# EVALUATION OF DIFFERENT BREAD WHEAT LINES IN THE $F_6$ AND $F_7$ GENERATION FOR GRAIN YIELD AND ITS ATTRIBUTES

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## ABSTRACT

This investigation was carried out to evaluate 66 wheat lines derived from five crosses of bread wheat along with their seven parents and ten check cultivars giving a total of 83 genotypes. The 66 lines were evaluated in the $F_6$ and $F_7$ generations in 1995/96 and 1996/97 seasons, respectively. Statistical analysis showed highly significant differences for all studied traits in the two seasons except kernels weight/spike in the second season. Six lines were earlier in heading date as compared to their parents and the check cultivars in both seasons. With regard to grain yield performance, the lines numbered 49 and 53 gave higher yields in both seasons, while line 46 outyielded all genotypes in the first season but failed to be stable in the second. The highest values of phenotypic and genotypic coefficients of variation were recorded in the two seasons for grain yield /plant followed by kernels weight/spike. Estimates of heritability in the broad sense were high for all studied traits in the two seasons except spikes/plant and spikelets/spike which were moderate in the second season. Phenotypic correlation cofficients showed positive and significant relationship between grain yield/plant and each of heading date, plant height, spikes/plant and 1000-kernel weight.

**Key words:** Bread wheat, genotypes, phenotypic, genotypic, heritability, correlation, agronomic traits.

## INTRODUCTION

Wheat is the world's most important and most widely grown cereal crop. Its importance is derived from many properties and uses of its grains which makes it a stable food for more than one third of the world's population (Poehlman 1987).

Any progress in a breeding program depends on the magnitude of genetic variability in the population and the extent of heritability of the desirable characters. Variability analysis has been found useful for getting information about the characters that are expected to response to selection. Thereby during the past few years plant breeders have given special attention to the study of world collections of different species to maximize genetic variability and to identify superior genotypes for use in plant breeding programs. Previous studies made on wheat provided useful indication about variability for several traits such as Baker *et al,* 1968; Rady *et al,* 1981; El-Shouny *et al,* 1987; Ehdaie and Waines 1989; El-Marakby *et al,* 1992a and 1994; Shehab El-Dine 1997; El-Seidy and Hamada 1997; Ibrahim 1994 and Mondal *et al,* 1997.

The present work was conducted to study the genetic variability of eighty three genotypes derived from different crosses for two seasons including parents and check varieties. The relative performance for each

genotype was accounted. Estimets of phenotypic and genotypic coefficients of variation, heritability in the broad sense and correlation coefficients between grain yield and yield attributes.

## MATERIALS AND METHODS

The field experimental work of the present investigation was carried out in first season (1995/96) at the Experimental Farm of the Faculty of Agriculture, Ain Shams University at Shoubra El-Kheima. In Second season (1996/97) the experimental work was carried out at the Experimental Farm of the Faculty of Agriculture, Ain Shams University at Shalakan, Kalubia Governorate. The material used comprised 83 breat wheat genotypes, which were: sixty six lines derived from five crosses and evaluated in the $F_6$ and $F_7$ generations, seven parents involved in these crosses as well as nine local and one exotic cultivars.

**Table 1: The five wheat crosses and their parental genotypes and number of lines selected from each cross.**

| No. | Crosses | No. of lines selected |
|---|---|---|
| 1 | MD 689 IB/Chere "S" X Giza 160 | 1-23 |
| 2 | Bow "S"//YD "S"/ZZ "S" X Chat "S" | 24-30 |
| 3 | Giza 155 X MD 689 IB/Chere "S" | 31-44 |
| 4 | Giza 157 X Bow "S"// YD "S"/ZZ "S" | 45-53 |
| 5 | MD 689 IB/Chere "S" X Kvz// Con/ Pj 62 | 54-66 |

In both seasons, sowing was made during the last week of November and the experimental design used was a randomized complete block design with three replicates. Each replicate consisted of one row for each genotype. Rows were 2.5 m long, 20 cm apart and plants were spaced at 10 cm within the row. One plant was left per hill. The recommended cultural practices for wheat production were followed during the growing seasons. Data were recorded on ten guarded plants for the following characters: 1- Heading date, was recorded as number of days from sowing until the main stem spikes of about 75% of plants per plot were fully emerged from the sheath of flag leaf. 2- plant height (cm), 3- spike length (cm). 4- No. of spikes/plant. 5- No. of spikelets/spike. 6- No. of kernels/spike. 7- kernels weight/spike (g). 8- 1000-kernel weight (g). 9- grain yield/plant (g).

Statistical analysis was performed as outlined by Gomez and Gomez (1984). The environmental ( ), genotypic ( ) and phenotypic ( ) variances, phenotypic (P.C.V.) and genotypic (G.C.V.) coefficients of variability and heritability in the broad sense were calculated according to Singh and Chowdhary (1977). Phenotypic correlations between grain yield/plant and yield components were also calculated.

The test of homogeneity of variances for most traits was significant, thus the combined analysis was not performed and data of each seasons was presented separately.

## RESULTS AND DISCUSSION

**1- Genotypic performance and variability:**

Results of statistical analysis of variance presented in Table 2 show presence of considerable variation among wheat genotypes regarding the studied traits in both seasons, except for kernels weight/spike in the second season since no significant differences were detected between entries for this trait. Heading date for 75% of plants/plot were recorded for 83 wheat genotypes in every season as shown in Tables (3 and 4). Heading date ranged from 72.67 days for line 10 to 106.67 days for line 3 with an average of 85.31 days in the first season and from 75.67 days for line 11 to 103.67 for line 3 with an average of 90.62 days in the second season. The range in heading date was greater among lines than among original parents or the check cultivars indicating the presence of greater genetic variability among selected lines as compared to parents and check cvs. for this trait. The two lines 10 and 12 were the earliest in both seasons as well as the two lines 11 and 21 in the second season. These lines were earlier by about 7 to 8.33 days in the second season than the two early commerical cultivars No. 77 (Sids 7) and No. 78 (Sids 9). On the other hand, the line No. 3 came later in heading in both seasons which averaged 105.17 days over the two season followed by line No. 4, the two parental varieties No. 70 and No. 72 and the commercial cv. Giza 163 in the second season. Other wheat genotypes behaved as intermediate in heading date with different degrees of significances among and within each genotype groups (lines, parents and commertial cvs.).

**Table 2: Mean squares of the studied traits of the 83 bread wheat genotypes in 1995/96 and 1996/97 seasons.**

| S.O.V. | d.f | Heading date | | Plant height (cm) | | Spike length (cm) | |
|---|---|---|---|---|---|---|---|
| | | 1995/96 | 1996/97 | 1995/96 | 1996/97 | 1995/96 | 1996/97 |
| Replicate | 2 | 2.18 | 6.68 | 16.37 | 21.12 | 0.46 | 0.24 |
| Genotype | 82 | 155.67** | 129.66** | 190.81** | 161.58** | 4.39** | 4.15** |
| Error | 164 | 2.13 | 2.26 | 5.76 | 10.79 | 0.43 | 0.75 |
| **S.O.V.** | **d.f** | **Spikes/plant** | | **Spikelets/spike** | | **Kernels/spike** | |
| | | **1995/96** | **1996/97** | **1995/96** | **1996/97** | **1995/96** | **1996/97** |
| Replicate | 2 | 0.59 | 1.53 | 0.77 | 0.39 | 1.56 | 36.88 |
| Genotype | 82 | 6.28** | 6.67** | 6.73** | 9.03** | 183.78** | 179.41** |
| Error | 164 | 1.17 | 1.55 | 0.87 | 2.25 | 19.39 | 20.35 |
| **S.O.V.** | **d.f** | **Kernels weight/spike (gm)** | | **1000-kernel weight** | | **Grain yield/plant (gm)** | |
| | | **1995/96** | **1996/97** | **1995/96** | **1996/97** | **1995/96** | **1996/97** |
| Replicate | 2 | 0.08 | 0.16 | 5.79 | 1.69 | 0.04 | 6.32 |
| Genotype | 82 | 0.59** | 0.32 | 45.46** | 62.78** | 12.32** | 12.39** |
| Error | 164 | 0.06 | 0.07 | 4.74 | 9.31 | 2.42 | 1.73 |

