5. SUMMARY

This study was carried out during the period of 1998/1999, 1999/2000 and 2000/2001 growing seasons at Etay El-Baroud Agricultural Research Station, Behaira Governorate, Egypt. The objective of this study was to estimate the response to different methods of plant breeding *i.e.*, pedigree, bulk and single pod descent. Also, direct and indirect selection criteria for increased seed yield were carried out. A selection intensity of 5% was used with direct selection (selection for seed yield it self) and with indirect selection using the three criteria, i.e. no. of seeds/pod, no of pods/plant and 100-seed weight. The genetic parameters were estimated in F_3, F_4 and F_5 generations.

Two F_2 populations derived from the crosses (L 18 x L 103) and (G.B. x G.429) were used.

The obtained results could be summarized as follow:

A. First cross (L 18 x L 103):

1. Mean squares associated with F_3 and F_4 families were found to be significant for the five traits under study in the first cross line 18 x line 103.
2. Genetic gain was rather higher for number of pods/plant and seed yield/plant. Moderate gain was found for 100-seed weight and number of seeds/pod. The same trend was obtained for G.C.V. % for these traits in the F_3-families.
3. Most selected families surpassed significantly the better parent for seed yield/plant in the F_4 families. Also, genetic gain was rather higher for number of pods/plant, number of

seeds/pod and seed yield/plant. Moderate gain was found for 100-seed weight. However, low gain from selection was found for maturity date. Also, the same trend was obtained for G.C.V. % for the previous traits.

4. F_5 generation:

a) Breeding methods:

Mean squares due to breeding methods were significant for all the five traits under study. The pedigree breeding method produced consistently more superior lines compared the pest parent in the first cross with 9, 7 and 8 lines for pedigree bulk and SPD respectively. The best line was no. 8 of pedigree method (48.2 g/plant) and lines no. 1 (41.7 g) no. 5 (39.09 g) and no. 6 (39.34 g) in bulk method.

b) Selection criteria:

Mean squares due to five selection criteria *i.e.* number of pods/plant, 100-seed weight, number of seeds/pod, low and high seed yield/plant were significant.

The selection of high number of pods/plant, gave the highest mean values for number of pods/plant, number of seeds/pod and seed yield/plant. Also, it the fourth ranks for seed index.

It could be concluded that indirect selection for yield via pod number is more efficient than direct selection for yield.

The comparison revealed the efficiency of selection for number of pods/plant, followed by no. of seeds/pod and then seed index in improving mean yield of F_5-lines and also

extracting a higher number of high yielding lines. (selection for high no. of pods/plant). It also, appeared that indirect selection for yield via number of pods/plant was more efficient than direct selection for yield.

B. Second cross: (G.B. x G.429)

1. Significant mean squares for F_3-families were detected for all traits. With respect of seed yield/plant, all F_3-families except two families no. 4 and 12, surpassed significantly higher than the best parent (G.B.). The high heritability in broad sense were detected for yield and its components.
2. Significant mean squares due to F_4-selected families were detected for all the studied traits. With regard to seed yield/plant, 33 selected families surpassed significantly than the better parent. The range of selected families varied from 281.41 (family no. 51) to 20.31 (family no. 35). The best families were no. 51, 26, 13, 23, 29, 43 and 54. The percentage of superior selected families having higher seed yield than better parent and population mean were 61-66 and 45%, respectively.
3. Genetic gain was rather higher for number of pods/plant and seed yield/plant. Moderate gain was found for 100-seed weight and number of seeds/pod, However, low gain was found for maturity date.

4. F_5-generation:

   a) Breeding method:

Mean squares due to breeding methods were significant for yield and its components.

The bulk method gave the highest values for number of pods/plant, number of seeds/pod and seed yield/plant. While, SPD exhibited significantly heavy 100-seed weight. It could be concluded that bulk method considered the best breeding method for seed yield/plant, number of seeds/pod and number of pods/plant than those pedigree and SPD ones.

The bulk method produced consistently more superior lines compared the best parent or the average populations with 11 and 9; 9 and 7; and 7 and 4 for bulk, pedigree and SPD, respectively. The best lines were no. 10 (49.58), no. 6 (44.32) and no. 8 (43.02) in bulk method and no. 4 (43.62) in SPD.

b) selection criteria:

Mean squares due to five selection criteria *i.e.*, number of pods/plant, 100-seed weight, number of seeds/pod (indirect selection), low and high seed yield/plant (direct selection) were significant.

Concerning seed yield/plant, the selection method of high number of pods/plant exhibited significantly higher value of this trait, but without superiority over that recorded by selected plants heavier seed index. However, the selection plants with low seed yield gave the lowest one.

The selection of high number of pods/plant, gave the highest seed yield plant, number of pods/plant and the second ranks for seed index and number of seeds/pod.

The present investigation expressed the selection for high number of pods/plant was more efficiency as indirect selection for yield via direct selection for seed yield/plant. Also, the selection for heavier 100-seed weight and number of seeds/pod gave more effectiveness of seed yield/plant compared with selection of seed yield *per se* in faba bean. The results indicated that selection for pod number and 100-seed weight were more efficient in breeding forward superior yielding F_5-lines.

Regarding seed yield/plant, the range of selected lines ranged from 19.07 to 48.22, 25.33 to 40.59; 13.48 to 34.57; 14.79 to 37.63; and 29.17 to 33.73 when electing plants with high number of pods, heavier seed, no. of seeds/pod, high and low seed yield/plant, respectively.

It could be concluded that indirect selection for yield via pod number and heavier seed index are more efficient than direct selection for yield.