SUMMARY

The monitoring of the genetic base provides information on the gene action and their utilization for the improvement of different characters. Ten varieties viz., Gujarat 67, Laxmi, MCU 1, MCU 5, Reba B 50, Albar 49, Acala 4-42, Paymaster, 108 F and C 1998 were used in a 10 x 10 diallel mating system. Ninety hybrids (both straight and reciprocals) along with ten parents were raised in a randomised block design with three replications during 1978-1979 winter season.

Observations on nine important characters, viz., bolls per plant, number of locules per boll, seeds per boll, boll weight, seed index, lint index, yield per plant, mean halo length and ginning per cent were recorded in the diallel experiment.

Heterosis over mid-parent values, graphic analysis, genetic analysis and combining ability analysis were made in the diallel experiment.

The regression coefficient 'b' of Wr, Vr was not significant for all the characters except bolls per plant, seed index and seed cotton yield per plant. Further 't^2' test was not significant for all the characters indicating the adequacy of the simple additive dominance model and fulfilment of most of the assumptions of the diallel analysis. Similar conditions existed in Wr', Wr graphs.
Overdominance was seen for bolls per plant and yield per plant. Complete dominance for lint index, and rest of the characters showed partial dominance.

Correlation coefficients between Yr and Wr + Vr values showed negative significance for boll number, boll weight, lint index, yield per plant and ginning per cent. Negative values were seen for seeds per boll and seed index. Positive but not significant values were observed for locules per boll and mean halo length.

Thus, in the present study the most dominant parents viz., MCU 1 (16.00) and MCU 5 (14.00) for boll number, Paymaster (6.20 g) and Acala 4-42 (5.67 g) for boll weight, Paymaster (6.47 g) and Acala 4-42 (5.87 g) for lint index, Paymaster (53.50 g) and Reba B 50 (53.60 g) for yield per plant and Paymaster (38.67) and Acala 4-42 (36.53) for ginning per cent showed positive effects for the respective character.

Significant positive 'D' was seen operating for locules per boll, seeds per boll, boll weight, lint index, mean halo length and ginning per cent. Significant negative additive effects were found operating for bolls per plant and seed index.

Significant positive dominance component 'H1', was observed for lint index and yield per plant. Significant negative dominance component was observed for seeds per boll, seed index and mean halo length.
Significant positive $'h^2$' for all the characters except locules per boll and mean halo length suggested that dominance effects over all the loci were present in the parent material.

Both additive and dominance effects significantly influenced number of seeds per boll, seed index, lint index and mean halo length. Additive effects alone were significantly higher for boll number, boll weight, locules per boll and ginning per cent and dominance effects were significant for yield.

The average degree of dominance at each locus $(H_1/D)^{1/2}$ showed partial dominance for characters viz., bolls per plant, locules per boll, seeds per boll, boll weight, mean halo length and ginning per cent and complete dominance for seed index and lint index and overdominance for yield per plant. The present study confirms the earlier findings on the nature of additive effects involved in the inheritance of locules per boll, seeds per boll, boll weight and lint index.

Heritability was very high for ginning per cent (77.6%), mean halo length (72.0%), locules per boll (71.9%), boll weight (53.7%) and lint index (52.0%) and medium for yield (27.2%) and low for boll number (14.8%) and negative for seeds per boll (-3.7%). High heterosis was observed for bolls per plant (120.1%) and yield per plant (143.0%).

Significant sca effects for all the characters and significant sca effects for locules per boll, boll weight, seed index, lint
index, mean halo length and ginning per cent indicated that both additive and dominance effects were operating. Bolls per plant and yield per plant showed significant gca, sca and reciprocal differences indicating operation of additive, dominance and interaction effects.

In the line x tester experiment, eleven varieties viz., Albar 49, MCU 5, MCU 7, Acala 4-42, 108 F, SRT 1, Bikaneri Nerma, ROIL 3, Reba B 50, Paymaster and C 1998 were crossed as eleven lines (females) with three primitive non-cultivated races of G. hirsutum as testers (males), to know their genetic potential and to understand the nature of gene action involved, so as to utilize them in hybridization programme, for exploitation of heterosis as well as for subsequent selection.

