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PHENOTYPIC AND GENOTYPIC STABILITY FOR PEANUT POD YIELD AND YIELD COMPONENTS UNDER VARYING ENVIRONMENTS IN EGYPT

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ABSTRACT: Thirteen exetic and advanced peanut breeding genotypes, and two check cultivar (Giza/6 and Ismailia 2) were evaluated for yield and yield component under eighteen divers environments condition i.e. three years (2017, 2018 and 2019), three locations (Ismailia, Shandawell and Toshka) Reasearch station and two sowing dates (1st April and 1st June). The components of G x E interaction, phenotypic and genotypic stability parameters were estimated according Eberhart and Russel (1966) and Tai method (1971). The obtained results revealed that Pooled analysis of variance indicated, highly significant differences among genotypes, years, locations and sowing dates as well as all interactions between them for all characters, providing evidence for the necessity of testing studied genotypes in multiple environments. Phenotypic stability parameters indicated that genotypes (4 and 6) were classified as highly adapted to favorable environments for pod yield ard/fed. and oil percentage as well as line (Ismailia/2) for pod yield ard/fed. The most desired and stable lines showed genotypes (2,5 and 10) for pod yield ard/fed. under wide range variable environmental conditions; genotypes (2and 5) for shelling percentage and pod yield ard/fed. as well as genotypes (5 and 8) for 100-seed weight and oil percentage. Genotypic stability estimates showed that, the most average stable genotypes were, genotypes (2 and 10) for pod yield ard/fed., genotype (7) for 100-seed weight, genotypes (11 and 13) for shelling percentage as well as genotypes (9 and 12) for oil percentage. It is worthy to mention that, the phenotypic and genotypic of stability are quite similar for describing stability in peanut genotypes (2 and 10) for pod yield ard/fed. and genotype (13) for shelling percentage. It is therefore suggested that these genotypes may be recommended to be included in any breeding program for improving peanut pod yield stability under different environments.

Key words: Peanut, (*Arachis hypogaea* L.), yield component, oil phenotypic stability, genotypic stability and G x E interaction.

INTROUDUCTION

Peanut (Arachis *hypogaea* L.) is considered as one of the important oil crops in the world. The crop in Egypt is consisting a daily dish in the diet of most of the population, and large quantities of seeds are imported every year. The production of peanut is severely limited by several constraints, which include total lack of research emphasis on the crop, new sandy soil and high production from oil crop.

Stability analysis is an important tool for plant breeders in predicting response for various genotypes over changing environments.

Genotype x environment (G x E) interactions are of notable importance in the development and evaluation of peanut cultivar. Although, it represents a major challenge to plant breeders, significant advances have been made to understand the nature of these interactions and determine the most stable genotype with a minimum (G x E). genotype x environment interaction is often described as inconsistent differences among genotypes from one environment to another. The inconsistency may arise from two reasons, one being the difference in responses of the same set of genes to different environments and the other being the expression of different sets of genes in various environments Cockerham (1963) and John *et al.*, (2001). Phenotypic and genotypic stability parameters have been proposed by Eberhart and Russell

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(1966) and Tai (1971), respectively, to provide information on the real response of phenotype and genotype to environments.

The phenotypic stability is often used to refer to fluctuations in the phenotypic expression of yield while the genetic composition of the varieties or populations remains stable Becker and Leon (1988) and Abd El-Rahman (2016). However, Hanson (1970) proposed stability, statistic which is found on the regression approach, this measure was termed as genotypic stability, because it includes that part of the variance due to environmental effects which could be reduced by breeding or selection Utz (1972). However, Eberhart and Russell (1966), suggested that both linear and non-linear component of G x E interactions should be used in judging the stability of different genotypes described an ideal genotype as one with the highest yield over a wide range of environments, a regression coefficient of one deviation mean squares of zero.

Many investigators had described importance of G x E interaction and suggested that only mean yield is not a satisfactory measure, hence emphasis must be given on the evaluation of genotype which could perform better even besides fluctuation in the environment Byth (1977) and Kang (1998) reported significant interaction between genotype x environment both in linear and non-linear components. Sojitra and Pethani (1994) and Abd El-Rahman (2016) they importance of non-linear component of variance for 100-pod weight and shelling percentage Patil *et al.,* (2004) studied the stability of 58 Spanish bunch groundnut genotypes for yield and yield components. Significant genotype x environment interaction was recorded for all studied characters except protein content. Abd El-aziz *et al.,* (2008) evaluated eight peanut genotypes under 8 environments for variation and stability of pod yield and yield components and found significant effect of environment, genotype and interaction between environment and genotypes on pod yield and yield component. Also, the low "b" value with high mean values were noticed for some crosses for oil percentage Abd El-Rahman (2009).