*** and ** Denote significant at 0.05 and 0.01 probability levels, respectively.**

**Table 3: Mean values of heading date, plant height and spike length for 83 wheat genotypes in 1995/96 and 1996/97 seasons.**

| Genotypes | Heading date (day) | | | Plant height (cm) | | | Spike length (cm) | | |
|---|---|---|---|---|---|---|---|---|---|
| Lines | 1995/96 | 1996/97 | Mean | 1995/96 | 1996/97 | Mean | 1995/96 | 1996/97 | Mean |
| 1 | 93.67 | 89.67 | 91.67 | 103.67 | 102.67 | 103.17 | 7.77 | 7.73 | 7.75 |
| 2 | 91.00 | 85.00 | 88.00 | 102.67 | 104.67 | 103.67 | 7.77 | 8.33 | 8.05 |
| 3 | 106.67 | 103.67 | 105.17 | 96.00 | 93.00 | 94.50 | 7.63 | 7.83 | 7.73 |
| 4 | 103.00 | 102.33 | 102.67 | 109.67 | 106.00 | 107.83 | 7.77 | 7.97 | 7.87 |
| 5 | 83.00 | 80.00 | 81.50 | 93.00 | 91.67 | 92.33 | 7.63 | 7.40 | 7.52 |
| 6 | 87.67 | 88.00 | 87.83 | 82.67 | 94.00 | 93.33 | 7.93 | 7.67 | 7.80 |
| 7 | 93.00 | 93.00 | 93.00 | 110.00 | 95.33 | 102.67 | 7.30 | 7.40 | 7.35 |
| 8 | 78.00 | 79.00 | 78.50 | 85.67 | 86.00 | 85.83 | 7.13 | 6.27 | 6.70 |
| 9 | 78.67 | 79.00 | 78.83 | 97.00 | 98.00 | 97.50 | 8.63 | 8.27 | 8.45 |
| 10 | 72.67 | 76.67 | 74.67 | 94.00 | 92.67 | 93.33 | 8.63 | 8.27 | 8.45 |
| 11 | 75.33 | 75.67 | 75.50 | 86.00 | 82.67 | 84.33 | 8.17 | 7.00 | 7.58 |
| 12 | 75.00 | 76.67 | 75.83 | 87.67 | 89.00 | 88.33 | 7.87 | 7.13 | 7.50 |
| 13 | 85.00 | 85.67 | 85.33 | 96.00 | 97.67 | 96.83 | 7.80 | 7.20 | 7.50 |
| 14 | 91.00 | 90.67 | 90.83 | 96.67 | 103.67 | 100.17 | 8.17 | 8.00 | 8.08 |
| 15 | 87.00 | 88.00 | 87.50 | 119.33 | 120.00 | 119.67 | 8.27 | 7.70 | 7.98 |
| 16 | 95.33 | 94.67 | 95.00 | 102.00 | 104.67 | 103.33 | 7.10 | 7.73 | 7.42 |
| 17 | 88.67 | 89.00 | 88.83 | 104.00 | 103.33 | 103.67 | 8.53 | 7.63 | 8.08 |
| 18 | 84.67 | 87.67 | 86.17 | 103.00 | 94.00 | 98.50 | 8.40 | 7.70 | 8.05 |
| 19 | 96.00 | 97.00 | 96.50 | 106.00 | 96.67 | 101.33 | 8.37 | 7.30 | 7.83 |
| 20 | 80.00 | 80.00 | 80.00 | 86.33 | 83.67 | 85.00 | 7.80 | 7.57 | 7.68 |
| 21 | 78.00 | 76.67 | 77.33 | 93.67 | 90.00 | 91.83 | 8.03 | 7.30 | 7.67 |
| 22 | 83.67 | 79.67 | 81.67 | 90.00 | 90.00 | 90.00 | 8.00 | 8.60 | 8.30 |
| 23 | 97.67 | 94.00 | 95.83 | 91.67 | 95.00 | 93.33 | 8.80 | 7.17 | 7.98 |
| 24 | 95.33 | 95.00 | 95.17 | 99.00 | 99.67 | 99.33 | 9.13 | 7.40 | 8.27 |
| 25 | 89.00 | 91.33 | 90.17 | 101.00 | 96.67 | 98.83 | 9.63 | 7.00 | 8.32 |
| 26 | 97.33 | 94.33 | 95.83 | 100.00 | 97.00 | 98.50 | 10.27 | 7.83 | 9.05 |
| 27 | 96.00 | 94.33 | 95.17 | 104.00 | 102.00 | 103.00 | 9.67 | 7.33 | 8.50 |
| 28 | 91.67 | 92.33 | 92.00 | 97.67 | 89.67 | 93.67 | 9.07 | 6.97 | 8.02 |
| 29 | 94.00 | 91.00 | 92.50 | 91.33 | 85.33 | 88.33 | 8.87 | 6.03 | 7.45 |
| 30 | 98.67 | 97.67 | 98.17 | 95.00 | 92.33 | 93.67 | 9.23 | 7.03 | 8.13 |
| 31 | 97.67 | 98.67 | 98.17 | 92.33 | 87.00 | 89.67 | 8.80 | 7.30 | 8.05 |
| 32 | 94.33 | 93.67 | 94.00 | 102.67 | 102.67 | 102.67 | 7.10 | 7.10 | 7.10 |
| 33 | 86.67 | 93.00 | 89.83 | 80.67 | 75.67 | 78.17 | 7.53 | 5.67 | 6.60 |
| 34 | 95.67 | 88.67 | 92.17 | 83.67 | 81.67 | 82.67 | 7.67 | 6.47 | 7.07 |
| 35 | 94.67 | 95.00 | 94.83 | 89.67 | 82.67 | 86.17 | 7.77 | 7.13 | 7.45 |
| 36 | 94.67 | 97.00 | 95.83 | 99.00 | 93.67 | 96.33 | 7.77 | 6.50 | 7.13 |
| 37 | 94.33 | 95.00 | 94.67 | 90.67 | 92.67 | 91.67 | 7.67 | 7.57 | 7.62 |
| 38 | 96.33 | 96.67 | 96.50 | 94.67 | 88.00 | 91.33 | 9.33 | 7.30 | 8.32 |
| 39 | 84.00 | 85.67 | 84.83 | 94.00 | 96.00 | 95.00 | 8.93 | 6.30 | 7.62 |
| 40 | 84.67 | 85.67 | 85.17 | 84.67 | 97.67 | 91.17 | 9.00 | 6.57 | 7.78 |
| 41 | 81.00 | 83.67 | 82.33 | 87.67 | 83.67 | 85.67 | 8.83 | 6.67 | 7.75 |
| 42 | 95.00 | 91.67 | 93.33 | 94.67 | 97.00 | 95.83 | 9.10 | 9.40 | 9.25 |
| 43 | 87.67 | 89.00 | 88.33 | 101.00 | 96.00 | 98.50 | 8.60 | 8.97 | 8.78 |
| 44 | 96.00 | 93.67 | 94.83 | 85.67 | 88.67 | 87.17 | 7.63 | 8.27 | 7.95 |
| 45 | 86.00 | 83.00 | 84.50 | 88.00 | 92.00 | 90.00 | 9.10 | 8.60 | 8.85 |

