CHAPTER VI
SUMMARY

The present investigation 'A study of combining ability of some yield components in linseed [Linum usitatissimum (L.)] using a 10 x 10 diallel set was used to study the component of variance, general and specific combining ability variance general and specific combining ability effects, heterosis (over economic parent) and imbreeding depression, heritability and genetic advance and correlation.

Ten varieties viz., Gaurav, Shubhra, Mukta, Laxmi-27, T-397, Neelam, Hira, Garima, LCK 8605 and Sweta were selected on the basis of genographical and phenotypic diversity and a diallel set (excluding reciprocal crosses) was prepared. The $F_1$ crosses were made during 1992-93 and in the subsequent year (1993-94) selfing of the hybrids resulted in $F_2$ progenies. The experiment comprising 100 treatments (10 parents, 45 $F_1$S and 45 $F_2$S) was planted on November 3, 1993 at the research farm of the Brahmanand Mahavidhyalaya Rath (Hamirpur) U.P. The observations on thirteen characters viz., days to flower, days to maturity, days for reproductive period, plant height, number of primary branches, number of secondary branches, number of capsules per plant, number of seeds per capsule, 1000-seeds weight, oil content, fibre yield per plant, Harvest index and grain yield per plant, were recorded on ten randomly
selected plants in parents and F₁S and 20 such plants in each F₂ populations. The recorded was subjected to statistical analysis viz., analysis of the design of the experiment, diallel analysis as suggested by Jinks and Hayman (1953) and Hayman (1954), Griffing (1956b) analysis for determining the variances due to general and specific combining ability and their effects, heterosis and its components (Gardner and Eberhart (1966) and inbreeding depression, heritability in narrow sense as suggested by Crumpacker and Allard (1962) and expected genetic advance. The salient results obtained during the course of investigation are summarized below :-

General analysis of variance indicated significant differences among all the 100 entries (10 parents, 45 F₁S and 45F₂S) except number of primary branches in parents. Parents also differed significantly from their crosses for all the characters except days for reproductive period. Significant differences were also observed among F₁ and F₂ for all the characters except number of seeds per capsules and number of primary branches.

The value of degree of diminence \( (\hat{H}^2/\hat{D})^{1/2} \) indicated over-dominance for the characters days to flower, days to maturity, days for reproductive period, plant height, number of primary branches, number of secondary branches, number of capsules per plant, Harvest index and grain yield per plant in both the generations and number of seeds per capsule in
F2 generation. The additive component (\( \hat{D} \)) was found significant for days to flower, days to maturity, days for reproductive period, plant height, number of secondary branches, number of capsules per plant, oil content, fibre yield per plant, Harvest index and grain yield per plant in both the generations.

Dominance component (\( \hat{H}_1 \)) was found significant for days to flower, days to maturity, days for reproductive period, plant height, number of secondary branches, number of capsules per plant, 1000-seeds weight, oil content, fibre yield per plant, Harvest index and grain yield per plant in both the generations.

The proportion of genes with positive and negative effects (\( \hat{H}_2/4\hat{H}_1 \)) were found less than the theoretical value (0.21) in both the generations for all the characters except days to maturity, plant height, number of primary branches, number of capsules per plant, fibre yield per plant in F1 generation, indicating thereby that the positive and negative alleles were distributed in considerable symmetrical manner over all the arrays.

The relative value of dominant and recessive gene among the parents determines the extent of genetic advance that can be made in particular direction. The ratio was more than unity for days to maturity, days for reproductive period, plant height and oil content in both the
generations. This revealed that the dominant genes were more frequently distributed than the recessive genes.

The ratio of $\hat{h}^2 / \hat{h}_2^2$ was found significant less than the unity for days to maturity, number of primary branches, number of secondary branches, number of capsules per plant, 1000-seeds weight, fibre yield per plant, Harvest index and grain yield per plant in both the generations. The value was found significant in $F_2$ for days to flower, days for reproductive period, plant height, number of seeds per capsule and oil content. This suggested that one major gene group might be controlling inheritance of these characters. This was however, not true for days to flower, days for reproductive period, plant height, number of seeds per capsule and oil content in $F_1$ for which more than one major gene groups were responsible.

The variances for combining ability were computed and mean squares for general and specific combining ability were observed highly significant for all the characters in both the generations. However, the g.c.a. of number of primary branches and s.c.a. of number of primary branches, number of seeds per capsule and 1000-seeds weight were found non-significant. This indicated that both additive and non-additive gene effects are involved in the expression of these traits, magnitude of g.c.a. variance was much higher than s.c.a. variances in both the generations for all the characters, indicating thereby preponderance of additive
gene action for this trait.

General combining ability effects suggested that parent 'LCK 8605' performed well for days to maturity, number of capsules per plant, 1000-seeds weight and grain yield per plant. Parent Laxmi-27 was found to combine well in respect of characters like days to flower, number of secondary branches, oil content, Harvest index and grain yield per plant.

The crosses Gaurav x Neelam, Gaurav x T-397, Gaurav x Laxmi-27, Shubhra x T-397 and Shubhra x LCK 8605 had high specific combining ability effects for grain yield per plant in F₁ generation. Elite cross combinations in F₂ included Gaurav x LCK 8605, Mukta x Sweta, Neelam x Sweta, T-397 x Sweta and Shubhra x LCK 8605. These crosses exhibited high s.c.a. effects for grain yield and its components.

The average heterosis percentage indicated considerable extent of heterosis for grain yield per plant. Ten crosses produced significant and desirable heterosis over economic parent for grain yield per plant. The maximum heterosis (62.89%) was observed in Mukta x Sweta. The magnitude of heterosis over economic parent ranged from (61.91) to (62.89) percent. Grain yield is the ultimate improvement, a breeder intends to bring about in any crop improvement programme. The superiority in the yield was attributed to non-additive gene action. It was confirmed by
the preponderance of dominant genes in the parents.

The heterosis over economic parent for oil content was found desirable and significant in all crosses. The maximum heterosis (9.78) was recorded in T-397 x LCK 8605. Hybrid vigour for the crosses which showed high percentage of inbreeding depression was attributed due to the effect of direct and indirect components. The increase was found due to dominance and dominance x dominance genetic effects.

High estimates of heritability accompanied by genetic gain of medium order for days to flower, days for reproductive period, plant height, number of primary branches, number of seeds per capsule and 1000-seeds weight in both the generations, indicated some scope for their improvement, having high estimates of heritability and genetic gain suggested wider scope for its improvement. On the other hand. Oil content value was found to be high heritable. But their improvement seems to be very restricted due to their very low genetic advance. The selection in this set of material would not be much effective for there traits in early generation.

It has, therefore, been suggested that the following parents must be considered for hybridization - Neelam, LCK-8605, Laxmi-27, Gaurav.

The selected cross combinations, for the development of yield in this crop, are as follows -
Gaurav x T-397
Gaurav x Neelam
Gaurav x Laxmi-27
Shubhra x Laxmi-27
Gaurav x LCK 8605
Mukta x Sweta