Genotypic stability of peanut pod yield, related characters for yield and oil percentage have been assessed by Moneim Babu Fatih (1987) reported significant differences among genotypes, environments and their interactions for yield and its attributes. Therefore, studying the performance and stability of various peanut genotypes over old and newly reclaimed environments may provide reliable information for recommendation of some cultivars to be grown under specific environments or to assist peanut breeders for planning breeding programs. The objective of the present research was to evaluate yield stability and yield components across environments using newly developed peanut genotypes.

MATERIALS AND METHODS

Fifteen groundnut genotypes shown in Table (1) were evaluated for 100-seed weight (g), shelling percentage (%), pod yield (ard/fed) and seed oil percentage (%) under eighteen environments, which were the combinations between three locations, i.e. (Ismailia, Shandawell and Toshka) Research Station (ARC), in two sowing dates i.e., early (1^{st} April) and late (1^{st} June) during three summer seasons 2017, 2018 and 2019 using a location. Each genotype was planted in a plot having five row with 3 m long. Row and plant spacing were kept at 60 and 10 cm respectively. The experiments were maintained in accordance with the recommended cultural practices. Regular analysis of variance was computed for each environment. Combined analysis of variance over environments were again conducted as outlined by Allard (1960). A genotype which has high mean yield a regression coefficient (bi) close to 1.0 and deviation from regression (S^2d) near to zero, is defined as stable. The phenotypic stability analysis was computed according Eberhart and Russell (1966). Also, genotypic stability parameters were estimated for comparing genotypes using Tai method (1971), who suggested partitioning the genotype-environment interaction effect of the i^{th} genotype into two statistics parameters namely α and λ, which measure linear response to environmental and the deviation from linear response of the i^{th} genotype to the environmental effects, respectively. A perfectly stable genotypes would not change its performance from one environment to another. This is equivalent to stating that α= 0 and λ=1. Because, perfectly stable genotypes probably do not exist, plant breeders will have to be satisfied with the obtainable levels of stability, i.e., average stability α=0.0 and λ=1, whereas, value α>0.0 and λ=1 will be as below average and the value α <0.0 and λ=1 as above average stability.

RESULTS AND DISCUSION

The combined analysis of variance G x E interaction throw multi environments:

Pooled analysis of variance for fifteen groundnut genotypes (G) as shown in Table (2) provide evidence for highly significant environmental effects for all studied characters i.e. 100-seed weight, shelling percentage, pod yield and oil percentage. Partitioning the environmental effects into years (y), location (L), and sowing dates (D), and their interaction items, revealed that they were highly significant for all studied characters in all cases. This result suggests that these characters were not influenced by the combination of environmental components (Y), (L) and (D). significant differences were recoded for genotypes (G) and their first-order interaction of (G x Y), (G x L) and (G x D). in this connection, Patil *et al.,* (2014), Mekontchou *et al.,* (2006) and Ajay *et al.,* (2020) they reported significant differences among genotypes, environments as well as G x E interaction Abd El-Aziz *et al.,* (2018) and Abo Elezz *et al.,* (2010). Also highly significant second (G x Y x L), (G x Y x D) and (G x L x D) as well as third (G x Y x L x D) order interactions have been noticed for 100-seed weight, shelling percentage, pod yield and oil percentage, employing different response of genotypes over years, locations and sowing dates. The obtained results provide evidence for the necessity of evaluating the studied peanut genotypes under several different environments in order to identify the best genetic makeup to be grow under a particular environment.

Table (1): Name and Origin of the fifteen peanut genotypes.

