SUMMARY

The aim of the present investigation was to study the inheritance of protein content, the amino acid lysine, in addition to some economic characters in grain sorghum namely, weight of seeds per head, 1000-kernel weight and number of seeds per head. Three crosses included two exotic varieties. NM5612 and NM5272 and one local variety G.15 were performed and data were obtained on the parents, F_1, F_2, BC_1 and BC_2 generations. Besides the relationships between these characters were determined. The experiments were conducted at Shandaweel Experimental Station, Field Crop Research Institute, Agricultural Research Center, Giza. The experimental work lasted for the three seasons: 1984, 1985 and 1986, Results could be summarized as follows :-

I. Total protein content :

1. The differences among all genotypes were highly significant for this character.

2. Potence ratio exhibited over-dominance to the lower protein content in the two crosses NM5612 x NM5272 and NM 5272 x G.15, while the cross NM5612 x G.15 showed partial dominance to the higher protein content.

3. Heterosis compared with mid-and better parents showed highly significant negative values in the two crosses NM5612 x NM5272 and NM5272 x G.15 indicating that F_1 shorghum hybrids contained less crude protein than the initial forms. While the mid parents heterosis in the cross NM5612 x G.15 exhibited insignificant positive value.

4. The inbreeding depression percentage showed insignificant positive or negative values in the crosses studied which may be due to heterozygosity in the F_2 generations.

5. Broad sense heritability in the two crosses NM5612 x NM5272 and NM5272 x G.15 showed values above 80% while the cross NM5612 x G.15 exhibited low heritability.

6. Estimates of number of genes showed one to three pair of genes affecting this character.

7. The estimation of gene effects showed that dominance was the most important parameter for the inheritance of protein content.

II. Amino acid lysine in protein :

1. The differences among the used genotypes were highly significant for this character.

2. Potence ratio exhibited partial dominance to the higher lysine in the cross NM5612 x NM5272, partial dominance to the lower lysine in the cross NM5612 x G.15 and over-dominance to the higher lysine in the cross NM5272 x G.15.

3. Heterosis compared with mid- and better parents showed highly significant positive values in the cross NM5272 x G.15. While the other two crosses exhibited negative values suggesting that F_1 sorghum hybrids contain less of the amino acid lysine than the initial forms.

4. Inbreeding depression (I.D.%) showed highly significant negative values in the two crosses NM5612 x NM5272 and NM5612 x G.15 indicating heterozygosity in most factors influencing lysine in protein.

5. The broad sense heritability gave values less than 40% in all crosses studied due to the high variance in the F_1 generations.

6. Number of genes controlling this character was found to be one pair of genes.

7. Estimates of gene effects showed that dominance effect was more important part than others for the inheritance of lysine.

III. Weight of seeds per head :

1. The differences among genotypes were highly significant for weight of seeds per head character.

2. High values of potence ratio were obtained for weight of seeds per head in the three crosses studied indicating over-dominance to the heavy seed weight.

3. Heterosis over mid- and better parents gave highly significant positive values for all crosses studied suggesting heterozygosity in the F_1 generations.

4. Inbreeding depression percentages gave highly significant positive values in all crosses studied which may be due to homozygosity in the F_2 generations.

5. Heritability in broad sense gave in general high values above 50%.

6. The number of genes controlling this character ranged from one to thirteen pair of genes.

7. The estimates of parameters of gene effects showed that dominance, additive x dominance and dominance x dominance were important parts than others in all crosses studied.

IV. 1000-kernel weight:

1. The differences among genotypes were highly significant for this character.

2. Potence ratio as an indicator to dominance relationships showed partial dominance to the heavy seeds in the two crosses NM5612 x G.15 and NM5272 x G.15, while the cross NM5612 x NM5272 showed over-dominance to the lighter seeds.

3. Mid and better parent heterosis in the cross NM5612 x NM5272 were found to be highly significant negative direction towards lighter seeds. In the other two crosses mid-parents heterosis exhibited highly significant positive values, while the better parent heterosis showed negative values.

4. Inbreeding depression percentage showed negative value in the cross NM5272 x G.15, while the other two crosses exhibited positive values.

5. The values of heritability in broad sense were high suggesting effectiveness of selection for 1000-kernel weight in all crosses studied.

6. Estimates of number of genes showed that one to two pair of genes affect this character in all crosses.

7. The six parameters of gene effects showed that dominance and additive x additive were more important parts than others in the inheritance of 1000-kernel weight.

V. Number of seeds per head:

1. The differences among genotypes were highly significant for this character.

2. High values of potence ratio were obtained in all crosses studied suggesting the presence of over-dominance to the high number of seeds.

3. Heterosis compared with mid- and better parents showed highly significant positive values in all crosses

studied indicating heterozygosity in the F_1 generations.

4. Inbreeding depression percentage gave highly significant positive values indicating the presence of homozygosity in some of F_2 generation.

5. Data of broad sense heritability showed that all crosses studied gave values above 60% indicating that individual selection could be effective for number of seeds per head.

6. The number of genes controlling this character was found to be one to five pair of genes.

7. The estimates of parameters of gene effects showed that the additive and additive x dominance were more important than others for this character.

IV. Correlation coefficient between characters studied:

The phenotypic and genotypic correlation coefficients were higher than the environmental one's among the studied characters, except between protein content and each of 1000 kernel weight, number of seeds per head and lysine. These results indicate that most of the studied characters has not been appreciably affected by environmental factors.

Values of genotypic and phenotypic correlations were approximately equal among all characters indicating that magnitude of r_G as compared to r_p was equal for these characters.

The correlations between weight of seeds per head and each of 1000-kernel weight and number of seeds per head were highly significant positive, r_G values were approximately equal with r_p values. The correlation between weight of seeds per head and total protein content was significant and r_p value ($r_p = 0.48$) was higher than r_G value ($r_G = -0.45$) indicating that r_p was high in magnitude than r_G and that genetic association between these characters were due to non genetic linkage.

The correlations between 1000-kernel weight and each of number of seeds per head and total protein content were significant positive or negative.

There is no correlation between number of seeds per head and each of protein or lysine and also between protein and lysine.

Correlation coefficients (r_p, r_G and r_E) between lysine content and each of weight of seeds per head, 1000-

kernel weight and number of seeds per head showed insignificant values.

From these results the following conclusions may be drawn :-

1. Protein and lysine were insignificantly correlated with seed weight at least in the present material of this investigation.

2. Lysine content is not at all correlated with protein content, which means that both characters are genetically conditioned by different genes. A result which may help in selecting sorghum genotypes high in protein and lysine.