Comparison between some designs of diallel crosses on faba bean (vicia faba,l.)

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SUMMARYThis investigation was carried out during three successive seasons starting from 1994/95 to asses the genetic basis and comparing between four analysis methods of half diallel cross of some agronomic characters, i. e. seed yield and its components, and shedding characteristics of faba bean. Eight parental varieties and/or lines namely, Sham, Alfred, 1.44, 61/563/66, NEB 319, Giza 2, Giza 3 and Giza 461, in addition to their 28 F 1 hybrids of all possible compinations excluding reciprocals, were evaluated in a randomized complete block design with three replications at the Agricultural Research and Experiment Center of Faculty of Agricultural Sience at Moshtohor.Data were recorded on indvidual gaurded plants for the following characters: seed yield/palnt, 100-seed weight, No. of branches/plant, No. of pods/pant, No. of seeds/pod, flowering date, plant height, No. of flowers/main stem, No. of set pods/main stem, No. of mature pods main stem, shedding of flowers, shedding of pods and total shedding. The data were genetically analysed by the procedures developed by Griffing's (1956) (method 2 and 4), Jones 1965 and Hayman (1954 b).The obtained results could be summarized as follows:1- Analysis of variance, mean performance and heterosis.Mean squares for genotypes (Parents and their F 1 's) were highly significant. Also highly significant mean squares were observed for hybrids and parents exept number of branches per plant where the parents mean squares were insignfmcant. The parental variety Alfred gave the highest seed yield per plant. The parental variety Sham had the highest number of pods per plant followed by cross Alfred x Giza 3. The cross Sham x 1.44 had the highest seed yield per plant, and also exhibited significant heighest value for number of podsper plant. The crosses Alfred x 1.44, Alfred x G. 3, 1.44 x G. 2, G. 2 x G. 3 and G. 2 x G. 461 expressed the highest values for 100-seed weight.Heterosis in seed yield per plant in most hybrids was largely manifested in bybrids showing pronounced heterosis in number of pods per plant. For total shedding, Twelve and nine crosses experssed significantly negative heterotic effects relative to mid-and better parent, respectively.2- Methods of diallel analysisa-Griffing's method-4 model 1 (1956):-Mean squeres of both general and specific combining ability (GCA and SCA) were highly significant for all the studied traits.b-Griffing's method-2 model 1 (1956):-The mean squeres associated with general and specific combining ability were highly significant for all traits.The previous methods are in agreement with that the additive and non additive gene effects involved in determining the performance of single cross progeny.c-The half diallel cross (method of Jones 1965):The (a) and (b) components were highly significant in all traits. This finding coincided with that already reached from the combining ability analysis (method-2 and method-4). The results obtained for additive, non additive and additive/non additive ratio confirmed the results obtained from the previous two methods.d-Hayman's method (1954):With the exception of seed yield per plant and number of branches per plant, the additive component (D) reached the significant level of probability for all traits. This finding is in harmony with that reached obove by theprevious three methods. For both the exceptional traits, insignificant (D) value inspite of that highly significant GCA and (a) estimates were obtained. Highly significant values for the dominance component (H1) were obtained for all traits.3-General combining ability effects.The parental varieties sham and 1.44 in both Griffing's methods (Method-2 and Method-4), and Giza 2 in method 4 showed significant positive (”gi) effects for 100-seed weight. Sham Alfred, 1.44, Giza 3 and Giza 461 exhibited considerable positive (”gi) seed yield per plant in both methods of analysis.

For total shedding the parental variety Giza-3 exhibited significantly negative Cgi) effects in both methods of analysis. Also, the parental variety Giza 2 showed significantly negative (^gi) effects for the three traits of shedding percentage in the Griffing's method-4.4-Specific combining ability effects:For number of pods per plant, eleven and ten crosses exhibited significant positive (^sij) effects in method-2 and method-4, respectively. The crosses Sham x 1.44, NEB 319 x G. 461 and G. 2 x G. 3 had the highest (^sij) values in both methods. For number of seeds per pod, seven hybrids showed significantly positive (^sij) effects in method 4. Also five crosses showed significantly possitive ("sij) effects for this trait in method-2. The crosses Alfred x G. 3, 1.44 x G. 461 and Alfred x G .2 had the highest ("sij) effects for this trait in both methods. Concerning seed yield per plant, fifteen crosses expressed signifcantly possitive ("sij) effects in Gritting method-2 . Also, eleven parental combinations from the previous crosses had significantly positive (^sij) effects in Giffing methods-4. The cross Sham x 1.44 gave the highest ("sij) value for this trait in both methods. The most desirable (^sij)effects were showed by crosses NEB 319 x G. 2, NEB 319 x G. 461 and G. 2 x G. 3 for low total shedding.5- Comparison between methodsThe correlation coefficient between Cgi) effects in the two methods of Griffing (method-2 and method-4) , was significant for all traits except number of set and matur pods per main stem. The correlation coefficient between (^sip effects in the two methods (Griffin's method 2 and 4) was highly significant for all traits. F. test for homogeniety of variances was used herien to differentiate between the studied analysis methods. Insignificant. F. values were detected between all methods in case of additive component for all traits, except seed yield and number of branches per plant where method of Hayman (1954 b) wasdiffered from the three other methods.The correlation coefficient of additive effects between the three methods i. e Griffing's method-2 and 4, and Jones (1965), was significant. However, insignificant correlation coefficient of additive effects in all triats betweenHayman's method and each of other methods.The correlation coefficients between the non additive genetic effects derived from the four methods of diallel analysis over all traits were highly significant. Also, the correlation coefficients between additive/non additive ratio derived from the four methods of diallel analysis were significant exceptbetween Griffing's method-4 and Hayman (1954 b).Correlation coefficient values of error mean squares between the four methods in all traits were significant.For error variance, insignificant F. test was detected between all methods used in this investigation for all traits, except for number of pods perplant where Griffing's method-4 was differed from each of Griffing's method-2 and Jones (1965). Insignificant F. test was obtained between the three methods (Griffing's method 2, 4, 1956 and Jones 1965) for non-additive gene effects. These results indicate strong relation between the three methods of diallel crosses in estimating the non-additive genetic variance. However significant F. values were obtained between Hayman method and each of the three methods (Griffing's method2, 4 and Jones 1965).