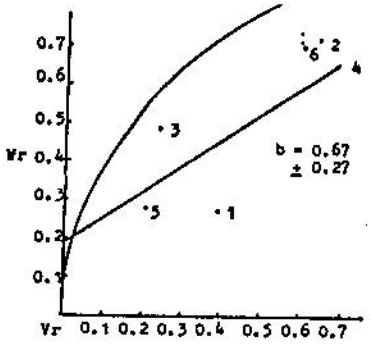

Fig. 2. Vr/Wr graph for staple length.

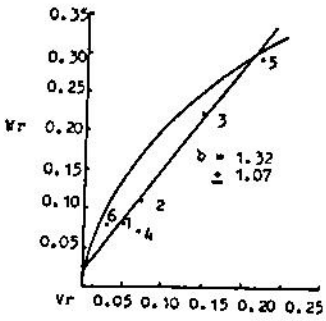

Fig. 3. Vr/Wr graph for fibre fineness.

No. = Name of variety
1. = Allepo-45; 2. = Okra; 3. = Coker 5110/111.
4. = 272/79; 5. = Brace 81/6; 6. = BPA/66

Table 2. Mean values for parents and F_1 hybrids

Genotype	Ginning outturn (%)	Staple length (mm)	Fibre fitness
Allepo-45	37.11	26.13	4.67
Okra	32.14	26.26	5.48
Coker-5110/III	34.15	28.76	4.13
272/79	38.25	25.21	5.21
Brace 81/6	34.05	28.83	3.77
BPA/66	35.40	26.93	4.63
Allepo-45 x Okra	34.57	27.54	4.74
Allepo-45 x Coker-5110/III	34.98	27.79	4.15
Allepo-45 x 272/79	37.83	27.25	4.49
Allepo-45 x Brace 81/6	35.87	26.93	4.46
Allepo-45 x BPA/66	37.23	26.49	4.57
Okra x Coker 5110/III	33.28	28.50	4.89
Okra x 272/79	35.28	26.68	5.21
Okra x Brace 81/6	34.63	27.64	5.01
Okra x BPA/66	34.21	27.82	4.88
Coker x 272/79	37.63	27.36	4.96
Coker x Brace 81/6	34.23	28.08	4.13
Coker x BPA/66	35.60	28.03	4.59
272/79 x Brace 81/6	36.70	27.48	4.90
272/79 x BPA/66	37.19	26.05	4.99
Brace 81/6 x BPA/66	35.45	27.53	4.65

to their closer and distal position from the origin. The importance of additive gene effects in the phenotypic manifestation of fibre fineness had also been emphasized by Virk *et al.* (1984).

The genetic pattern of all the characters reported herein indicated the involvement of additive genes. This situation seemed suitable for a breeder where he can improve such characters through simple selection procedures.

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