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SUMMARY

The present study was carried out during the four successive seasons 1997/98, 1998/99, 1999/2000 and 2000/2001 at Sids Agricultural Research Station, Beni-Suef governorate.

The study aimed to evaluate the efficiency of four breeding pollination methods in faba bean namely:

1- Open-method (OOOO) = F_3, F_4, F_5 and F_6 are open.

2- Self-method (SSSO) = F_3, F_4, F_5 are selfed and F_6 is open.

3- Self-method (SOSO) = F_3 and F_5 are selfed and F_4 and F_6 are open.

4- Self-method (SSOO) = F_3 and F_4 are selfed and F_5 and F_6 are open.

Selection was mainly practiced for seed yield. Another 3 agronomic traits were studied, they were number of pods per plant, number of seeds per plant and 100-seed weight. The final evaluation trials was designed as a randomized complete block design with three replications.

Two F2 populations derived from the crosses T.W. x Giza 402 and T.W. x Giza 2 were used. Data were recorded on 150 individual F2 spaced plants and those give rise to 20 identical families in F_5 and F_6.

The objectives of this investigation were:

1- To compare the efficiency of four pollination methods in increasing seed yield in faba beans.

2- To determine within pollination methods approach, the value of selfing in F_3, F_4 and F_5 in increasing the efficiency of selection for seed yield in faba beans.

The results obtained could be summarized as follows:

1- Highly significant differences were obtained among F_5 and F_6 families of each cross by applying either of the four breeding pollination methods.

2- The F_5 and F_6 open-pollination methods showed significantly higher seed yield, number of pods per plant and number of seeds per plant compared with the other three pollination methods.

3- The percentage increase at F_6 open-pollination method (OOOO) resulting from producing more heterozygous plants, while the reduction in seed yield of self-pollination (SSSO) may due to the complete absence of insect pollinator, inbreeding depression and reduced self-fertility of inbreds.

4- Selfed families in the method (SSSO) did not show much advantage over growing identical materials in the open method (OOOO) since 60 and 45 % of F_6 families in the cross T.W. x Giza 402 and T.W. x Giza 2 performed almost in similar manner in both pollination methods.

5- Planting identical materials if subjected simultaneously to self-and-open-methods could help in identifying in F_6 families with fixed genes for autofertility.

6- Open pollination method could be effective method when pollinators are not lacking during flowering in faba bean fields and could increase the frequency of heterozygous genotypes with high yielding ability to produce open-pollination variety at reduced cost.

7- The phenotypic (δ^2_{ph}) and genotypic (δ^2_g) variances estimated from F_6 open method were the highest compared with the other three pollination methods in both crosses.

8- Heritability estimates indicated that the F_6 open-pollination method (OOOO) recorded consistently the higher values compared with the other three pollination methods. For the cross T.W. x Giza 402 the heritability estimates in the open method recorded the highest values compared with the other three pollination methods with 4, 37.9 and 11.7 % more in open method over (SSSO), (SOSO) and (SSOO), respectively. Similar trends were obtained in the cross T.W. x Giza 2 where the open method recorded higher values compared the other three methods with 25.5, 4.6 and 38.4 % more in open methods over (SSSO), (SOSO) and (SSOO), respectively.

9- The expected and percentage of genetic advance indicated that the open pollination method (OOOO) had higher genetic advance than that of the other three pollination methods.

10- The widest range in seed yield was obtained by the self-pollination method (2.45 kg/plot) in the cross T.W. x Giza 402 and (1.76 kg/plot) in the cross T.W. x Giza 2 followed by the other pollination methods.

11- Number of superior families produced by self-pollination method (SSSO) was more in the cross T.W. x Giza 402 which produced more superior families with 10, 8, 7 and 5 for (SSSO), (OOOO), (SOSO) and (SSOO) pollination methods, respectively. These values represent 50, 40, 35 and 25 % of the total number of families. While, in the cross T.W. x Giza 2 the (SOSO) The superior families were 9, 8, 7 and 6 families for (SOSO), (SSSO), (SSOO) and (OOOO) pollination methods in the same order.

12- The phenotypic and genotypic coefficients of variability followed almost the same trend with the highest estimate for open method in both crosses.