A STUDY OF AN INTER-VARIETAL CROSS BETWEEN AN INTRODUCED WHEAT VARIETY AND LOCAL VARIETY GIZA 155.

By

MAHMOUD SOLIMAN AHMED SULTAN

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By : Mahmoud Soliman Ahmed Sultan

Approved by:

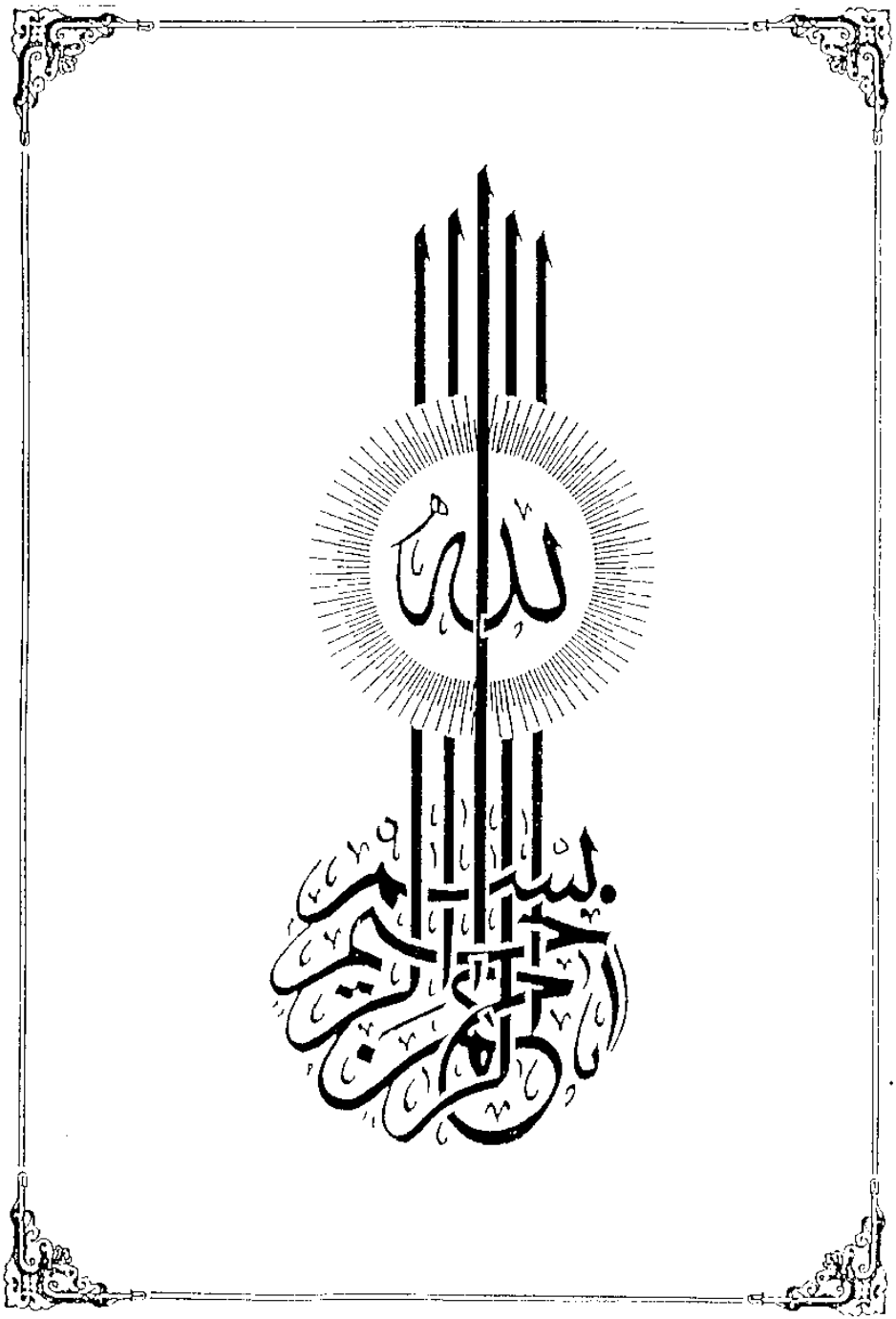
.....M. S. Nawar.....

....A. I. El-Agamy

.K. A. Gh. Shamaga.

Committee in Charge

Date: / /1977.



