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V. SUMMARY

The present study was conducted at the Farm of Sids Agricultural Research Station, Beni-Suef governorate, during the four successive seasons 2000/2001, 2001/2002, 2002/2003 and 2003/2004.

The study aimed to evaluate the efficiency of two breeding methods in faba bean namely; pedigree and bulk methods. Selection was mainly practiced for seed yield, the other four agronomic traits were studied as influenced by this selection. These traits were: number of pods/plant, number of seeds/plant, 100-seed weight and plant height.

The study aimed at:

1)   Evaluating the efficiency of pedigree and bulk breeding methods. The evaluation based on the following:

a-   The different statistics measured for a trait selected by the methods; i,e. ranges, means and number of superior families over populations mean.

b-   The different genetic parameters, i.e. variances, heritability, expected genetic advance and the different coefficients of variability.

2) Determining, within the bulk-pedigree approach, parameters which either alone, or combination, could be used to select in F_2 for advanced generation seed yield potential in faba bean

Two F_2 populations derived from two crosses: Giza 40 x Giza 429 and Giza 3 x Giza 429 were used. From each F_2 population a 150 plants were taken at random and those gave rise to 30 F_4 and F_5 families.

The results could be summarized as follows:

Generally, the differences obtained among the families selected by each of the two breeding methods were highly significant.

1- Seed yield:

The differences between the two crosses on the average of the two methods was significant with the pedigree method outyielded the other bulk method with 15.5 %. The widest range was obtained in F_5 by the pedigree method in the cross Giza 40 x Giza 429 and the reverse was observed in the cross Giza 3 x Giza 429 in favour of bulk method. In both crosses, the pedigree method produced largest number of superior families followed by bulk method. The F_5 pedigree method in the two crosses consistently retains the largest amount of the genotypic and phenotypic variation. The estimates were 157.2 and 182.03 for the cross Giza 40 x Giza 429, and 114.5 and 132.1 for the cross Giza 3 x Giza 429 for genotypic and phenotypic variation, respectively. Consequently, high heritability estimates were obtained for pedigree method followed by bulk method. The expected genetic advance was higher at pedigree method than that of bulk method over the two crosses. The phenotypic, genotypic and environmental coefficients followed almost the same trend with highest estimate for pedigree method.

From the previous mentioned data it is observed that the pedigree breeding method retained the higher genetic and coefficients of variability as well as number of superior families compared to the bulk method. However, each of pedigree and bulk methods were suitable methods used to select for high faba bean seed yield in the present material.

2- Number of pods per plant:

The widest range was obtained in F_5 by the pedigree method over the two crosses. In the cross Giza 40 x Giza 429, the pedigree method produced largest number of superior families and the reverse was observed in the cross Giza 3 x Giza 429 in favour of bulk method. In the cross Giza 40 x Giza 429, the F_5

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pedigree method consistently retain the largest amount of the genotypic and phenotypic variation and the reverse was observed in the cross Giza 3 x Giza 429 in favour of bulk method. In the two crosses, the bulk method retained the largest amount of variability with relatively high heritability estimate.

The expected genetic advance was higher at bulk method than that of pedigree method over the two crosses. The phenotypic, genotypic and environmental coefficients followed almost the same trend with highest for pedigree method in the cross Giza 40 x Giza 429, and the reverse in the cross Giza 3 x Giza 429 in favour of bulk method.

3- Number of seeds per plant:

The pedigree method gave families widely ranged in number of seeds/plant. The number of superior families produced by pedigree method was higher than that of bulk method over the two crosses. The F_5 pedigree method consistently retains the largest amount of the genotypic and phenotypic variation in both crosses. Consequently, high heritability estimates were obtained for pedigree over the two crosses. The expected genetic advance was higher at pedigree method than that of bulk method in both crosses. The different coefficients of variation followed almost the same trend with highest estimates for pedigree method.

4- 100-Seed weight:

The widest range was obtained in F_5 by bulk method in the cross Giza 40 x Giza 429, and the reverse was observed in the cross Giza 3 x Giza 429 in favour of pedigree method. The two breeding methods produced equal number of superior families. In the cross Giza 40 x Giza 429, the F_5 bulk method retain the largest amount of genetic and phenotypic estimates. The estimates herein were 21.38 and 45.09, respectively. The estimates of pedigree method were 12.35 and 34.65, respectively. The estimates of heritability and expected genetic advance were

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47.4 and 5.6, respectively. The coefficients of variation estimated for the different variance components showed the same trend of other genetic parameters illustrated before. The reverse was observed in the cross Giza 3 x Giza 429, the F_5 pedigree method retains the largest amount of variability, heritability and expected genetic advance. The different coefficients of variation followed the same trend of the other genetic parameters demonstrated before.

5- Plant height:

The two methods produced families with approximately equal ranges of about 30 cm difference between the minimum and maximum limits. The mean height of the F_5 bulk method was the tallest while the shortest was for pedigree in the cross Giza 40 x Giza 429. The reverse was observed in the cross Giza 3 x Giza 429. In both crosses, the estimates of the variances, heritability and expected genetic advance were the highest for the bulk method. The different coefficients of variation followed almost the same trend with highest estimates for bulk method. From the previous data it could be concluded that bulk method produced tallest families while pedigree method produced the shortest families.

6- Correlation and path coefficient analysis in F_2:

The results of path coefficient analysis indicated that the multiple linear correlation coefficient were 0.988 and 0.975 for the two crosses, Giza 40 x Giza 429 and Giza 3 x Giza 429, respectively, and that number of pods/plant, number of seeds/plant and 100-seed weight had the highest contribution its direct effect and/or its indirect effects with other characters.

Based on the results obtained, it seems that each of pedigree and bulk methods were suitable methods. Considering the partial allogamous nature of the crop, it could be concluded that the bulk method was more efficient and could be less costly in breeding for seed yield.