**Table.3. Continued.**

| Genotypes | Heading date (day) | | | Plant height (cm) | | | Spike length (cm) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Lines** | **1995/96** | **1996/97** | **Mean** | **1995/96** | **1996/97** | **Mean** | **1995/96** | **1996/97** | **Mean** |
| 46 | 86.67 | 83.33 | 85.00 | 93.67 | 84.67 | 89.17 | 8.20 | 7.37 | 7.78 |
| 47 | 82.67 | 82.33 | 82.50 | 100.33 | 90.67 | 95.50 | 7.53 | 8.03 | 7.78 |
| 48 | 84.33 | 83.33 | 83.83 | 106.00 | 100.00 | 103.00 | 8.50 | 7.20 | 7.85 |
| 49 | 89.67 | 88.67 | 89.17 | 99.00 | 95.00 | 97.00 | 9.80 | 8.60 | 9.20 |
| 50 | 89.67 | 89.67 | 89.67 | 90.67 | 93.00 | 91.83 | 8.97 | 8.53 | 8.75 |
| 51 | 98.33 | 93.67 | 96.00 | 95.00 | 95.67 | 95.33 | 8.10 | 6.60 | 7.35 |
| 52 | 97.67 | 95.67 | 96.67 | 99.67 | 100.67 | 100.17 | 8.73 | 7.50 | 8.12 |
| 53 | 92.67 | 93.33 | 93.00 | 92.00 | 92.67 | 92.33 | 9.60 | 7.47 | 8.53 |
| 54 | 97.00 | 99.00 | 98.00 | 88.00 | 93.00 | 90.50 | 8.67 | 8.20 | 8.43 |
| 55 | 95.67 | 92.00 | 93.83 | 92.67 | 92.67 | 92.67 | 9.73 | 8.30 | 9.02 |
| 56 | 96.33 | 93.67 | 95.00 | 94.67 | 97.00 | 95.83 | 8.83 | 8.30 | 8.57 |
| 57 | 87.33 | 88.00 | 87.67 | 101.33 | 91.67 | 96.50 | 9.57 | 8.77 | 9.17 |
| 58 | 84.33 | 81.67 | 83.00 | 115.67 | 95.00 | 105.33 | 8.43 | 7.27 | 7.85 |
| 59 | 96.00 | 94.33 | 95.17 | 94.67 | 94.67 | 94.67 | 9.40 | 8.57 | 8.98 |
| 60 | 85.67 | 85.67 | 85.67 | 101.67 | 95.67 | 98.67 | 8.87 | 8.83 | 8.85 |
| 61 | 94.00 | 93.00 | 93.50 | 103.67 | 103.00 | 103.33 | 8.57 | 8.67 | 8.62 |
| 62 | 87.67 | 89.00 | 88.33 | 93.67 | 94.67 | 94.17 | 10.13 | 9.27 | 9.70 |
| 63 | 87.67 | 87.67 | 87.67 | 108.67 | 95.00 | 101.83 | 9.03 | 9.00 | 9.02 |
| 64 | 94.67 | 97.00 | 95.83 | 90.00 | 89.00 | 89.50 | 8.90 | 9.33 | 9.12 |
| 65 | 95.33 | 97.00 | 96.17 | 90.00 | 95.00 | 92.50 | 10.10 | 9.60 | 9.85 |
| 66 | 94.33 | 92.67 | 93.50 | 107.67 | 93.67 | 100.67 | 9.33 | 8.07 | 8.70 |
| **Parents** | | | | | | | | | |
| MD689IB/Chere"S" | 95.67 | 96.00 | 95.83 | 97.67 | 96.00 | 96.83 | 8.63 | 6.97 | 7.80 |
| Giza 160 | 99.67 | 95.33 | 97.50 | 98.67 | 95.00 | 96.83 | 7.73 | 7.20 | 7.47 |
| Bow"S"//YD"S"/ZZ"S" | 98.00 | 97.00 | 97.50 | 87.33 | 81.67 | 84.50 | 7.63 | 6.74 | 7.18 |
| Chat"S"//YD"S"/ZZ"S" | 102.33 | 101.67 | 102.00 | 95.67 | 95.00 | 95.33 | 7.80 | 6.90 | 7.35 |
| Giza 155 | 96.00 | 92.00 | 94.00 | 96.33 | 97.67 | 97.00 | 9.33 | 8.27 | 8.80 |
| Giza 157 | 101.67 | 100.33 | 101.00 | 106.33 | 104.67 | 105.50 | 9.67 | 7.77 | 8.72 |
| KVZ//Con/PJ 62 | 97.33 | 96.33 | 96.83 | 93.00 | 96.67 | 94.83 | 8.77 | 8.67 | 8.72 |
| **Check CVS** | | | | | | | | | |
| Giza 162 | 99.33 | 99.33 | 99.33 | 86.00 | 86.33 | 86.17 | 9.07 | 9.17 | 9.12 |
| Giza 163 | 102.67 | 101.33 | 102.00 | 84.67 | 81.00 | 82.83 | 9.03 | 9.00 | 9.02 |
| Sakha 61 | 86.67 | 91.00 | 88.83 | 74.00 | 77.00 | 75.50 | 8.53 | 10.20 | 9.37 |
| Sids 7 | 81.00 | 84.67 | 82.83 | 88.00 | 79.67 | 83.83 | 14.17 | 11.90 | 13.03 |
| Sids 9 | 82.00 | 83.33 | 82.67 | 84.67 | 84.67 | 84.67 | 12.37 | 12.77 | 12.57 |
| Sids 10 | 88.33 | 93.00 | 90.67 | 90.67 | 85.00 | 87.83 | 13.90 | 11.07 | 12.48 |
| Sakha 69 | 99.67 | 93.33 | 96.50 | 98.67 | 90.33 | 94.50 | 9.50 | 7.40 | 8.45 |
| Gemmieza 1 | 97.00 | 93.67 | 95.33 | 100.00 | 93.33 | 96.67 | 10.13 | 8.47 | 9.30 |
| Gemmieza3 | 88.67 | 90.67 | 89.67 | 99.67 | 91.00 | 95.33 | 8.53 | 7.63 | 8.08 |
| Sonalika | 95.00 | 94.33 | 94.67 | 85.33 | 84.67 | 85.00 | 8.53 | 8.43 | 8.48 |
| **Means** | **85.31** | **90.62** | **90.88** | **95.53** | **93.18** | **94.36** | **8.75** | **7.91** | **8.33** |
| L.S.D at 5% | 2.34 | 3.30 | | 3.84 | 5.26 | | 1.05 | 1.39 | |
| at 1% | 3.07 | 4.35 | | 5.06 | 6.92 | | 1.38 | 1.82 | |

With respect to plant height, all genotypes ranged from 74.00 cm for Sakha 61 to 119.33 cm for line No. 15 with an average of 95.53 cm in the first season and from 75.67 for line No. 33 to 120.0 cm for line No. 15 with an average of 93.18 cm in the second season. The range in plant height was greater among lines than among parents and check cultivars. Line No. 15 was the tallest (119.33 and 120.0 cm) in the two respective seasons, as well as line No. 58 (115.67 cm) in the first season.