C O N T E N T S

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I. INTRODUCTION

Wheat is one of the most important cereal crop grown in Egypt. Such wheat grains are considered to be the main source of flour required to bread and other products making. Also the strew is considered to be the major portion of farm animals feeding during a long period in summer. In Egypt this crop occupies rather a great area than any other crop with the exception of cotton. However, this area produces yield much less than our national need. Therefore the prime breeders objective in Egypt as elsewhere is to raising the yield per unit area, whereas increase the cultivated area is very difficult now. In the same time improving the quality of grain also is one of the prime breeders objectives.

The main objective of the present investigation was to study some genetical estimates concerning some yield and quality characters, and also the possibility of improvement the egyptian varieties by crossing it with introduced varieties which had high quality characteristics.

II. REVIEW OF LITERATURE

This review will deal with the characters involved in present investigation as follows:

a) Vegetative characters:

1. Heading date.
2. Plant height.

b) Yield and yield components:

3. Number of spikes per plant.
4. Number of spikelets per spike.
5. Spike length.
6. 100 kernel weight.
7. Yield per plant.

c) Quality characters:

8. Protein percentage.
9. Sedimentation value.
10. Dough properties.

a. Vegetative characters

1. Heading date:

Sikka et al. (1959) reported that F_1 was the earliest in maturity followed by the F_2, F_3 and mean of the parents.

Grumpacker and Allard (1962) reported significant additive and additive x additive epistatic variation for the inheritance of heading date in wheat.

Stuber et al. (1962) reported that average flowering date in the F_1 and F_2 fell between the mid-parent value and the P_2 mean which indicated a preponderance of genes with at least partial dominance for late flowering. They also reported that heritability estimate calculated by three methods was high for each method of calculation (0.511, 0.724, and 0.762) respectively. They concluded that late flowering appears to be at least partially dominant.

Pinthus (1963) found that time of ripening in wheat follows both quantitative and qualitative inheritance patterns.

McNeal et al. (1965) reported that the F_1 and F_2 were either intermediate between the two parents or equal to one parent for days from January 1 to heading.

Johnson et al. (1966) found that these evidence provided by means and variances for date of heading indicates that earliness completely dominant. F_1 and Bc_1 means are nearly identical to that of the early parent and the Bc_2 mean equals the mid-parent value, Comparison of Bc_1 and Bc_2 variances provides additional evidence for dominance of earliness. The bimodal distribution of the F_2 and probable

bimodality of Bc_2 are suggestive of the operation of a single gene pair for early heading.
They reported that heritability estimate for earliness was 0.364 ± 0.211.

Similar results were reported by Hashmi (1967).

Chowdhry (1969) reported that the F_1 means were intermediate between the two parental means, but were nearer to the low parental mean indicating partial dominance of genes controlling earliness in heading.

Singh et al. (1970) reported that the mean of heading date was 87 days, the genotypic coefficient of variation (20,81), heritability (99.83%) and the genetic advance in percentage of mean was (41.67).

Amaya et al. (1972) indicated that the means of the F_1 hybrids were intermediate to the parents but generally skewed toward the earlier parent. Mean heading dates of the F_2 and F_3 generations were equal to or earlier than the F_1's except in cross 2, where the F_3 bulk was later. Back cross means tended to be intermediate to F_1 and recurrent parent means. The dominance effect for cross 1 was approximately twice as large as the additive effect. This cross had the least genetic variability, and possibly genes for earliness and lateness were equally distributed between the

parents. Dominance effects and additive effects were of approximately the same magnitute for crosses 2, 3, and 4 with dominance for earliness indicated in each cross.

Bhatt (1972) found that about 1% of the total F_2 population gave an indication of transgressive segregation for earliness in heading date. He also found that degree of dominance $(H/D)^{½}$ for the two crosses studied were (0.75, 1.07), effective factors were (1.47, 1.41), heritability in broad sense were (85.42% and 73.92%) but in narrow sense were (64.17% and 48.28%), and genetic coefficient of variation (G.C.V) 2.74 and 1.81. Additive variance was almost double the dominance variance in one cross while in the other cross both these variances were almost equal. Environmental variances were relatively low in both crosses. The values of $(H/D)^{½}$ indicated partial dominance for earliness in heading. The additive effect was significant, whereas the dominance effect was nonsignificant for either crosses.

Gill and Brar (1973) reported that high heritability estimate was observed for days to earing 98.33%. Also Tripathi et al. (1973) reported that genetic coefficient of variation for days to 75% flowering was high value of 69.9, heritability was 95.78% and phenotypic variance 47.40 but genotypic variance 45.40.

2. Plant height:

Clark and Hooker (1926) reported that all gradiation in height equal to or between the parents were observed.

On the other hand Kučumov (1937) reported that by crossing contrasting wheat ecotypes hybrids were obtained which exceeded parental types in height.

