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Summary

The present investigation was carried out at Shandaweel Research Station, Agricultural Research Center, Egypt.

The study aimed to determine mean performance , Genotype x Environment interaction and stability for twelve bread wheat genotypes evaluated under nine environments which are the combination between three sowing dates i.e. 25th of November, 10 th December and 25 th December during the three winter growing seasons 2004/2005, 2005/2006 and 2006/2007. Also correlation and path coefficient analysis were computed.

The twelve bread wheat genotypes were grown on three dates; i.e. 25 th of Nov, 10 th of Dec. and 25 th of Dec. during the three seasons. Randomized complete Block Design was used for every planting date. The studied traits were days to heading, days to physiological maturity, plant height, peduncle length, flag leaf area, no. of spikes/m^2, 1000-kernel weight, no. of kernels/spike, biological yield, grain yield and straw yield of wheat genotypes.

The analysis of variance was performed according to the procedure of **Comstock and Moll (1963)** and stability analysis was computed as outlined by **Eberhart and Russell (1966).**

The results obtained from the present study were summarized as follows:

I) Analysis of variance and Performance of wheat genotypes:-

I-1) Analysis of variance:-

The combined analysis of variance showed highly significant differences between years, planting dates and genotypes for days to heading, days to physiological maturity, plant height, peduncle length, flag leaf area, no. of spikes / m^2 , 1000-kernel weight, no. of kernels/spike, biological yield, grain yield and straw yield. These results reflect the differences in climatic conditions prevailing during the growing seasons. The main effect of planting dates was highly significant for all traits as it would be expected for difference between optimum and late planting dates.

The studied genotypes significantly differed for all traits, reflecting the genetic diversity between them. The first order interaction years x planting dates was significant or highly significant for all traits except plant height. On the other hand, significant interaction between years and genotypes was found for all the studied characters.

The combined analysis of variance showed significant and highly significant among planting dates and genotypes for all studied characters except peduncle length, biological yield and straw yield. Meanwhile the combined analysis of variance showed highly significant second degree of interaction among genotypes, planting dates and years for days to heading, days to physiological maturity, plant height, peduncle length, no. of kernels / spike and grain yield. Accordingly, there were differential responses among genotypes to planting dates and years. These results indicate that wheat genotypes responded differently to the different environmental conditions, suggesting the importance of assessment of stability in order to identify the best genetic make up for a particular environment.

I-2) Performance of wheat genotypes:-

I-2-1) Days to heading:

The average number of days to heading over all environments ranged from 87.26 days for El-Nelin to 93.26 days for Gemmeiza 10 with an average of 90.16 days. The results indicated that Giza 168, El-Nelin and Debeira are early in heading compared with Gemmeiza 10 and Line # 13 under Upper Egypt conditions.

I-2-2) Days to maturity:

The average number of days to maturity over all environments ranged from 131.26 days for Sakha 94 to 137.11 days for line # 13 with an average of 134.73 days. The results indicated that genotypes Giza 168, Line # 3, Sakha 94,

Sakha 95 and El-Nelin are early in maturity compared with Line # 13 under Upper Egypt conditions.

I-2-3) Plant height (cm):

The average of plant height over all environments varied from 88.67 cm for Gemmeiza 10 to 106.29 cm for Sids 1 with an average of 97.99 cm.

I-2-4) Peduncle length (cm):

The average of peduncle length over all environments varied from 30.74 cm for line # 3 to 39.23 cm for El-Nelin with an average of 35.61 cm.

I-2-5) Flag leaf area (cm^2):

The average of flag leaf area over all environments ranged from 36.16 cm^2 for line # 13 to 50.62 cm^2 for HD 2501 with an average of 42.26 cm^2.

I-2-6) Number of spikes/m^2:

The average number of spikes/m^2 over all environments ranged from 381.19 spikes/m^2 for Gemmeiza 9 to 418.67 spikes/m^2 for Sakha 95 with an average of 403.24 spikes/m^2. The results indicated that line # 3, Sakha 94, Sakha 95 and Debeira have the highest no. of spikes/ m^2 compared with the Gemmeiza 9 under Upper Egypt conditions.

I-2-7) 1000-kernel weight (gm):

The average of 1000-kernel weight over all environments varied from 37.66 gm for Sakha 95 to 43.35 gm for Sids 1 with an average of 40.07 gm. The results indicated that Sids1, Giza 168, Sakha 94, Gemmeiza 9, El-Nelin and HD 2501 have the highest 1000-kernel weight compared with Sakha 95 under Upper Egypt conditions.

I-2-8) Number of kernels/spike:

The average number of kernels/spike over all environments ranged from 44.86 kernels for Debeira to 51.07 kernels for line # 3 with an average of 47.98

kernels. The results indicated that Giza 168, line # 3, Sakha 95, Gemmeiza 10, Line # 13, Line # 15 and Gemmeiza 9 have high no. of kernels/spike compared with Debeira under Upper Egypt conditions.

