V. SUMMARY

The aim of this investigation was to determine the extent of heterosis and gene action estimates for some agronomic characters i.e. flowering date, maturity date, maturity period, plant height, number of branches/plant, number of pods/plant, number of seeds/pod, 100-seed weight and seed yield/plant; and shedding percentage (number of flowers/main stem and number of pods/main stem) in faba bean lines and their hybrids.

Six parental lines namely; N.A.112, Giza 2, Giza 3, 61/536/69, NEB.319 and Sevella gaint representing wide range of variability in most of the studied traits were utilized. Crossing among the parental material by means of diallel system was initiated at 1988/89 growing season. A half diallel set of crosses involving six parental lines were evaluated in 1989/90 growing season. A randomized complete block design with four replications was used.

Data were recorded on ten guarded plants randomely sampled from each plot. The data obtained for each trait were analysed on individual plant mean basis. An ordinary analysis of variance was firstly performed. Heterosis was computed as mean squares and as the percentage deviation of F_1 mean performance from the mid-parent and better parent average values for individual crosses. General and specific combining ability estimates were obtained by employing

Griffing's (1956) diallel cross analysis designated as method 2 model 1. The genetic parameters described by Hayman (1954 a & b) were estimated. The narrow sense heritability was computed according to Crumpaker and Allard (1962).

The data were also, subjected to (Wr), (Vr) regression analysis to determine gene action as described by Jinks (1954).

The obtained results can be summarized as follows:

Growth and yeiled characteristics:

1. Highly significant mean squares due to genotypes, parents and crosses were detected for all traits.

2. Significant parents vs. crosses mean squares were obtained for flowering date, maturity date, number of branches/plant, number of pods/plant and seed yield/plant.

3. The five crosses (N.A.112 x 61/536/69, N.A.112 x NEB.319, Giza 3 x NEB.319, 61/536/69 x NEB.319 and NEB.319 x Sevella gaint) showed significant negative heterotic effect from mid-parent for flowering date. For maturity date, six and five hybrids showed significant negative heterotic effects from mid- and better parents, respectively. The percent heterosis obtained from the cross (NEB.319 x Sevella gaint) were -10.95 and -9.72 measured from mid-and better parent, respectively. The heterosis from mid-and better parent was found to be negative and significant in two crosses (Giza 3

x 61/536/69 and Giza 3 x Sevella gaint) for maturity period. For seed yield per plant, ten and nine hybrids expressed significant positive heterotic effect relative to mid-and better parent, respectively. With the exception of hybrids between N.A.112 and each of other parents all hybrids showed significant positive heterotic effects for seed yield per plant.

4. The variance associated with general and specific combining ability were significant for all traits. With the exception of number of branches per plant, high gca/sca ratio largely exceed the unity were obtained for all traits, indicating that the largest part of the total genetic variability was a result of additive and additive x additive types of gene action.

5. The best combiners were N.A.112 for maturity date, maturity period and number of seeds/pod and Giza 2 for seed yield per plant, number of pods per plant and number of branches per plant. Also, the two local varieties Giza 3 and 61/536/69 expressed highly significant positive ($\hat{g}_i$) for seed yield/plant and number of pods/plant and gave significant negative ($\hat{g}_i$) for flowering date. NEB.319 gave significant negative ($\hat{g}_i$) for flowering date.

6. The most desirable inter- and intra-allelic interactions were showed by six crosses for flowering date, five crosses for maturity date, seven crosses for number of pods/plant,

two crosses for number of seeds/pod, four crosses for seed index and by nine crosses for seed yield/plant.

7. The additive components "$\hat{D}$" reached the significant level of probability for all traits except for number of pods/plant. Significant values for dominance components (H_1) were detected for all traits.

8. the results showed the presence of overdominance for flowering date, plant height, number of branches per plant and number of pods per plant and nearly of complete dominance for the other traits.

9. Significant ($\hat{h}^2$) values were detected for all the studied traits. Negative and positive allels were unequally distributed among the parents for all traits except flowering date and plant height.

10. High heritability values were detected for maturity date, maturity period, number of seeds per pod and 100-seed weight. Moderate heritability values were obtained for seed yield per plant and number of branches per plant, while, low heritability values were detected for flowering date, plant height and number of pods per plant.

11. The correlation between parental mean performances and their order of dominance revealed that, few number of seeds

per pod was dominant over large number. Line 61/536/69 contained the most dominant genes, while, N.A.112 seemed to be carry the most recessive ones.

For maturity period, maturity date and 100-seed weight, the correlation values revealed that increasers were dominant over decreasers genes. The parental line 61/536/69 for maturity date and maturity period, and line NEB 319 for seed index appeared to passess the largest number of dominant genes. For seed yield/plant, the correlation values revealed that the low seed yield was dominant over the high one. The parental line NEB 319 contained the most dominant genes, while the parental line N.A.112 seems to carry the most resessive ones for the other traits, no particular trend could be detected.

Shedding:

12. Significant mean squares due to genotypes, parents, hybrids and parents vs. hybrids were detected for the number of flowers and number of pods per main stem and shedding percentage.

13. Ten and five crosses showed a significant positive heterotic effects relative to the mid- and better parent,respectively for number of flowers/main stem. While, the crosses Giza 3 x 61/536/69 and NEB 319 x Sevella gaint exhibited significant positive heterotic effects relative to

mid and better parent for number of pods/main stem. The three crosses N.A.112 x Giza 2, N.A.112 x Giza 3 and 61/536/69 x NEB 319 exhibited significant negative heterotic effects for shedding percentage. Significantly positive correlation coefficient values between mid parent values and f_1 mean performance were obtained for number of flowers and pods/main stem.

14. The mean squares associated with gca and sca were significant for the three traits. High values of gca/sca exceeding unity were detected for flowers and pods per main stem.

15. The parental line N.A.112 seems to be the best combiner for low shedding percentage, followed by Giza 3. The local lines 61/536/69 and Giza 3 expressed significant desirable ($\hat{g}_i$) for both number of flowers and pods per main stem. The excellent agreement between the parental performance and its ($\hat{g}_i$) was obtained for the three traits.

16. The highest desirable sca effects were obtained by nine and three crosses for high number of flowers and pods, and five crosses for low shedding percentage. The crosses N.A.112 x Giza 2, N.A.112 x Giza 3 and N.A.112 x Sevella gaint exhibited low shedding percentage and cross Giza 3 x 61/536/69 gave the highest sca effects for number of flowers and pods per main stem.

17. Both additive "$\hat{D}$" and dominance "$\hat{H}_1$" components were significant for the number of flowers and pods per main stem.

18. Studies of nature and degree of dominance revealed the overdominance for the three traits.

19. Signifiant "$\hat{h}^2$" values were detected for the three traits. Low heritability values were obtained for the three traits.

20. The correlation between parental mean performances and their order of dominance revealed that increasers genes were dominant over decreasers for number of flowers and shedding percentages. The parental line N.A.112 contained the most dominant genes responsible for the expression of both traits, however, NEB 319 seemed to be contain most of the recessive ones. For number of pods per main stem, the few number of pods was dominant over high one. Giza 3 contained the most dominant genes responsible for the expression of this trait. Meanwhile, N.A.112 seemed to be carry the most recessive ones.