J. Agric. Sci. Mansoura Univ., 28 (9): 6603 - 6617 , 2003

ESTIMATING PARAMETERS OF GENOTYPIC AND PHENOTYPIC STABILITY FOR SOME BREAD WHEAT GENOTYPES

Abdel- Karim, A. A.* and Manal M. Salem **

*** Wheat Res. Sec., Field Crop Res. Ins., A.R.C.**

**** Scientific Computation Section, Centeral Laboratory of Design and Statistical analysis, Agricultural Research Center, Giza, Egypt**

ABSTRACT

Genotype x environment (GE) interaction is a challeng to plant breeders because it causes difficultes in selecting genotypes evaluated in diverse environments. When GE interaction is significant, its cause, nature and implication must be carefully considered. The objective of this study was determine the effect of GE interaction on grain yield, days to heading and maturity heading of bread wheat genotypes as well as stability and adaptability of each genotypes. Phenotypic and genotypic stability parameters were computed as outlined by Eberhart and Russell (1966) and Tai (1971), respectively.

Regading phenotypic stability according to Eberhart and Russell (1960), the results indicated that the following genotypes characterized by general and specific stability.

Genotypes no. (1) Giza 165, (2) KAUZ* 2/ TRAP// KAUZ, (3) KAUZ *2 /YACO// KAUZ, (4) KAUZ* 2/ MNV// KAUZ, (5) Tevee 'S'/Kaus 'S', (6) Mexipak 65, (7) Kaus 'S', (8) MYNA/VUL//TURACO/3/TURACO, (10) CHAM 2/VEE 'S' and (12) Tevee 'v'// Vee 's'/pvn 'S' for grain yield.

Genotypes no. (2) KAUZ* 2/ TRAP// KAUZ, (5) Tevee 'S'/Kaus 'S', (6) Mexipak 65, (9) Prl 'S'/Vee 'S'/3/P106.19//Soty/Jt*3 and (12) Tevee 'v'//Vee 's'/pvn 'S' for heading date.

Genotypes no. (2) KAUZ* 2/ TRAP//KAUZ, (4) KAUZ* 2/MNV//KAUZ and (12) Tevee 'v'//Vee 's'/pvn 'S' for maturity date.

Concerning genotypic stability the results showed that genotypes no (1) Giza 165, (4) KAUZ* 2/ MNV// KAUZ and (11) Seri 82//Shuha 'S' had a degree of below average stability, genotypes no. (3) KAUZ *2 /YACO// KAUZ, (7) Kaus 'S', (8) MYNA/VUL//TURACO/3/TURACO, (10) CHAM 2/VEE 'S' and (12) Tevee 'v'// Vee 's'/pvn 'S' showed a stability of above average degree and genotypes no. (6) Mexipak 65, and 9 had on average degree of stability for grain yield. Genotypes no. (9) Prl 'S'/Vee 'S'/3/P106.19//Soty/Jt*3 and (12) Tevee 'v'// Vee 's'/pvn 'S' showed stability of below average degree and genotypes no. (1) Giza 165, (8) MYNA/VUL//TURACO/3/TURACO and (10) CHAM 2/VEE 'S' showed stability of an average degree for maturity date. On other hand, degrees of below average stability were performed by genotypes no. 4, 6, 9 and 10 with respect to heading date.

INTRODUCTION

The environmental of crops were comprised of several elements. In each season, location, weather conditions and another factors are important to determine to the yield potential of a genotype.

Increased productivity of spring bread wheat with high and stable yield is the main objective of the national research program.

The optimum and high temperature during terminal grain filling period influence crop growth and yield. Often, biotic stresses such as low nutrient level, diseases, insect pests, and poor crop management also limit production.

Variation in yield my be partitioned into the variation caused by genotype x location or genotype x year interactions. Developing stable varieties (Allard and Bradshaw 1964) can minimize the year-to year variations in the climatic conditions at a given location.

The methods for Eberhart and Russell, 1966;Lewontin, 1966 and Tai 1971 can be used to evaluate the lines for stability of their performance under diverse environmental conditions such as nurseries grown in different environments.

Regression technique was used by Eberhart and Russell (1966) to classify cultivars into relatively stable (regression slope closer to 1, and deviation from linear-regression slope closer to zero) and less stable (slope greater than 1 and deviation from regression greater than zero) cultivars.

Tai (1971) presented a method of genotypic stability analysis which based on the genotype x environment interaction effects of a variety, the GE interaction was partitioned into two components. Linear (α) and the deviation from the linear response (λ). A perfectly stable variety has (α=-1) and (λ=1). Variety with average stability has (α=0) and (λ=1). Results showed that the highest yielded were unstable.