**Table 4: Mean values ofspikes/plant, spikelets/spike and kernels/spike for 83 wheat genotypes in 1995/96 and 1996/97 seasons.**

| Genotypes | Spikes/plant | | | Spikelets/spike | | | Kernels/spike | | |
|---|---|---|---|---|---|---|---|---|---|
| Lines | 1995/96 | 1996/97 | Mean | 1995/96 | 1996/97 | Mean | 1995/96 | 1996/97 | Mean |
| 1 | 8.33 | 8.00 | 8.17 | 23.33 | | 23.17 | 40.00 | 40.67 | 40.33 |
| 2 | 7.33 | 8.00 | 7.67 | 24.00 | | 23.50 | 44.33 | 44.67 | 44.50 |
| 3 | 9.00 | 6.67 | 7.83 | 26.00 | | 25.33 | 54.00 | 53.00 | 53.50 |
| 4 | 9.00 | 7.67 | 8.33 | 27.33 | | 25.67 | 42.67 | 44.67 | 43.67 |
| 5 | 9.00 | 9.67 | 9.33 | 22.33 | | 21.50 | 39.00 | 31.67 | 35.33 |
| 6 | 7.00 | 6.30 | 6.67 | 22.33 | | 22.50 | 45.67 | 40.67 | 43.17 |
| 7 | 7.33 | 6.67 | 7.00 | 22.33 | | 22.00 | 55.33 | 46.67 | 51.00 |
| 8 | 7.67 | 6.00 | 6.83 | 19.00 | | 19.00 | 37.67 | 38.33 | 38.00 |
| 9 | 8.67 | 7.67 | 8.17 | 21.00 | | 21.33 | 53.67 | 47.67 | 50.67 |
| 10 | 7.67 | 5.67 | 6.67 | 20.67 | | 20.33 | 43.00 | 38.67 | 40.83 |
| 11 | 8.00 | 7.00 | 7.50 | 20.67 | | 20.33 | 40.00 | 32.67 | 36.33 |
| 12 | 8.00 | 7.33 | 7.67 | 19.67 | | 19.33 | 42.00 | 41.33 | 41.67 |
| 13 | 7.67 | 6.00 | 6.83 | 23.33 | | 22.83 | 35.67 | 34.67 | 35.17 |
| 14 | 7.67 | 8.00 | 7.83 | 23.33 | | 23.50 | 46.00 | 43.00 | 44.50 |
| 15 | 7.00 | 7.00 | 7.00 | 21.33 | | 21.17 | 44.00 | 29.33 | 36.67 |
| 16 | 7.33 | 9.00 | 8.17 | 24.00 | | 23.17 | 38.33 | 46.67 | 42.50 |
| 17 | 8.00 | 8.67 | 8.33 | 23.00 | | 21.17 | 45.00 | 50.67 | 47.83 |
| 18 | 10.67 | 6.33 | 8.50 | 21.67 | | 22.17 | 40.67 | 42.00 | 41.33 |
| 19 | 7.67 | 7.67 | 7.67 | 24.00 | | 23.33 | 44.00 | 44.67 | 44.33 |
| 20 | 10.00 | 7.67 | 8.83 | 20.67 | | 20.67 | 46.33 | 53.00 | 49.67 |
| 21 | 8.67 | 8.00 | 8.33 | 21.33 | | 20.17 | 45.67 | 44.00 | 44.83 |
| 22 | 10.00 | 8.00 | 9.00 | 24.00 | | 22.17 | 46.00 | 42.33 | 44.17 |
| 23 | 9.67 | 8.67 | 9.17 | 23.67 | | 22.67 | 55.00 | 49.33 | 52.17 |
| 24 | 9.33 | 8.67 | 9.00 | 22.33 | | 21.33 | 44.00 | 50.67 | 47.33 |
| 25 | 8.67 | 10.00 | 9.33 | 23.33 | | 23.17 | 39.67 | 49.33 | 44.50 |
| 26 | 7.00 | 9.67 | 8.33 | 24.00 | | 23.33 | 54.33 | 38.67 | 46.50 |
| 27 | 9.33 | 10.33 | 9.83 | 23.33 | | 23.00 | 39.33 | 33.33 | 36.33 |
| 28 | 7.33 | 7.67 | 7.50 | 23.33 | | 23.33 | 40.00 | 33.67 | 36.83 |
| 29 | 7.00 | 6.33 | 6.67 | 23.67 | | 23.50 | 57.33 | 46.00 | 51.67 |
| 30 | 6.67 | 6.67 | 6.67 | 23.67 | | 25.00 | 56.67 | 53.33 | 55.00 |
| 31 | 8.33 | 8.33 | 8.33 | 25.00 | | 24.83 | 47.00 | 50.33 | 48.67 |
| 32 | 7.67 | 7.00 | 7.33 | 22.67 | | 22.17 | 54.00 | 49.67 | 51.83 |
| 33 | 6.33 | 3.67 | 5.00 | 20.67 | | 21.17 | 40.67 | 39.00 | 39.83 |
| 34 | 8.00 | 11.00 | 9.50 | 22.33 | | 21.33 | 51.00 | 46.67 | 48.83 |
| 35 | 6.67 | 8.00 | 7.33 | 21.67 | | 21.83 | 51.67 | 45.00 | 48.33 |
| 36 | 8.00 | 7.00 | 7.50 | 24.00 | | 23.50 | 44.00 | 50.00 | 47.00 |
| 37 | 6.33 | 7.67 | 7.00 | 23.00 | | 22.33 | 52.67 | 32.67 | 42.67 |
| 38 | 6.33 | 9.00 | 7.67 | 22.00 | | 22.33 | 38.00 | 32.00 | 35.00 |
| 39 | 7.67 | 7.67 | 7.67 | 21.67 | | 21.50 | 51.33 | 48.67 | 50.00 |
| 40 | 6.00 | 8.67 | 7.33 | 22.33 | | 22.17 | 54.33 | 40.00 | 47.17 |
| 41 | 6.67 | 5.00 | 5.83 | 22.67 | | 21.67 | 44.67 | 28.00 | 36.33 |
| 42 | 7.33 | 6.00 | 6.67 | 21.67 | | 21.67 | 57.00 | 39.67 | 48.33 |
| 43 | 7.33 | 6.67 | 7.00 | 24.33 | | 24.00 | 33.33 | 46.67 | 40.00 |
| 44 | 9.00 | 8.00 | 8.50 | 24.67 | | 23.17 | 52.67 | 59.00 | 55.83 |
| 45 | 9.67 | 8.67 | 9.17 | 20.33 | | 19.50 | 42.00 | 38.00 | 40.00 |