The resultant 33 hybrids along with 14 parents were raised in a randomized block design with three replications during the winter season 1979-1980. Observations on 17 characters were recorded viz., plant height, number of monopodia, number of sympodia, mean maturity date, number of ovules, number of motes, seeds per boll, bolls per plant, boll weight (g), seed index, lint index, yield per plant (g), ginning per cent, 2.5% span length, uniformity ratio, micronaire and bundle strength.

Heterosis over the mid-parent and better parent values, the combining ability analysis, contribution of lines, testers and lines x testers were estimated.
Non-significant effects of lines, testers and lines x testers for plant height, number of monopodia, and number of sympodia and the significance of parents vs. crosses indicated that all the crosses behaved alike and the nature of inheritance of the characters approached the mid-parental value and the combinations behaved like lines with certain non-significant type of modifications. In the case of mean maturity date the significant effects of testers and parent vs. crosses indicated that the effect of testers was more pronounced in imparting this character in the crosses.

Significance of testers in motes number and lines in ovule number and lines and testers in seeds per boll, indicated that testers influenced the hybrids more towards motes, and lines towards ovules and both towards the improvement of number of seeds per boll.

Significance of lines and testers for bolls per plant, boll weight, seed index, lint index, yield per plant and ginning percent, indicated that these two contribute more towards the differences.

The combining ability analysis showed that the plant height, number of monopodia, number of sympodia and mean maturity date were governed mainly by dominance and interaction effects with little additivity. Additive and higher negative dominance effects for motes and seeds per boll were observed. High positive dominance effects were seen for ovule number.
Additive and dominance effects played an important role for boll number. Additive, dominance and interaction effects were noticed for yield. Higher dominance effects were observed for ginning per cent and seed index. Non-allelic interaction for lint index and higher additive effects and negative dominance effects for boll weight had contributed towards the inheritance of these characters.

For 2.5% span length, lower additive and dominance effects and for uniformity ratio dominant effects of lines and other interaction effects were operating.

Comparative studies on the intra and inter-racial hybrids of G. hirsutum

In the inter-racial hybrids, C 1998, SRT 1 for plant height, ROIL 3, C 1998, Reba B 50 and Albar 49 for number of sympodia, MCU 7, MCU 5, C 1998 and Paymaster with morrilli and palmeri could be considered for obtaining desired plant characters and earliness.

Negative additive effects were found operating in commercial cultivars for bolls per plant. In the inter-racial crosses both additive and dominance effects were operating. The positive additive effects of testers which were fixable along with the dominance effects of lines could be useful in improving bolls per plant. This had been confirmed by high heterosis observed in the crosses involving richmondii and palmeri. In the lines Albar 49, ROIL 3 and C 1998 had shown promising results.
Highly significant additive effects in diallel crosses and low significant additive effects in the line x tester analysis, indicated effective nature of additive gene action in cultivar hybrids. Parents Reba B 50, Paymaster and MCU 5 varieties which had shown dominance effects in cultivar hybrids, had given positive $sca$ effects in the line x tester experiment with palmeri and richmondii for seeds per boll.

Among the testers richmondii contributed more than the other two testers and in the lines, ROIL 3, MCU 5, Paymaster and Acala 4-42 contributed more towards the inheritance of boll weight.

In the cultivar hybrids dominance effects were positively significant and additive effects were comparatively low, and the direction of dominance was towards the improvement of yield per plant. In inter-racial hybrids both dominance and additive effects were higher. In the lines Paymaster, Reba B 50, Acala 4-42, Albar 49 and tester parent richmondii could be considered as promising ones for the hybridization programme.

Ginning per cent showed significantly high additive effects and high heritability in the cultivar hybrids. In inter-racial hybrids dominance effects were higher than the additive effects. Thus, parents Acala 4-42, Paymaster, C 1998, 108 F and Reba B 50 along with tester parents richmondii and palmeri could be considered for the improvement of ginning per cent.
For 2.5% span length, lines Reba B 50 and Acala 4-42 with tester parents richmondii and morrilli would help in achieving the desired level. Parental lines Acala 4-42, MCU 5, C 1998 with morrilli and richmondii testers could be utilized in keeping the uniformity ratio at the optimum level.