Pal and Nek Alam (1938) concluded that F_1 plants were significantly taller than the taller parent under 4 to 5 planting conditions. Also Granhall (1943) reported that the hybrid plants averaged as tall or slightly taller than the taller parent in a cross between common wheat x Triticum turgidum.

Pao et al. (1944) obtained evidence for tri-genic control of height, while Everson et al. (1957) obtained results that could be explained by two genes.

Skurygina (1958) indicated that F_1 plants from a cross between common wheat and T. timopheevi exceeded the parents in height.

Sikka et al. (1959) reported in a study involving 12 intervarietal crosses of wheat that over all crosses the F_1 generation had the tallest plants followed by the parental mean, F_2 and F_3.

Gandhi et al. (1961) on 11 wheat crosses found that ten of the 11 hybrids were taller than the taller parent, the maximum increase over the taller parent was 20.5%.

Stuber et al. (1962) indicated that plant height means of the F_1 and segregating population were significantly larger than parental means, indicating a heterotic effect for plant height. They also reported that heritability estimates of plant height and grain yield were low indicating that selection progress would be slow.

Kronstad and foote (1964) found that heritability estimate in narrow sense for plant height was 0.829.

McNeal et al. (1965) reported that significant differences were not obtained between populations. The F_1 and F_2 were similar in plant height in each cross which were significantly taller than the Thatcher parent in two crosses and equal to the second parent in all crosses.

Johnson et al. (1966) reported that plant height in wheat has been shown to be an expression of both polygenic and major gene effects. They also reported that analysis of population means and variances for plant height suggests the operation of more than one type of gene action, the predominant portion of the total variance among generation

means could be attributed to accumulative additive effects. Partial dominance of tallness was indicated by an F_1 mean larger than the mid-parent value and the small variance of Bc_2 in relation to that of Bc_1. While F_2, Bc_1, Bc_2 and F_3, means that closely approximate the mid-parent value suggest additive gene action. A slightly bimodal distribution of the F_2 population suggests the operation of small number of genes in the expression of plant height. The same authers reported that heritability estimate values for plant height were the most consistent between the broad and narrow sense of 0.453 ± 0.149.

On the other hand Ahmed (1967) and Hashmi (1967) reported that plant height behave as a complexly inherited character.

Briggle et al. (1967) reported no heterosis for plant height.

Fonseca and patterson (1968) using regression models, obtained high heritability estimates for plant height, and also reported that this character was intermediate between the two parents in all 21 hybrids studied.

Gyawali et al. (1968) reported that the hybrids were generally taller than the mid-parent, but shorter than the taller parent.

Anwar and Chowdhry (1969) reported heterosis for plant height.

Chapman and McNeal (1971) found that relationship of the F_1 to the mid-parent value indicates possible dominance in the direction of tallness, the F_1 was greater than the mid-parent and statistically equal to taller parent. Only the additive genetic effect contributed significantly to genetic variation for plant height. The dominance effect and dominance x dominance epistatic effect played major roles in the inheritance of plant height. The authers cannot conclude that epistatic gene action directly influences the inheritance of plant height. However they do conclude that epistatisis influences the phenotypic expression of this character.

Amaya et al. (1972) found that in one of crosses studied about equal amounts of additive and dominance effects, while epistatic effects was present in other two crosses. They also found that the F_1 hybrids were 5-8 cms. taller than mid-parent values, while F_2 and F_3 bulk generations were equal to or shorter than the F_1 for all crosses studied except one. The backcross means were intermediate between the F_1 and the recurrent parent.

Bhatt (1972) reported that the individuals in each of the six population in both crosses showed an approximately normal distribution. He also reported that the mean F_1 values in both the two crosses studied were higher than the mid-parent, and were nearer to the higher parent, this result suggested partial dominance of genes governing the tallness.

Gill and Brar (1973) and also Tripathi et al. (1973) found high heritability estimates (95.28% and 74.88%) respectively.

b. Yield and Yield components

3. Number of spikes per plant:

Pal and Nek Alam (1936) concluded that expression of heterosis is greatly influenced by environmental conditions. The F_1 showed up to 46% greater capacity for tillering when sowing were made early in the season.
On the other hand Palmer (1952) reported that the number of spikes per plant was higher for the F_1 but was not significantly different from the better parent.

Skurygina (1958) indicated that F_1 plants from a cross between common wheat and T. timopheevi exceeded the parent species in tillering capacity. Also Sikka et al. (1959) in a study involving 12 intervarietal cross of wheat reported