**Table 4: Continued.**

| Genotypes Lines | Spikes/plant | | | Spikelets/spike | | | Kernels/spike | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1995/96 | 1996/97 | Mean | 1995/96 | 1996/97 | Mean | 1995/96 | 1996/97 | Mean |
| 46 | 9.67 | 8.67 | 9.17 | 21.33 | | 21.17 | 46.67 | 40.67 | 43.67 |
| 47 | 7.00 | 7.00 | 7.00 | 19.33 | | 18.67 | 49.67 | 37.00 | 43.33 |
| 48 | 9.33 | 9.00 | 9.17 | 20.33 | | 22.33 | 39.00 | 32.00 | 35.50 |
| 49 | 9.67 | 8.67 | 9.17 | 19.67 | | 19.33 | 43.00 | 39.67 | 41.33 |
| 50 | 7.00 | 6.33 | 6.67 | 20.33 | | 19.17 | 40.67 | 40.00 | 40.33 |
| 51 | 7.67 | 7.67 | 7.67 | 19.67 | | 18.67 | 37.67 | 41.67 | 39.67 |
| 52 | 8.33 | 7.33 | 7.83 | 23.00 | | 21.50 | 48.00 | 46.00 | 47.00 |
| 53 | 9.67 | 8.00 | 8.83 | 22.67 | | 22.17 | 52.67 | 44.67 | 48.67 |
| 54 | 8.00 | 8.00 | 8.00 | 23.33 | | 21.67 | 51.00 | 51.33 | 51.17 |
| 55 | 7.33 | 9.67 | 8.50 | 22.33 | | 22.17 | 47.67 | 46.00 | 46.83 |
| 56 | 6.00 | 7.00 | 6.50 | 23.00 | | 22.67 | 52.00 | 38.00 | 45.00 |
| 57 | 8.00 | 8.67 | 8.33 | 21.67 | | 20.83 | 51.33 | 28.67 | 40.00 |
| 58 | 9.33 | 7.33 | 8.33 | 22.00 | | 21.83 | 51.00 | 42.00 | 46.50 |
| 59 | 8.33 | 7.33 | 7.83 | 20.67 | | 20.83 | 46.00 | 37.67 | 41.83 |
| 60 | 8.67 | 9.00 | 8.83 | 21.00 | | 21.50 | 45.33 | 52.67 | 49.00 |
| 61 | 8.67 | 7.00 | 7.83 | 23.67 | | 23.67 | 47.33 | 49.00 | 48.17 |
| 62 | 7.00 | 8.00 | 7.50 | 22.33 | | 21.33 | 51.67 | 42.33 | 47.00 |
| 63 | 8.00 | 6.67 | 7.33 | 22.33 | | 22.00 | 45.33 | 45.00 | 45.17 |
| 64 | 8.67 | 8.00 | 8.33 | 23.33 | | 22.17 | 49.00 | 34.67 | 41.83 |
| 65 | 8.00 | 6.00 | 7.00 | 22.00 | | 21.33 | 53.00 | 43.67 | 48.33 |
| 66 | 7.67 | 6.67 | 7.17 | 23.00 | | 22.83 | 53.00 | 52.00 | 52.50 |
| **Parents** | | | | | | | | | |
| MD689IB/Chere"S" | 8.00 | 7.67 | 7.83 | 22.33 | | 22.00 | 40.67 | 38.67 | 39.67 |
| Giza 160 | 11.00 | 11.00 | 11.00 | 22.67 | | 21.83 | 51.33 | 52.67 | 52.00 |
| Bow"S"//YD"S"/ZZ"S" | 8.00 | 8.67 | 8.33 | 22.67 | | 22.33 | 48.00 | 44.00 | 46.00 |
| Chat"S"//YD"S"/ZZ"S" | 7.67 | 8.00 | 7.83 | 24.67 | | 24.00 | 45.00 | 47.67 | 46.33 |
| Giza 155 | 8.67 | 8.67 | 8.67 | 22.00 | | 22.00 | 71.67 | 65.00 | 68.33 |
| Giza 157 | 7.67 | 7.00 | 7.33 | 22.00 | | 21.67 | 50.67 | 37.00 | 43.83 |
| KVZ//Con/PJ62 | 7.67 | 7.33 | 7.50 | 22.33 | | 22.17 | 42.67 | 50.00 | 46.33 |
| **Check CVS** | | | | | | | | | |
| Giza 162 | 9.00 | 9.00 | 9.00 | 23.00 | | 22.17 | 53.00 | 44.00 | 48.50 |
| Giza 163 | 5.67 | 6.00 | 5.83 | 23.33 | | 22.67 | 37.67 | 43.67 | 40.67 |
| Sakha 61 | 7.33 | 8.67 | 8.00 | 20.00 | | 20.50 | 36.67 | 35.33 | 36.00 |
| Sids 7 | 3.33 | 3.00 | 3.17 | 22.67 | | 23.50 | 65.00 | 55.67 | 60.33 |
| Sids 9 | 3.67 | 4.00 | 3.83 | 21.33 | | 19.50 | 69.67 | 53.67 | 61.67 |
| Sids 10 | 3.00 | 5.00 | 4.00 | 23.00 | | 24.33 | 75.67 | 59.67 | 67.67 |
| Sakha 69 | 5.67 | 4.33 | 5.00 | 22.67 | | 21.17 | 48.67 | 38.33 | 43.50 |
| Gemmieza 1 | 5.00 | 7.00 | 6.00 | 24.33 | | 23.50 | 46.00 | 26.67 | 36.33 |
| Gemmieza3 | 6.33 | 6.00 | 6.17 | 22.67 | | 22.33 | 37.00 | 34.67 | 35.83 |
| Sonalika | 8.33 | 8.33 | 8.33 | 21.67 | | 21.83 | 45.67 | 54.00 | 49.83 |
| **Means** | **7.78** | **7.53** | **7.66** | **22.43** | | **22.03** | **47.42** | **43.33** | **45.37** |
| L.S.D at 5% | 1.73 | 1.99 | | 1.49 | | | 7.05 | 7.22 | |
| at 1% | 2.28 | 2.62 | | 1.97 | | | 9.28 | 9.50 | |

Estimates of environmental ( ), genotypic ( ) and phenotypic ( ) variances for all studied traits in both seasons are recorded in (Table 5). The magnitude of was generally high than the for all studied traits in both seasons and constitute the major part except, spikes/plant and spikelets/spike in the second season, in these two traits was larger than the. This indicates that these traits were more affected by environmental conditions than the other traits. These results reflected the presence of wide genetic diversity among genotypes.

Phenotypic and genotypic coefficient of variability for the two growing seasons are shown in (Table 5). The highest P.C.V.% values were recorded

for grain yield per plant, followed by kernels weight per spike and spikes/plant rankeal third in both seasons. Also, G.C.C% exhibited the same trend in the second season. This variability could be due to the genetic make-up and environmental effects. These results are in agreement with those obtained by Ehdaie and Waines (1989), who estimated the phenotypic coefficient of variability at 3% and the genotypic coefficeint of variation at 2.9% for heading date, Rady *et al,* (1981), Dawla (1984) and Hanna *et al,* (1996) reported that G.C.V values ranged from 2.29 to 6.57% compared to P.C.V which ranged from 11.78 to 29.67% for grain yield/plant.

Table 5 show that high heritability values in the broad sense were detected for most traits in the two seasons except No. of spikelets/spike in second season, which had moderate heritability value 39.87%. This indicating that these traits are mainly determined by the genetic factors and partially by the environmental one. Similar results were obtained by Anwar and Chowdhry (1969), Sidwell *et al,* (1976). Rady *et al,* (1981) also reported broad sense heritability value of 69.80% for spikelets/spike, Ehdaie and Waines (1989), Al-Kaddoussi and Eissa (1990), reported that broad sense heritability values ranged from 51.90 to 90.6% for No. of spikes and from 22.40 to 65.5% for spike length, Hassan 1993, El-Marakby *et al,* 1993, reported high heritability values in broad sense which ranged from 82.77 to 91.81% for kernels/spike and from 77.62 to 99.70% for 100-kernel weight. El-Marakby *et al,* (1994b), estimated broad sense heritability values ranging from 51.82 to 65.39% for spike length, 42.94 to 57.5 % for 100-kernel weight and from 58.80 to 75.49% for grain yield/plant. Hanna *et al,* (1996), El-Seidy and Hamada (1997), found that the broad sense heritability values ranged from 51.06 to 70.59% for kernels/spike. Shehab El-Din (1997) also reported that broad sense heritability values ranged from 63 to 97% for heading date and from 73.5 to 88.2% for plant height.