Delayed sowing decreased grain yield (Phadnawis and Saini 1986; Abdel-Karim 1991;El-Morshidy *et al.*, 2001; Singh and Dixit, 1985). Ismail (1995) found significant interactions between locations x dates for heading date and grain yield.

El-Morshedy *et al* (2000) revealed that most the variations in the total sum of squer of days to heading and grain yield were due to the environmental variations which were, in consequences, attributed to the main effects of the used environmental factors (year, sowing date and irrigation) and the interaction of year x sowing date. So the environmental variations were statistically significant.

Lin *et al* (1986) reported that a genotype may be considered to be stable (i) if its among-environment variance is small, (ii) if its response to environments are parallel to the mean response of all genotypes in the trial, or (iii) if the residual mean square from a regression model on the environmental index is small.

Kheiralla *et al.* (1997) evaluated 12 bread wheat cultivars under different environments.They found that, the two components of G x E interactions, heterogeneity between regressions and the remainder component,were statistically significant,which indicated the presence of G x E interactions for grain yield.The variations in bi values suggested that the genotypes responded differently to the different environments.

MATERIALS AND METHODS

Data uesd in this study were obtained from eleven exotic bread wheat lines selected from CIMMYT/ICARD and Giza 165 as local check variety were evaluated Table 1 at the experimental farm of Agric.Res. Station (ARC) in Mattana, Komombo and New Valley, Egypt. A field trials were conducted during the successive winter growing seasons of 2000/01, 2001/02 and 2002/03. In each season, two trails were conducted in two dates the first was the recommended one (10-15 Nov.) and the second was late (10-15 Dec.) . The environments (E) studied were as follow:

Environment (1 and 2) in 2000/01 season at El-mattana farm of Agric. Res. St. in the recommended and late planting, respectively.

Environment (3 and 4), (5 and 6) and (7 and 8) In 2001/02 season at El-mattana, Komombo and New Valley farm of Agric. Res. St. in the recommended and late planting, repectively.

Environment (9 and 10) and (11 and 12) In 2002/03 season at El-Mattana and New Valley farm of Agric. Res. St. in the recommended and late planting, respectively.

Table 1 : Entry No-name/cross, pedigree and origin of eleven exotic lines and local check Giza 165 which used in the stability analysis.

Entry no.	Name/Cross	Origin
1	Giza 165	Egypt
2	KAUZ* 2/ TRAP/ /KAUZ	Mex.
3	KAUZ *2 /YACO/ /KAUZ	Mex.
4	KAUZ* 2/ MNV/ / KAUZ	Mex.
5	Tevee 'S'/Kaus 'S'	Syria
6	Mexipak 65	Syria
7	Kaus 'S'	Syria
8	MYNA/VUL//TURACO/3/TURACO	Syria
9	Prl 'S'/Vee 'S'/3/P106.19//Soty/Jt*3	Syria
10	CHAM 2/VEE 'S'	Syria
11	Seri 82//Shuha 'S'	Syria
12	Tevee 'v'//Vee 's'/pvn 'S'	Syria

The experimental design used was randomized complete design (RCBD), with four replications. Each plot consists of six rows,3.5 m long and 20 cm apart, seeds were hand sown in drills. All other cultural practices were applied as recommended.

Data recorded:

1- Grain yield Ardb/fed. : Weight of clean grain from 4 central rows.
2- Days to heading (HD): Number of days from planting until emergence 50% of the heads from the flag leaf sheath.
3- Days to maturity (MD): Number of days from planting to 50% of the spike reached physiological maturity.

Statistical Procedures:

Standard analysis of variance was computed for each environment according to Snedecor and Cochran (1989).Combined analysis of variance was performed for both eleven exotic bread lines and the local check Giza165 and twelve environments to estimate. A regular analysis of variance was applied for each environment, the effect of genotype x environment interaction on the heading data, maturity data, and yielding ability. In the analysis of variance for studied charactors,genotypes were considered as fixed and environments were considered random effects. Differences among cultivar means were compared by using L.S.D. The regression analysis were conducted using two techinques.

I- Eberhart and Russell technique to estimate phenotypic stability.

This method was used to compute the phenotypic stability as outlined by Eberhart and Russell (1966) according to this model.

$Y_{ij} = M_i + bi_{ij} + d_{ij}$ Where:

Y_{ij} is the genotype mean of the j^{th} genotype at the j^{th} environment (i=1,2....v, j=1,2...n).

m_i is the mean of the i^{th} genotype over all environments.

b_i is the regression coefficient that measures the response of the i^{th} genotype to varying environments.

d_{ij} is the deviation from regression of the i^{th} genotype at the j^{th} environment and ij is the environmental index obtained as the mean of all genotypes at the j^{th} environment minus the grand mean.

Eberhart and Russell (1966) proposed that the ideal variety is one that has three characteristics as follows:

1-Regression coefficient significantly different from zero (b?0) and not significantly different from unity (b=1).

