

Genetic studies on some quantitative characters in soy bean

Refat Abd El-Salam Ismail Abou Moustafa

The present investigation was carried out at Zarzoura Agricultural Research Station, Etai El-Barod, Agricultural Research Center during the three growing seasons 1994, 1995 and 1996 to study the inheritance of resistance to cotton leafworm (*Spodoptera littoralis* (Boisd.) such as (hairiness, the area of leaf consumed, defoliation, the percentage of increase in larva), earliness such as (flowering date, maturity date, filling period), and some growth attributes such as (plant height, first pod height) and yield and yield components such as (number of pods, number of seeds, number of branches per plant, seed yield weight/plant, number of seeds per pod, 100-seed weight). Five varieties and one line of soybean (*Glycine max*) were used in this study namely Clark (1), Elgin 87 (2), Calland (3), L 81-4420 (4), Ware (5) and Lakota (6). Crossing among the parental material by means of a half diallel system was initiated in 1994 growing season. In 1995 season, the obtained hybrid seed from each of 15 crosses were sown to obtain F₂ seeds. Meantime, the same work of the previous season was reported for obtaining more F₁ seeds. In 1996 growing season, two experiments were conducted, the first experiment involved the six parental varieties and their F₁ crosses and the second included parents and F₂ crosses were evaluated. A randomized complete block design with three replications was used. Data were recorded on 10 and 30 individual guarded plants chosen at random for F₁ and F₂, respectively. The data obtained for each trait were analysed on individual plant mean basis. An ordinary analysis of variance was first performed. Heterosis was computed as mean squares and as the percentage of F₁ and F₂ means performance from better parent value for individual crosses. The data were genetically analysed by the procedures developed by (Grifing, 1956 and Hayman, 1954). The obtained results can be summarized as follows:

- 1- Genotypes mean squares were significant for all traits in both generations. Also, parents, hybrids and parent vs. crosses were significant for all traits in both generations.
- 2- The five crosses Clark x L 81-4420, Clark x Ware, Elgin 87 x Calland, Elgin 87 x Ware and L 81-4420 x Ware exhibited the highest negative heterotic effects relative to better parent for defoliation. While, both crosses Clark x Elgin 87 and Clark x Ware gave significantly negative heterotic effects relative to better parent for area of leaf consumed. Also, eight crosses showed significant negative heterotic effects relative to better parent for percentage of increase larva.
- 3- In the F₁ generation mean squares of general and specific combining ability were significant for four traits. Also, the results showed that all four traits exhibited high GCA/SCA ratios which exceeded the unity indicating the predominance of additive gene action in the inheritance of such traits, in both generations.
- 4- In both generations, the parental variety Ware showed significant desirable "g_i" effects for the four traits. This parent could be considered as good combiner for developing resistant variety for leafworm. The parental Clark ranked the second after Ware for area consumed of leaf and percentage of increase in larva. Significant correlation coefficient between the parental performance and its "g_i" effects were obtained for all traits in the F₁ and hairiness and defoliation in the F₂-generation.
- 5- In the F₁ generation, the most desirable inter- and intra-allelic interaction were by Clark x Elgin 87, Clark x Calland, Clark x L 81-4420 and Clark x Ware for number of hairs. In eleven crosses Clark x Elgin 87, Clark x Calland, Clark x Ware, Clark x Lakota, Elgin 87 x Calland, Elgin 87 x L 81-4420, Elgin 87 x Ware, Calland x L 81-4420, Calland x Ware, Calland x Lakota and Ware x Lakota for area of leaf consumed. In four crosses Clark x L 81-4420, Clark x Ware, Elgin 87 x Ware and Elgin 87 x Lakota

for defoliation and in seven crosses Clak x Calland, Clark x Ware, Clark x Lakota, Elgin 87 x L 81-4420, Elgin 87 x Lakota, Calland x L 81-4420 and Ware x Lakota for percentage of increase in larva. In the F2 generation, the most desirable SCA effects were obtained in five crosses for number of hairs, eight crosses for area of leaf consumed, three crosses for defoliation and seven crosses for percentage of increase in larva. In these traits one or more from the crosses had significant desirable SCA effects in the F1 generation.

6-The additive and dominance components (D and H1) showed the significant level of probability for all traits in both generations.

7-Studies on nature and degree of dominance revealed that the existence of overdominance for most traits in both generations.

8-The negative and positive alleles were unequally distributed among the parental population for all traits in both generations except defoliation in the F1 generation.

9-High to moderate heritability values in narrow sense were detected for all traits in both generations.

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Agronomic Characters :

1-The genotype mean squares and its components were significant for all the studied traits in both generations.

2-For earliness, none of the hybrids showed significant negative heterotic effects relative to better parent in both generations, except cross Clark x Elgin 87 in both generations and cross Elgin 87 x Lakota in the F2 generation for maturity period. Ten crosses showed significant positive heterotic effects relative to better parent in the F1 and F2 generations. The cross Clark x Ware, Elgin 87x Ware, Calland x Ware, Elgin 87 x Lakota and Ware x Lakota gave the highest heterotic effects relative to better parent for yield and its components in both generations.

3- Mean squares of general and specific combining ability were significant for all traits in both generations, except for flowering date and number of branches per plant in the F1 generation which showed significant SCA. Both additive and non-additive gene effects were involved in determining the performance of single cross progeny for all traits except flowering date and number of branches per plant in the F1 generation, where additive gene effects was the most important part of the total genetic variability. Also, the results showed that all traits in both generations exhibited high GCA/SCA ratios that exceeded the unity indicating the predominance of additive gene action in the inheritance of such traits.

4-In both generations, the parental variety Lakota seems to be the best combiner for earliness. Also, the parental varieties Calland and Ware showed significant positive "gi" effects for yield and yield components.

5-In both generations, the most desirable inter- and intra-allelic interactions were represented by cross Elgin 87 x Lakota for earliness, by six crosses, Clark x Ware, Elgin 87 x Ware, Calland x L 81-4420, Calland x Ware, Calland x Lakota and Ware x lakota for yield and yield components.

6-Appreciable additive and non-additive components (D and Hi) were detected for all traits in both generations.

7- Studies on nature and degree of dominance revealed the existence of over-dominance for most traits in both generations.

8-The negative and positive alleles were unequally distributed among the parental population for all traits in both generations.

9-High to moderate heritability values in narrow sense were detected for most traits in both generations.