**Relationship between grain yield per plant and the other studied traits:**

Phenotypic correlation coefficients between grain yield/plant and its attributes are presented in Table (6). Positive and high significant correlation coefficients were obtained between grain yield/plant on one hand and heading date (0.165**) in the first season, plant height (0.201** and 0.179**) and No. of spikes/plant (0.643** and 0.475**) in the two seasons, respectively. Also, positive and significant correlation coefficients were found between grain yield/plant and each of heading date (0.130*) in the second season and 1000-kernel weight (0.162* and 0.148*) in the two seasons, respectively. No significant correlation coefficients were obtained between grain yield/plant and each of spike length, spikelets/spike, kernels/spike and kernel weight/spike in the two seasons.

This finding indicates that selection for each or the three traits, viz; plant height, spikes/plant and 1000-kernel weight would be accompainied by high yielding ability. Moreover, the significant positive correlation coefficient between grain yield/plant and heading date was very important result, because selection for earlier plant may-improv yielding ability. Similar results were reported by Fonseca and Patterson (1968), Sidwell *et al,* (1976), El-Marakby *et al,* (1992) who found significant positive correlations among grain

yield/plant and each of spikes/plant and plant height. Also, El-Shouny *et al,* (1987) and El-Marakby *et al,* (1994 b) reported that most cases of positive correlations were found between grain yield/plant and each of spikes/plant and 100-kernel weight. On the other hand, negative correlation was found between grain yield/plant and heading date (El-Marakby *et al,* 1992).

**Table 6: Estimates of variance components, phenotypic (P.C.V) and genotypic (G.C.V.) coefficient of variability and broad sense heritability (H2%) values for wheat traits in the two seasons (1996 and 1997).**

| Characters | Variance components | | | H2% | P.C.V% | G.C.V% |
|---|---|---|---|---|---|---|
| | | | | 1995/1996 Season ($F_6$) | | |
| Heading date | 210 | 51.18 | 53.28 | 96.00 | 8.56 | 8.39 |
| Plant height | 5.80 | 61.69 | 67.49 | 91.46 | 8.60 | 8.22 |
| Spike length | 0.40 | 1.32 | 1.72 | 75.27 | 15.12 | 13.12 |
| Spikes/plant | 1.20 | 1.70 | 2.90 | 59.24 | 21.79 | 16.77 |
| Spikelets/spike | 0.90 | 1.96 | 2.86 | 69.34 | 7.49 | 6.23 |
| Kernels/spike | 19.0 | 54.80 | 73.80 | 73.87 | 18.16 | 15.61 |
| Kernels weight/spike | 0.10 | 0.18 | 0.28 | 73.21 | 25.29 | 21.64 |
| 1000-kernel weight | 4.70 | 13.57 | 18.27 | 74.11 | 11.23 | 9.67 |
| Grain yield/plant | 2.40 | 3.30 | 5.70 | 57.70 | 27.24 | 20.69 |
| | | | | 1996/1997 Season ($F_7$) | | |
| Heading date | 4.3 | 50.47 | 54.77 | 92.21 | 8.16 | 7.84 |
| Plant height | 11.0 | 60.01 | 71.01 | 84.76 | 9.03 | 8.31 |
| Spike length | 0.7 | 1.21 | 1.91 | 61.88 | 17.70 | 13.93 |
| Spikes/plant | 1.60 | 1.58 | 3.18 | 50.42 | 23.48 | 16.68 |
| Spikelets/spike | 2.3 | 1.49 | 3.79 | 39.87 | 8.95 | 5.65 |
| Kernels/spike | 20.0 | 54.48 | 74.48 | 72.80 | 19.96 | 17.03 |
| Kernels weight/spike | 0.1 | 0.17 | 0.27 | 72.70 | 28.12 | 23.97 |
| 1000-kernel weight | 9.3 | 12.05 | 21.35 | 56.42 | 12.32 | 9.25 |
| Grain yield/plant | 1.7 | 3.53 | 5.23 | 67.10 | 29.82 | 24.43 |

**Table 7: Phenotypic correlation coefficients between grain yield/plant and yield components of 83 wheat genotypes in 1996 and 1997 seasons.**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Heading date | 1.000 | | | | | | | |
| Plant height | 0.151* | 1.000 | | | | | | |
| Spike length | -0.035 | -0.080 | 1.000 | | | | | |
| Spikes/plant | 0.030 | 0.183** | -0.367** | 1.000 | | | | |
| Spikelets/spike | 0.528** | 0.202** | 0.007 | -0.018 | 1.000 | | | |
| Kernels/spike | 0.100 | -0.106 | 0.449** | -0.222** | 0.090 | | | |
| Kernels weight/spike | -0.064 | -0.035 | 0.501** | -0.357** | 0.008 | 0.728** | | |
| 1000-kernel weight | -0.223** | 0.114 | 0.258** | -0.120 | -0.256** | 0.121 | 0.388** | |
| Grain yield/plant | 0.165** | 0.201** | -0.030 | 0.643** | -0.022 | 0.062 | 0.024 | 0.162* |
| | | | | | | | | |
| Heading date | 1.000 | | | | | | | |
| Plant height | 0.127* | 1.000 | | | | | | |
| Spike length | -0.009 | -0.056 | 1.000 | | | | | |
| Spikes/plant | 0.077 | 0.201** | -0.181** | 1.000 | | | | |
| Spikelets/spike | 0.351** | 0.090 | -0.068 | -0.047 | 1.000 | | | |
| Kernels/spike | 0.200** | -0.024 | 0.175** | 0.005 | 0.273** | | | |
| Kernels weight/spike | -0.012 | -0.052 | 0.228** | 0.022 | 0.095 | 0.731** | | |
| 1000-kernel weight | -0.281** | 0.030 | 0.147* | -0.159* | -0.177** | 0.105 | 0.114 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Grain yield/plant | 0.130* | 0.179** | -0.106 | 0.475** | -0.105 | -0.040 | -0.027 | 0.148* |

* and ** denots significant at 0.05 and 0.01 level of probability, respectively.

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## تقيـيم سـلالات مختلفـة مـن قمـح الخبـز فـى الجيـل السـادس والسـابع للحصـول ومساهماته

**عفاف محمد طلبه**

**قسم المحاصيل - كلية الزراعة - جامعة عين شمس - القاهرة - مصر**

استخدم فى هذا البحث ٦٦ سلالة من قمح الخبز مشتقه من نسل خمسة هجن مختلفة من القمح شملت اصناف محلية واصناف مستوردة حيث تم تقييمها فى الجيل السادس فى موسم ١٩٩٦/٩٥ ثم فى الجيل السابع فى موسم ١٩٩٧/٩٦ مع استعمال اباء الهجن الخمسة وعشرة اصناف كمقارنة مكونة فى مجموعها عدد ٨٣ تركيبا وارثيا. تم عمل التحليل الاحصائى لمحصول الحبوب والصفات التى تساهم فى تكوينه. كما تم تقدير بعض الثوابت الوراثية مثل التباين البيئى والظاهرى والوراثى ومعامل التوريث بمعناه العام ثم تقدير علاقة المحصول بالصفات الاخرى المدروسة وقد اوضحت النتائج ما يلى:

١- وجود فروق عاليه المعنوية بين جميع التراكيب الوراثية المستخدمه لجميع الصفات المدروسة عدا وزن الحبوب بالسنبلة فى الموسم الثانى فقط.

٢- تميزت السلالات رقم ٨، ٩، ١٠، ١١، ١٢، ٢١ بأنها اكثر التراكيب الوراثية تبكيرا فى طرد السنابل فى الموسم الاول وقد حافظت هذه السلالات على نفس السلوك فى الموسم الثانى وذلك مقارنة بجميع الاباء واصناف المقارنة.