2-Minimum value of the deviation about regression, i.e.,$s^2d=0$.

3-High performance with a reasonable range of environmental variation.

II - Tai technique for estimating genotypic stability.

This approach was performed according to Tai (1971), who separated genotype x environment interaction effect of the i^{th} genotypes into two statistical parameters namely α and λ. These statistics, α and λ? measure the linear response to environmental effects and the deviation from linear response in terms of the magnitude of the error variance, respectively, as follow:

$$\alpha = \frac{S_i(gL)_i}{(MSL - MSB / mp}$$

$$\lambda = \frac{S^2(gL)_i - \alpha\, s_i.(gL)_i}{(m-1)MSE / mp}$$

Where

S_i (g L)$_i$ is the simple covariance, between the environmental and interaction effects, S^2 (g L)$_i$ is the sample variance of the interaction effects of the i th variety to the n environments. MSL, MSB, MSE, m and p are the mean squares of environmental effects, the replicates within environments, error deviates, number of varieties and number of replications, respectively. A perfectly stable variety has values α=-1 and λ=1, a variety with average stability has values α=0 and λ=1, a genotype with above average stability has values α < o and λ=1 and a cultivar with below average stability has values of α > o and λ=1

RESULTS AND DISCUSSION

I-Phenotypic stability using Eberhart and russel method:

1-Genotype x envirormental interaction:-

The mean seed yield, heading date and maturity data as an average over all genotypes and/or environments are presented in Tables 2,3 and 4. The results of analysis of variance showed significant differences among genotypes and environments over all genotypes for three traits.

Combined yield data recorded over all genotypes Table 2 showed that in environment 5,6 (Komombo 2001/02) exhibited the highest mean yield (14.815 and 13.651 ton/fed., respectively) with nonsignificant differences between them. However, the lowest mean yield (3.595,4.387 and 5.553) was recorded at environment 10 (EL-Mattana 2002/03), in environment 12 (New valley 2002/03) and in environment 8 (New valley 2001/02), respectively. Significant differences were also found among the studied genotypes in their response. Over all enviromments, G.3 surpassed all other gentypes (9.752 ton/ fed), whereas, G.11 gave the lowest seed yield (7.815 ton/ fed).

Concering heading date, its mean performance as average over the environments and/or genotypes are give in Table 3. The range between genotypes (4.521) was higher than that detected between environments (22.188) significant differences were recorded between environments. However, the highest mean heading date (89.188 and 88.500) was recorded at environment 7 (New Valley 2001/02) and in evironment 1 (El-Mattana 2000/01), the lowest mean heading date (67.00, 76.500 and 76.708) was recorded at environment 4 (El-Mattana 2001/02) in environment 8 (New valley 2001/02) and in environment 12 (New valley 2002/03). However, significant differences were found among studied genotpyes. G1 gave the highest heading date (85.00), While G12 gave the lowest heading date (80.479). Mean performances over all genotypes Table 4 showed that in environment 1 (EL-Mattana 2000/01) and in environment 5 (Komombo 2001/02) exhibited the highest mean matuerity date (141.188 and 132.83, respectively) with significant differences between them. However, the lowes mean maturity date (96.479 and 105.583) was recorded at environment 4 (El-Mattana 2201/02) and in environment 8 (New valley 2001/02), respectively. Significant differences were also found among the studied genotypes in their response. Over all environments, G11 gave the highest maturity date (121.604)., whereas, G2 gave the lowest maturity date (117.396).

Table 2: The interaction effects between genotypes and environments for yield (Ard./Fed.) character.

Locations	El-Mattana						Komombo		New valley				Means G.
Years	2000/ 2001		2001/2002		2002/2003		2000/ 2001		2001/ 2002		2002/2003		
Date / Genotypes	10-15 Nov.	10-15 Dec.	10-15 Nov.	10-15 Dec.	10-15 Nov.	10-15 Dec.	10-15 Nov.	10-15 Dec.	10-15 Nov.	10-15 Dec.	10-15 Nov.	10-15 Dec.	
G 1	10.93	9.79	13.27	8.02	9.39	3.10	15.56	16.82	8.33	6.30	9.01	4.56	9.58
G 2	13.69	11.64	14.39	8.40	7.62	3.15	14.48	13.71	6.29	4.93	8.72	4.89	9.33
G 3	11.34	10.56	12.81	8.47	9.02	4.37	16.13	13.87	9.58	6.90	8.85	5.12	9.75
G 4	11.72	12.13	13.35	8.31	8.32	2.69	14.58	14.60	5.10	4.80	8.59	3.42	8.97
G 5	10.79	9.78	13.85	8.31	11.98	5.25	15.44	14.78	5.52	4.90	9.94	4.80	9.61
G 6	10.26	10.23	13.61	8.53	8.51	3.49	16.53	12.57	8.10	5.34	9.39	4.85	9.28
G 7	10.16	11.14	12.19	9.48	7.86	2.85	15.97	12.98	6.56	5.24	8.59	3.39	8.95
G 8	10.64	9.03	13.61	7.22	6.45	2.53	12.90	11.74	5.67	5.17	7.68	3.39	8.00
G 9	9.48	7.86	14.57	7.44	8.90	3.23	13.52	13.71	5.56	4.84	7.50	4.46	8.42
G 10	11.61	9.98	13.68	9.45	8.75	4.77	14.48	14.94	8.55	6.49	9.10	4.56	9.70
G 11	9.52	8.99	11.32	6.93	6.10	2.77	12.51	10.64	8.08	5.60	7.46	3.87	7.82
G 12	11.40	8.78	13.61	9.47	10.70	4.94	15.70	13.45	6.99	6.13	10.78	4.27	9.69
Means Env.	10.96	9.99	13.35	8.34	8.63	3.60	14.82	13.65	7.03	5.55	8.80	4.39	