I-2-9) Biological yield (t/ha):

The average of biological yield over all environments ranged from 17.59 t/ha for line # 3 to 19.80 t/ha for Sids 1 with an average of 18.20 t/ha. The results revealed that Sids 1, Sakha 94, Gemmeiza 10, Line # 13and Gemmeiza 9 exhibited the highest biological yield compared with Giza 168 and El-Nelin under Upper Egypt conditions.

I-2-10) Grain yield (t/ha):

The average of grain yield over all environments ranged from 5.77 t/ha for line # 15 to 6.69 t/ha for Sids 1 with an average of 6.17 t/ha. Sids 1, Giza 168, Sakha 94, Sakha 95 and Gemmeiza 10 produced the highest grain yield compared with line # 15 under Upper Egypt conditions.

I-2-11) Straw yield (t/ha):

The average of Straw yield over all environments ranged from 11.19 t/ha for Giza 168 to 13.17 t/ha for Sids 1 with an average of 12.04 t/ha. The results indicated that Sids 1, Gemmeiza 10, Line # 13, Line # 15, Gemmeiza 9 and El-Nelin have the highest straw yield compared with Giza 168 under Upper Egypt conditions.

I-3) Delaying sowing date:-

Delaying sowing date reduced number of days to heading, maturity date, plant height, peduncle length, flag leaf area, no. of spikes / m^2 , 1000-kernel weight, no. of kernels / spike, biological yield (t/ha) , grain yield (t/ha) and straw yield (t/ha) in the second and third planting dates by an average of (5.41 & 12.15 %), (6.63 &14.00 %), (3.80 &10.31 %), (6.84 & 20.29 %), (14.97 & 23.10 %), (4.45 & 10.90 %), (5.21 & 10.80 %), (8.88 & 16.77 %), (18.70 &

32.07 %), (21.14 & 36.2 %) and (17.29 & 29.67 %), respectively as compared with the optimum planting date.

II) Genotype-environment interaction and stability analysis:-

II-1) Joint regression analysis:-

The joint regression analysis of variance indicated highly significant differences among genotypes for all the studied characters. Moreover, partitioning mean of squares due to environments plus genotypes x environments interactions as indicated by E + (G x E) to the following items E (Linear) showed highly significant for all the studied traits, while G×E component mean squares were not significant for all the studied characters, except flag leaf area, no. of spikes/m^2 and biological yield. The remainder sums of square was significant for days to heading, maturity date, no. of kernels/spike and grain yield t/ha.

II-2) Stability analysis:-

II-2-1) Flag leaf area:

Wheat genotypes Line # 3 and El-Nelin were classified as highly adapted to heat stress whereas; Sids 1, Debeira and HD 2501 appeared to be more adapted to favorable conditions. The most desired and stable genotype for broader flag leaf area was Sakha 95.

II-2-4) Number of spikes/m^2:

Wheat genotypes Line # 3 and Gemmeiza 10 were classified as highly adapted to heat stress whereas; Line # 15, El-Nelin and Debeira appeared to be more adapted to favorable conditions. The most desired and stable genotype for number of spikes/m^2 Sids 1, Giza 168, Sakha 94 and Sakha 95.

II-2-6) Biological yield:

Wheat genotypes Line # 3 was classified as highly adapted to heat stress. The most desired and stable genotype for biological yield Sids 1, Sakha 94, Gemmeiza 10, line # 13, Gemmeiza 9 and Debeira.

II-2-8, 9, 10, 11) Days to heading, days to physiological maturity, plant height, peduncle length, 1000-kernel weight, number of kernels/spike, grain yield and straw yield:

The joint regression analysis of variance revealed that the component of Env. + (G×E) was highly significant or significant for those traits. In addition, partitioning Env. component mean square was highly significant, while G×E component mean square was not significant. Indicted that the environments effect was linear function but the interaction of genotypes and environments were not linear function for such trait. This mean that response was direct and there is no interaction effected with planting dates and years and genotypes, so that there is no need to do stability parameters for such traits.

III): Correlation and path coefficient:

III-1): Simple correlation:

positive and significant or highly significant correlations were recorded between grain yield and number of spikes/m^2 in eleven out of the twelve genotypes, and ranged from 0.292 for Sakha 95 to 0.776 for Gemmeiza 9.

Positive and significant or highly significant correlation registered between grain yield and 1000-kernel weight in nine of the twelve wheat genotypes, and ranged from 0.154 for Debeira to 0.792 for Gemmeiza 10.

The correlations between grain yield and number of kernels/spike were positive for all the twelve genotypes, but varied greatly from non-significant to highly significant and ranged from 0.189 for line # 15 to 0.533 for El-Nelin. This indicates that grain yield and number of kernels/spike are compatible in some genotypes and incompatible in the others.

III-2) Path coefficient analysis:

The results indicate that path analysis gave a somewhat different picture than did the simple correlation analysis. Number of spike/ m^2 had strong influences, direct and indirect, upon grain yield, followed by 1000-kernels weight. Moreover the results indicate, of particular concern to the breeder is the fact that each genotype has a specific gene association.