٣- تفوقت السلالتين رقم ٤٩، ٥٣ فى وزن محصول الحبوب للنبات الفردى فى الموسم الاول واستمر هذا التفوق على جميع السلالات الاخرى والاباء واصناف المقارنة فى الموسم الثانى. كما تفوقت السلالة رقم ٤٦ فى الموسم الاول الا ان هذا التفوق لم يستمر فى الموسم الثانى.

٤- سجل معاملى الاختلاف المظهرى والوراثى اعلى قيمة لمحصول الحبوب ووزن الحبوب بالسنبلة فى الموسم الاول (٢٧,٢٤، ٢١,٦٤%) ولمحصول الحبوب فقط فى الموسم الثانى (٢٩,٨٢، ٢٤,٤٣%).

٥- كانت قيم معامل التوريث فى المعنى الواسع مرتفعة لجميع الصفات فى الموسمين ١٩٩٦/٩٥، ١٩٩٧/٩٦ عدا صفة عدد السنابل بالنبات وكذلك عدد السنيبلات بالسنبلة حيث سجلت قيما متوسطة فى الموسم الثانى.

**6-** كان معامل التلازم موجب ومعنوى بين المحصول وكلا من تاريخ طرد السنابل، طول النبات، عدد السنابل بالنبات، وزن الـ ١٠٠٠ حبه فى كلا الموسمين.

**Table.5: Mean values of kernels weight/spike, 1000-kernel weight and grain yield/plant for 83 wheat genotypes in 1995/96 and 1996/97 seasons.**

| Genotypes | Kernels weight/spike (g) | | | 1000 - kernel weight (g) | | | Grain yield/plant (g) | | |
|---|---|---|---|---|---|---|---|---|---|
| Lines | 1995/96 | 1996/97 | Mean | 1995/96 | 1996/97 | Mean | 1995/96 | 1996/97 | Mean |
| 1 | 1.73 | 1.69 | 1.71 | 41.57 | 43.43 | 42.50 | 9.29 | 10.57 | 9.93 |
| 2 | 1.80 | 1.97 | 1.89 | 42.17 | 45.87 | 44.02 | 6.80 | 10.79 | 8.79 |
| 3 | 1.92 | 1.64 | 1.78 | 36.47 | 32.77 | 34.62 | 8.88 | 8.33 | 8.61 |
| 4 | 1.54 | 1.42 | 1.48 | 36.57 | 33.43 | 35.00 | 8.69 | 10.27 | 9.48 |
| 5 | 1.06 | 1.00 | 1.03 | 30.20 | 28.97 | 29.58 | 9.82 | 8.41 | 9.12 |
| 6 | 1.67 | 1.54 | 1.60 | 38.73 | 38.27 | 38.50 | 6.97 | 6.81 | 6.89 |
| 7 | 2.23 | 1.78 | 2.00 | 37.73 | 39.67 | 38.70 | 8.29 | 8.54 | 8.41 |
| 8 | 1.36 | 1.58 | 1.47 | 36.77 | 38.37 | 37.57 | 7.10 | 6.79 | 6.95 |
| 9 | 2.12 | 1.85 | 1.98 | 40.47 | 40.10 | 40.28 | 7.59 | 6.64 | 7.12 |
| 10 | 1.66 | 1.95 | 1.80 | 38.43 | 35.23 | 36.83 | 6.19 | 4.90 | 5.54 |
| 11 | 1.58 | 1.44 | 1.51 | 39.90 | 40.80 | 40.35 | 6.81 | 6.76 | 6.78 |
| 12 | 1.53 | 1.68 | 1.60 | 38.73 | 39.83 | 39.28 | 8.16 | 5.27 | 6.71 |
| 13 | 1.53 | 1.31 | 1.42 | 32.57 | 37.27 | 34.92 | 7.71 | 6.81 | 7.26 |
| 14 | 1.76 | 1.89 | 1.83 | 38.00 | 38.10 | 38.05 | 7.27 | 8.82 | 8.04 |
| 15 | 1.94 | 1.36 | 1.65 | 40.47 | 41.27 | 40.87 | 8.36 | 7.56 | 7.96 |
| 16 | 1.76 | 1.81 | 1.79 | 40.23 | 38.63 | 39.43 | 10.18 | 6.64 | 8.41 |
| 17 | 1.70 | 2.16 | 1.93 | 32.47 | 33.53 | 33.00 | 6.57 | 5.26 | 5.91 |
| 18 | 1.42 | 1.62 | 1.52 | 40.67 | 36.00 | 38.33 | 10.00 | 7.04 | 8.52 |
| 19 | 2.10 | 1.51 | 1.80 | 38.17 | 34.07 | 36.12 | 10.62 | 5.33 | 7.97 |
| 20 | 1.72 | 2.26 | 1.99 | 35.97 | 38.80 | 37.38 | 8.29 | 8.80 | 8.55 |
| 21 | 1.70 | 1.96 | 1.83 | 39.97 | 39.07 | 39.52 | 9.30 | 7.32 | 8.31 |
| 22 | 1.71 | 1.68 | 1.69 | 36.00 | 40.00 | 38.00 | 10.42 | 8.81 | 9.76 |
| 23 | 2.14 | 1.85 | 1.99 | 37.10 | 41.10 | 39.10 | 12.50 | 9.70 | 11.10 |
| 24 | 1.68 | 2.03 | 1.86 | 37.53 | 40.20 | 38.87 | 11.47 | 8.80 | 10.14 |
| 25 | 2.00 | 2.07 | 2.04 | 37.17 | 33.87 | 35.52 | 9.15 | 7.52 | 8.34 |
| 26 | 2.30 | 1.65 | 1.98 | 37.77 | 33.60 | 35.68 | 9.77 | 7.18 | 8.48 |
| 27 | 1.63 | 1.33 | 1.48 | 37.80 | 36.87 | 37.33 | 8.62 | 6.83 | 7.73 |
| 28 | 1.62 | 1.35 | 1.49 | 39.00 | 36.03 | 37.52 | 7.49 | 5.90 | 6.69 |
| 29 | 2.10 | 1.62 | 1.86 | 39.07 | 33.77 | 36.42 | 8.40 | 5.47 | 6.94 |
| 30 | 2.15 | 1.83 | 1.99 | 34.83 | 33.43 | 34.13 | 8.45 | 7.96 | 8.20 |
| 31 | 1.71 | 1.78 | 1.74 | 32.30 | 29.53 | 30.92 | 8.38 | 5.68 | 7.03 |
| 32 | 2.01 | 2.26 | 2.13 | 40.80 | 42.90 | 41.85 | 9.27 | 6.71 | 7.99 |
| 33 | 2.29 | 1.44 | 1.87 | 34.90 | 33.07 | 33.98 | 4.80 | 4.49 | 4.64 |
| 34 | 2.46 | 2.14 | 2.30 | 41.70 | 37.00 | 39.35 | 9.15 | 10.09 | 9.62 |
| 35 | 2.27 | 2.05 | 2.16 | 40.07 | 41.20 | 40.63 | 7.36 | 8.32 | 7.84 |
| 36 | 2.32 | 1.73 | 2.02 | 35.20 | 38.07 | 36.63 | 7.44 | 8.96 | 8.20 |
| 37 | 2.12 | 1.27 | 1.69 | 35.87 | 33.90 | 34.88 | 6.33 | 9.25 | 7.79 |
| 38 | 1.46 | 2.14 | 1.80 | 37.53 | 36.37 | 36.95 | 8.84 | 8.83 | 8.84 |
| 39 | 2.05 | 1.74 | 1.89 | 35.43 | 35.70 | 35.57 | 7.60 | 6.15 | 6.87 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 40 | 2.47 | 1.54 | 2.01 | 33.40 | 35.27 | 34.33 | 6.73 | 5.90 | 6.31 |
| 41 | 2.15 | 1.21 | 1.68 | 37.57 | 38.97 | 38.27 | 7.74 | 6.98 | 7.36 |
| 42 | 2.46 | 1.75 | 2.10 | 38.93 | 41.50 | 40.22 | 11.53 | 10.97 | 11.25 |
| 43 | 2.00 | 1.80 | 1.90 | 36.37 | 33.70 | 35.03 | 8.34 | 4.03 | 6.19 |
| 44 | 1.57 | 2.00 | 1.79 | 32.50 | 32.67 | 32.58 | 8.64 | 10.39 | 9.51 |
| 45 | 1.73 | 1.72 | 1.72 | 42.23 | 46.10 | 44.17 | 11.20 | 11.39 | 11.29 |