	Genotypes	Environments	G. X Env.
L.S.D. 0.05	1.88	10.15	0.23
L.S.D. 0.01	2.45	13.19	0.30

G 1 = Giza 165
G 2 = KAUZ* 2/ TRAP/ /KAUZ
G 3 = KAUZ *2 /YACO/ /KAUZ
G 4 = KAUZ* 2/ MNV/ / KAUZ
G 5 = Tevee 'S'/Kaus 'S'
G 6 = Mexipak 65
G 7 = Kaus 'S'
G 8 = MYNA/VUL//TURACO/3/TURACO
G 9 = Prl 'S'/Vee 'S'/3/P106.19//Soty/Jt*3
G 10 = CHAM 2/VEE 'S'
G 11 = Seri 82//Shuha 'S'
G 12 = Tevee 'v'//Vee 's'/pvn 'S'

Table 3: The interaction effects between genotypes and environments for dayes of heading.

Genotypes	Environments												
	1	2	3	4	5	6	7	8	9	10	11	12	Means G.
G 1	91.3	89.8	88.0	68.3	87.8	85.0	92.8	81.3	87.3	83.8	87.5	77.5	85.0
G 2	83.8	85.5	86.0	73.5	87.5	81.0	86.8	75.3	89.3	83.8	86.0	75.5	83.0
G 3	89.0	86.0	87.0	66.8	88.3	82.5	88.3	75.8	88.8	84.0	89.3	77.0	83.5
G 4	88.3	85.5	85.0	65.3	86.0	81.5	87.3	76.3	86.0	80.3	87.0	75.5	82.0
G 5	86.3	86.5	84.0	65.3	85.5	81.5	89.3	77.3	84.0	79.0	85.0	77.0	81.7
G 6	87.3	86.3	86.0	65.5	86.5	81.5	90.3	74.8	86.5	82.3	85.3	76.3	82.4
G 7	88.3	85.8	87.0	65.8	86.8	82.8	90.0	73.5	84.8	80.0	85.5	77.0	82.3
G 8	91.5	90.5	86.8	69.5	89.5	84.3	89.5	74.8	88.5	84.5	89.0	78.3	84.7
G 9	87.8	87.0	87.3	66.0	87.3	80.8	90.3	75.8	87.3	81.0	86.5	76.5	82.8
G 10	89.3	87.5	86.5	66.0	88.8	82.5	89.8	77.3	88.0	82.3	88.3	77.8	83.6
G 11	91.5	88.3	86.8	67.8	86.3	83.3	89.0	83.0	88.0	81.3	86.3	77.5	84.1
G 12	85.5	85.8	85.0	64.5	84.8	77.5	87.3	73.3	87.0	79.0	81.5	74.8	80.5
Means Env.	88.5	87.0	86.3	67.0	87.1	82.0	89.2	76.5	87.1	81.8	86.7	76.7	

	Genotypes	Environments	G. X Env.
L.S.D. 0.05	3.64	18.42	0.33
L.S.D. 0.01	4.73	23.93	0.43

Table 4: The interaction effects between genotypes and environments for dayes of maturity.