**Table.5: Continued.**

| Genotypes | Kernels weight/spike (g) | | | 1000 - kernel weight (g) | | | Grain yield/plant (g) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Lines** | **1995/96** | **1996/97** | **Mean** | **1995/96** | **1996/97** | **Mean** | **1995/96** | **1996/97** | **Mean** |
| 46 | 2.34 | 1.95 | 2.15 | 44.67 | 42.37 | 43.52 | 15.02 | 8.09 | 11.56 |
| 47 | 2.37 | 1.56 | 1.97 | 41.83 | 37.10 | 39.47 | 8.50 | 7.19 | 7.85 |
| 48 | 2.29 | 1.50 | 1.89 | 45.93 | 46.97 | 46.45 | 11.06 | 11.24 | 11.15 |
| 49 | 2.10 | 1.59 | 1.85 | 44.30 | 49.47 | 46.88 | 14.31 | 13.16 | 13.74 |
| 50 | 1.65 | 1.58 | 1.62 | 41.73 | 40.70 | 41.22 | 5.91 | 6.83 | 6.37 |
| 51 | 1.51 | 1.82 | 1.67 | 42.87 | 48.00 | 45.43 | 8.23 | 10.34 | 9.28 |
| 52 | 1.92 | 2.06 | 1.99 | 33.17 | 28.60 | 30.88 | 11.28 | 7.74 | 9.51 |
| 53 | 2.05 | 1.62 | 1.83 | 40.40 | 35.63 | 38.02 | 14.03 | 11.22 | 12.62 |
| 54 | 2.03 | 1.95 | 1.99 | 36.53 | 31.80 | 34.17 | 11.72 | 9.97 | 10.85 |
| 55 | 1.66 | 1.80 | 1.73 | 34.53 | 34.13 | 34.33 | 9.05 | 10.79 | 9.92 |
| 56 | 1.63 | 1.32 | 1.48 | 35.47 | 37.90 | 36.68 | 5.17 | 8.82 | 6.99 |
| 57 | 2.27 | 1.35 | 1.81 | 42.20 | 38.60 | 40.40 | 10.33 | 9.39 | 9.86 |
| 58 | 1.64 | 1.89 | 1.76 | 39.00 | 32.70 | 35.85 | 10.36 | 5.36 | 7.86 |
| 59 | 1.65 | 1.42 | 1.53 | 34.47 | 35.67 | 35.07 | 9.94 | 6.46 | 8.20 |
| 60 | 1.81 | 2.33 | 2.07 | 38.67 | 34.77 | 36.72 | 9.25 | 7.66 | 8.46 |
| 61 | 1.70 | 1.80 | 1.75 | 34.00 | 34.10 | 34.05 | 8.61 | 6.84 | 7.72 |
| 62 | 2.12 | 1.68 | 1.90 | 34.63 | 34.70 | 34.67 | 7.40 | 7.35 | 7.37 |
| 63 | 1.87 | 1.77 | 1.82 | 36.70 | 35.60 | 36.15 | 9.49 | 6.08 | 7.78 |
| 64 | 1.70 | 1.43 | 1.56 | 35.60 | 37.33 | 36.47 | 9.89 | 9.79 | 9.84 |
| 65 | 1.94 | 1.66 | 1.80 | 35.37 | 32.53 | 33.95 | 8.06 | 7.98 | 8.02 |
| 66 | 2.70 | 2.24 | 2.47 | 37.90 | 39.50 | 38.70 | 8.13 | 7.98 | 8.05 |
| **Parents** | | | | | | | | | |
| MD689IB/Chere"S" | 1.56 | 1.65 | 1.60 | 39.37 | 37.87 | 38.62 | 9.29 | 7.32 | 8.31 |
| Giza 160 | 1.69 | 2.08 | 1.88 | 38.30 | 37.50 | 37.90 | 11.47 | 8.47 | 9.97 |
| Bow"S"//YD"S"/ZZ"S" | 1.59 | 1.78 | 1.68 | 37.73 | 38.60 | 38.17 | 8.08 | 7.56 | 7.82 |
| Chat"S"//YD"S"/ZZ"S" | 1.59 | 1.75 | 1.67 | 31.77 | 29.90 | 30.83 | 6.66 | 5.62 | 6.14 |
| Giza 155 | 2.52 | 2.43 | 2.47 | 35.77 | 35.90 | 35.83 | 9.69 | 10.76 | 10.23 |
| Giza 157 | 1.95 | 1.47 | 1.71 | 35.47 | 37.53 | 36.50 | 9.78 | 7.27 | 8.52 |
| KVZ//Con/PJ 62 | 1.15 | 1.88 | 1.52 | 33.63 | 33.58 | 33.61 | 8.26 | 8.48 | 8.37 |
| **Check CVS** | | | | | | | | | |
| Giza 162 | 2.21 | 1.79 | 2.00 | 38.13 | 35.73 | 36.93 | 11.56 | 7.62 | 9.59 |
| Giza 163 | 1.42 | 1.58 | 1.50 | 35.83 | 32.80 | 34.32 | 5.63 | 5.75 | 5.69 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sakha 61 | 1.34 | 1.49 | 1.41 | 34.40 | 35.70 | 35.05 | 5.97 | 6.47 | 6.22 |
| Sids 7 | 3.15 | 2.41 | 2.78 | 45.90 | 39.67 | 42.78 | 5.70 | 2.36 | 4.03 |
| Sids 9 | 3.08 | 2.31 | 2.70 | 45.40 | 48.70 | 47.05 | 5.80 | 5.28 | 5.54 |
| Sids 10 | 3.99 | 2.76 | 3.37 | 46.83 | 47.27 | 47.05 | 6.02 | 2.39 | 4.20 |
| Sakha 69 | 2.09 | 1.68 | 1.88 | 39.83 | 37.67 | 38.75 | 7.83 | 8.61 | 8.22 |
| Gemmieza 1 | 1.79 | 1.19 | 1.49 | 39.00 | 36.70 | 37.85 | 8.87 | 6.71 | 7.79 |
| Gemmieza3 | 2.01 | 1.04 | 1.53 | 53.87 | 48.40 | 51.13 | 8.61 | 5.98 | 7.30 |
| Sonalika | 1.71 | 1.69 | 1.70 | 35.07 | 34.87 | 34.97 | 11.12 | 7.11 | 9.12 |
| **Means** | **1.93** | **1.74** | **1.83** | **38.12** | **37.53** | **37.82** | **8.78** | **7.69** | **8.23** |
| L.S.D at 5% | 0.39 | 0.42 | | 3.48 | 4.88 | | 2.49 | 2.11 | |
| at 1% | 0.52 | 0.56 | | 4.59 | 6.43 | | 3.38 | 2.77 | |