Genotypes	Environments												
	1	2	3	4	5	6	7	8	9	10	11	12	Means G
G 1	142.3	126.3	121.5	97.5	131.0	126.5	124.0	111.3	121.8	110.8	121.8	109.5	120.3
G 2	139.5	127.5	121.3	96.3	133.0	124.5	120.3	81.3	123.5	112.0	121.5	108.3	117.4
G 3	140.0	127.0	118.3	96.5	133.5	124.8	120.8	103.0	123.5	111.0	123.0	108.8	119.2
G 4	138.8	127.3	119.5	94.0	132.5	125.8	121.3	102.0	122.3	108.5	120.5	108.3	118.4
G 5	141.3	128.5	119.0	95.5	129.0	126.3	122.3	107.5	121.3	110.8	122.5	109.5	119.4
G 6	140.0	128.3	121.8	95.5	128.0	125.8	122.3	106.0	121.8	111.5	121.8	108.5	119.3
G 7	143.8	127.8	121.8	99.0	134.5	126.8	122.3	114.5	121.8	111.5	121.5	107.5	121.0
G 8	142.0	127.8	120.5	98.0	134.5	125.8	123.8	106.5	124.0	110.5	125.3	110.5	120.8
G 9	140.0	127.5	123.3	95.5	134.5	125.0	123.0	105.8	123.3	110.5	123.3	108.8	120.0
G 10	144.0	129.5	119.3	96.5	134.5	125.0	121.8	110.8	124.0	109.8	122.8	109.3	120.6
G 11	144.0	128.8	126.5	98.5	128.0	128.5	125.0	113.8	124.8	110.0	123.0	108.5	121.6
G 12	138.8	128.3	119.8	95.0	132.0	125.0	122.0	104.8	123.3	108.8	119.5	104.8	118.5
Means Env.	141.2	127.9	121.0	96.5	132.1	125.8	122.4	105.6	122.9	110.5	122.2	108.5	

	Genotypes	Environments	G. X Env.
L.S.D. 0.05	3.45	34.56	0.64
L.S.D. 0.01	4.49	44.92	0.83

2- Stability analysis :

Analysis of variance and partitioning of genotypes x environment interaction into components to each genotype in Table 5 showed significant and highly significant differences between genotypes in yield and days to heading, respectively. When genotypes x environment interaction sum of squares were pertained, the environment (Linear) effect was highly significant and represented the major component of variance. The significant genotypes x environment (Linear) interaction indicated that there were differences among the regression coefficients of the genotypes that reacted differently in their linear response to the change in environments. Partitioning of GE interaction into components indicated that the most unstable genotype for grain yield was genotype 5, followed by genotype 2. The most stable genotypes were G1, G3, G4, G6, G7, G8, G9, G10, G11 and G12. Concerning days to heading, the unstable genotypes were G1, G2, G3, G7, G8, G11 and G12. The most stable genotypes were G4, G6, G9 and G10. Concerning days to maturity, the unstable genotypes were G2and G11. The most stable genotypes were G1, G3, G4, G5, G6, G7, G8, G9, G10 and G12.

Table 5: Combined analysis for characters of twelve bread wheat genotypes based on twelve environments according to Eberhart and Russell technique.

Source of variation	d.f	Mean square variance for all characters		
		Grain yield Ardb/fed	Days to heading (HD)	Days to maturity (MD.)
Total	143			
Genotypes (G.)	11	5.5171*	20.5455**	18.4659
Env + (G. x Env.)	132	14.1631**	45.6169**	160.9583**
Environment (Linear)	1	1752.117**	5769.6550**	20321.12**
G. x Env. (Linear)	11	1.3558	3.6456	7.3365
Poold Deviation	120	0.8542	1.7637	7.0574
G 1	10	0.9527	2.0171*	3.1219
G 2	10	1.1894*	4.1057**	48.9675**
G 3	10	0.6197	1.5932*	2.0130
G 4	10	0.8584	0.5810	1.2550
G 5	10	1.6796**	1.6392*	2.0225
G 6	10	0.6076	0.5732	1.7197
G 7	10	0.7628	1.6202*	7.6528
G 8	10	0.5504	2.3141**	1.3165
G 9	10	0.9851	0.3945	1.4158
G 10	10	0.3402	0.3690	4.0216
G 11	10	0.7336	3.9978**	9.5114*
G 12	10	0.9707	1.9590*	1.6738
Pooled error	432			

3- Adaptability:

As suggested by Eberhart and Russel (1966), the mean performance with the regression coefficient values and deviation from regression would provide a uesful parameters for studying the adaptation of genotypes. Also, in their interpretation for the analysis of adaptation in plant breeding programs. Finlay and Wilkinson (1963), reported that regression coefficient approximating to 1.0 indicated average stability. When this is associated with high mean yield, genotypes have general adaptaility; when associated with low mean yield genotypes are poorly adapted to all environments.

Moreover, "b" values increasing above 1.0 describe genotypes adapted to high yielding environments and "b" values decreasing below 1.0 describe genotypes better adpated to low yielding environments. Also the test of significance of each (bi) value against 0 (i.e. b=0) indicate that, genotypes have specific adaptability.

3-1- Grain yield:

It is clear from the data presented in Table 6 that genotypes 5, 6,7,8, and 9 appeared to be adapted for all invironments as indicated by high mean yield and insignificant "b" valus. They had general stability. However, G1, G2 and G4 had regression coefficients significantly greater than one and indicating when available. G3, G10, G11 and G12 had regression coefficients significantly less than one, indicated that they were less responsive to environmental change than performance of all the genotypes making up the site mean from test of significance of each (bi) values against 0.0 (specific adaptability), the best location for twelve genotyoes EL- mattana and komombo.

3-2 Days to heading:

Data presented in Table 6 showed that all genotypes except (G2 and G11) were near to unit reagression with heigh mean and insignficant "b" values. Therefore, these genotypes were proved to be generally stable with regard to days to heading. G2 and G11 had regression coefficients significantly less than one indicated that they were less responsive to environmental change than performance of genotypes making up the sit mean from of significance of each bi values against 0.0 (specific adaptability).

3-3 Days to maturity:

Data presented in tabe 6 that all genotypes characterized by general and specific stability of high performance .

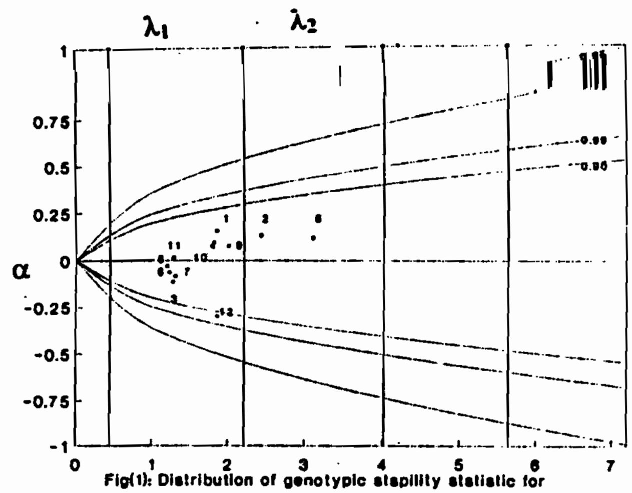
Therefor, environmental conditions and general stability should be considered by bread wheat breeders for selecting high performance cultivars. These results are similar to those obtained by, I smail (1995).

II- Genotypic stability using Tai's method:

Genotypic stability statistics α and λ estimated according to Tai (1971) are presented in Table 7 and graphically illustrated in fig 1, 2 and 3.

Table 6: Estimates of phenotypic stability for grain yield Ard/Fed, days to heading (HD) and days to maturity (MD) characters in twelve bread wheat genotypes (Eberhart and Russell Parameters).

Genotypes	Grain yield Ard/Fed				
	X_{vi}	b_{vi}	S^2d_{vi}	T_{bvi}-0	T_{bvi}-1
G 1	9.584	1.0989	0.3983	13.600	1.224
G 2	9.326	1.0930	0.6350	12.104	1.030
G 3	9.752	0.9274	0.0653	14.246	-1.115
G 4	8.966	1.1549	0.3041	15.574	2.019
G 5	9.612	1.0198	1.1252	9.320	0.184
G 6	9.282	1.0104	0.0532	15.665	0.161
G 7	8.953	1.0248	0.2084	14.174	0.343
G 8	8.002	0.9780	0.0040	15.928	-0.358
G 9	8.422	1.0101	0.4307	12.303	0.123
G 10	9.696	0.9442	0.2142	19.549	-1.155
G 11	7.815	0.7814	0.1793	11.021	-3.083
G 12	9.686	0.9571	0.4164	11.743	-0.526
Genotypes	Days to heading				
	X_{vi}	b_{vi}	S^2d_{vi}	T_{bvi}-0	T_{bvi}-1
G 1	85.000	1.001	1.279	15.40	0.015
G 2	83.021	0.761	3.367	8.27	-4.239
G 3	83.542	1.043	0.855	17.98	0.741
G 4	81.979	1.018	-0.158	29.08	0.514
G 5	81.708	0.957	0.901	16.50	-0.741
G 6	82.354	1.052	-0.165	30.94	1.529
G 7	82.250	1.053	0.882	18.15	0.914
G 8	84.708	1.032	1.575	14.96	0.464
G 9	82.771	1.065	-0.344	36.72	2.241
G 10	83.646	1.064	-0.370	38.00	2.286
G 11	84.063	0.922	3.259	10.13	-0.857
G 12	80.479	1.033	1.220	16.14	0.516
Genotypes	Days to maturity				
	X_{vi}	b_{vi}	S^2d_{vi}	T_{bvi}-0	T_{bvi}-1
G 1	120.333	0.931	-1.192	21.651	-1.605
G 2	117.396	1.175	44.651	6.912	1.029
G 3	119.167	1.002	-2.301	29.470	0.059
G 4	118.375	1.039	-3.059	38.481	1.444
G 5	119.438	0.968	-2.291	27.657	-0.914
G 6	119.250	0.959	-2.594	29.969	-1.281
G 7	121.042	0.942	3.339	14.060	-0.866
G 8	120.750	0.994	-2.997	35.50	-0.214
G 9	120.021	1.013	-2.898	34.931	0.448
G 10	120.583	1.014	-0.292	20.694	0.286
G 11	121.604	0.940	5.198	12.533	-0.800
G 12	118.479	1.024	-2.640	33.032	0.771



Fig(1): Distribution of genotypic stapility statistic for bread yield character.

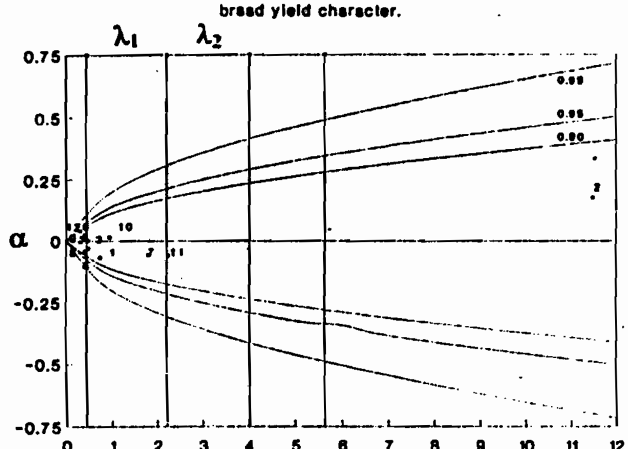


Fig.(2): Distribution of genotypic stability statistic for days to maturity character.

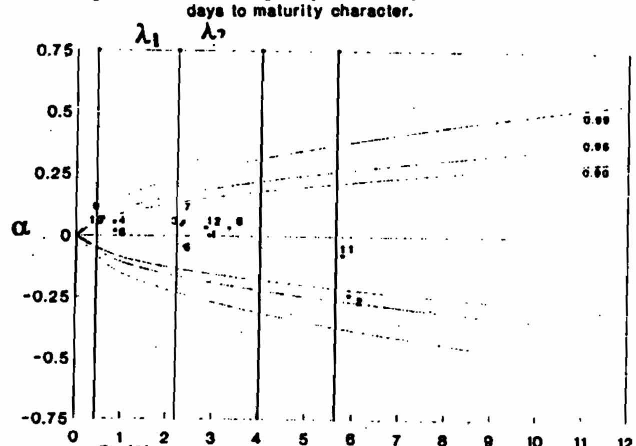


Fig.(3): Distribution of genotypic stability statistic for days to heading character.

The values α=-1 and λ=1 will berefered as perfect stability. However, the values α=0 and λ=1 will be referred as average stability, whereas the values α<0 and λ=1 as above average stability and the values α > 0 and λ=1 as below average stability.

Restults in Table 7 and fig 1 show clearly that genotypes no. 1,4 and 11 had a degree of below average stability, genotypes no. 3, 7, 8, 10 and 12 showed a stability of above average degree for grain yield/fed and genotypes no. 6 and 9 had an average degree of stability. Regarding maturity date, genotype no. 3, 4, 5, 6 and 7 recorded above average degree of stability. Genotypes no. 9 and 12 showed stability of below average degree and genotypes no. 1, 8 and 10 showed stability of on average degree in fig 2. On other hand, degrees of below average stability were performed by genotypes no. 4, 6, 9 and 10 with respect to heading date as illustrated in Fig 3. Ismail (1995) and El-Morshedy *et al.* (2000) reported similar findings.

It is, therefore, suggested that such genotypes (3,7,8,10 and 12) may be recommended to be included in breeding programs for development of seed yield stability and /or adaptability of wheat.

Table 7: Estimates of genotypic stability for grain yield Ard/Fed, days to heading (HD) and days to maturity (MD) characters in twelve bread wheat genotypes (Tai's Parameters).

Genotypes	Grain yield Ard/Fed			
	α	λ	b-1	M.S.V.$_{y}$/Env. No.
G 1	0.0997	1.9420	0.0989	0.0749
G 2	0.0938	2.4256	0.0930	0.0991
G 3	-0.0732	1.2634	-0.0726	0.0516
G 4	0.1562	1.7461	0.1549	0.0715
G 5	0.0200	3.4280	0.0198	0.1400
G 6	0.0105	1.2400	0.0104	0.0506
G 7	0.0250	1.5567	0.0248	0.0636
G 8	-0.0222	1.1232	-0.022	0.0459
G 9	0.0102	2.0105	0.0101	0.0821
G 10	-0.0563	0.6936	-0.0558	0.0283
G 11	-0.2204	1.4856	-0.2186	0.0611
G 12	-0.0433	1.9809	-0.0429	0.0809
Genotypes	**Days to heading**			
	α	λ	b-1	M.S.V.$_{y}$/Env. No.
G 1	0.0011	2.9123	0.0011	0.1681
G 2	-0.2399	5.9174	-0.2393	0.3421
G 3	0.0427	2.3005	0.0426	0.1328
G 4	0.0180	0.8396	0.0180	0.0484
G 5	-0.0434	2.3668	-0.0433	0.1366
G 6	0.0517	0.8279	0.0516	0.0478
G 7	0.0534	2.3388	0.0533	0.1351
G 8	0.0318	3.3412	0.0318	0.1928
G 9	0.0657	0.5697	0.0655	0.0329
G 10	0.0643	0.5329	0.0642	0.0307
G 11	-0.0785	5.7704	-0.0783	0.3331
G 12	0.0330	2.8287	0.0329	0.1632
Genotypes	**Days to maturity**			
	α	λ	b-1	M.S.V.$_{y}$/Env. No.
G 1	-0.0692	0.7307	-0.069	0.2601
G 2	0.1756	11.4683	0.1751	4.0806
G 3	0.0017	0.4714	0.0017	0.1677
G 4	0.0387	0.2938	0.0386	0.1046
G 5	-0.0323	0.4737	-0.0322	0.1685
G 6	-0.0415	0.4027	-0.0414	0.1433
G 7	-0.0579	1.7924	-0.0577	0.6377
G 8	-0.0063	0.3084	-0.0063	0.1097
G 9	0.0132	0.3315	0.0131	0.1180
G 10	0.0145	0.9420	0.0145	0.3351
G 11	-0.0605	2.2279	-0.0604	0.7926
G 12	0.0241	0.3919	0.0240	0.1395

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تقدير معالم الثبات الوراثى والمظهرى لبعض التراكيب الوراثية فى قمح الخبز

عبد الكريم احمد عبد الكريم* ومنال مصطفى سالم**

* قسم بحوث القمح – معهد المحاصيل الحقلية – مركز البحوث الزراعية

** المعمل المركزى لبحوث التصميم والتحليل الاحصائى – مركز البحوث الزراعية – الجيزة

يعتبر تقدير التفاعل بين التراكيب الوراثية والعوامل البيئية من اهم اهداف مربى النباتات فيجب ان يؤخذ فى الاعتبار عند انتخاب وتقييم الاصناف فى البيئات المختلفة درجة معنوية هذا التفاعل . ويهدف هذا البحث الى تقدير هذا التفاعل ثم دراسة معالم الثبات والاقلمة لمجموعة من التراكيب الوراثية لمحصول قمح الخبز وذلك على صفات المحصول وموعد طرد السنابل وموعد النضج لاهميتها فى تقييم الاصناف . وقد استخدم اسلوب ابرهارت وراسيل سنة ١٩٦٦ لتقدير معالم الثبات المظهرى لهجن القمح وكان الاسلوب المستخدم لتقدير معالم الثبات الوراثى لهذة الهجن هو طريقة تاى (Tai) ١٩٧١ ويمكن تلخيص النتائج كالاتى :-

١- طريقة إبرهارت وراسيل لتقدير معالم الثبات المظهرى :

أظهرت النتائج ان سلالات القمح ١و٢و٣و٤و٥و٦و٧و٨و١٠و١٢ أعطت ثباتا مظهريا لصفة المحصول وان السلالات ٢و٥و٦و٩و١٢ أعطت ثباتا مظهريا لصفة موعد طرد السنابل وبالنسبة لصفة موعد النضج اظهرت السلالات ٢و٤و١٢ ثباتا مظهريا لهذة الصفة .

٢- طريقة تاى لتقدير معالم الثبات الوراثى :

أوضحت النتائج ان السلالات رقم ١و٤و١١ أعطت ثباتا وراثيا بدرجة أقل من المتوسط بينما أعطته السلالات رقم ٣و٧و٨و١٠و١٢ درجة فوق المتوسط من الثبات الوراثى . بينما أعطت السلالات رقم ٦و٩ درجة متوسط من الثبات الوراثى لصفة المحصول اما بالنسبة لصفة موعد طرد السنابل أعطت السلالات ٩و١٢ ثباتا وراثيا بدرجة اقل من المتوسط بينما اظهرت السلالات رقم ١و٨و١٠ درجة متوسطة من الثبات الوراثى لهذه الصفة وقد تبين ايضا من النتائج ان السلالات رقم ٤و٦و٩و١٠ قد اظهرت درجة اقل من المتوسط من الثبات الوراثى بالنسبة لصفة موعد النضج .

مما سبق يتضح ان السلالات ٣و٧و٨و١٠و١٢ هى أكثر السلالات ثباتاً على المستويين المظهرى والوراثى لذلك يوصى بأدخالهم فى برامج التربية .