No	Genotypes	Pedigree	Origin
1	Line 16	Not available	Egypt
2	Line A25	Not available	Egypt
3	Line 199	Not available	India
4	Line 19	Not available	Egypt
5	Line 214	Not available	China
6	Line 405	Not available	China
7	Line A13	Selected from line198 x Giza/6	Egypt
8	Line A9	Selected from line 198 x line 425	Egypt
9	Line 215	Not available	India
10	Line A10	Selected from line 198 x line 623	Egypt
11	Line 623	Not available	USA
12	Line 525	Not available	India
13	Line 307	Not available	China
14	Ismailian-2	A commercial cultivar	Egypt
15	Giza 6	A commercial cultivar	Egypt

In this respect, Ebrehart and Russel (1966) and Baker (1969), reported that the high yielding potential and average stability are due to mainly to the most attributes involved in determining the wide adaptation of new genotypes.

Mean squares stability analysis of various for G x E interaction:

Stability analysis of variance of peanut 100-seed weight, seed weight, shelling percentage and oil percentage Table (3) revealed that mean squares among genotypes (G) were highly significant for yield and all the studied characters, revealing that peanut genotype were genetically different for genes controlling these characters.

Highly significant for environment (E) + (G x E) component and environment linear mean squares were recorded for all characters, indicated that the studied characters were highly influenced by the combination of environmental component (years, locations and sowing dates). Genotypes (G) x environment interaction (linear) component of variation of stability were also, significant for all studied characters, revealing the differential response of the genotypes to various agro-climates. Thus, each genotypes has specific environments performed well under it, and different from another one. The G x E (linear) interaction was significant when tested against the pooled deviation for 100-seed weight (g) and pod yield (ard/fed). These results suggested that the differences in linear responses among genotypes across environments had occurred, and the linear regression and the deviation from linearity were the main components for differences in stability for the foregoing characters. Paroda and Hayes (1971) advocated that the linear regression could simply be regarded as a measure of response of a particular genotype, which in fact is dependent largely on number genotypes including a particular study. Also, (G x E) interaction should be considered one of the most important strategies for any breeding program to improve and develop new varieties. Previous reports of Hasan Khan *etal*., (2018) and Thaware (2009) detected significant (G x E) on peanut seed yield and its components.

Table (2): Combined analysis of variance of evaluated genotypes over different environments.

S.O.V	d.f	100-seed weight (g)	Shelling (%)	Pod yield (ard/fed.)	Oil (%)
Years (Y)	2	524.529**	5431.799**	400.900**	0.699
Location (L)	2	6726.265**	2266.103**	1542.325**	35.936**
Years xlocation (Y xL)	4	2789.609**	2111.490**	221.067**	34.462**
Reps in (Y x L) combined	18	5.556	3.994	1.390	0.244
Dates (D)	1	7364.429**	4072.080**	658.695**	51.172**
Y x L	2	753.169**	235.724**	4.205**	9.226**
L x D	2	1521.965**	141.709**	26.789**	8.146**
Y x L x D	4	624.809**	181.912**	15.089**	10.424**
Genotypes (G)	14	473.248**	205.746**	42.293**	3.860**
G x Y	28	65.899**	59.453**	6.807**	1.052**
G x L	28	136.893**	101.957**	27.019**	1.438**
G x D	14	91.449**	55.018**	14.126**	1.009**
G x Y x L	56	26.183**	38.417**	3.098**	0.912**
G x Y x D	28	26.499**	22.900**	6.111**	0.425**
G x L x D	28	38.037**	69.222**	13.958**	13.958**
G x Y x L x D	56	21.328**	34.609**	6.348**	6.348**
Error	528	2.091	4.980	0.711	0.674

*,** denote significant at 5% and 1% levels of probability, respectively
Peanut pod ardab=75 Kg .

Table (3): Combined analysis of variance of evaluated genotypes over different environments.

S.O.V	d.f	100-seed weight (g)	Shelling (%)	Pod yield (ard/fed.)	Oil (%)
Genotypes	14	473.248**	205.746**	42.293**	2.910**
E+(G x E)	255	74.267**	48.045**	10.537**	0.740**
E 'Linear'	1	13930.057**	8209.369**	1805.549**	87.622**
G x E 'Linear'	14	26.554**	9.136**	9.963**	0.468**
Pooled deviation	240	15.193**	16.306**	3.091**	0.240**
Pooled error	504	1.150	1.700	0.301	0.041

Mean performance, phenotypic and genotypic stability parameters:

The estimates of phenotypic and genotypic stability parameters have been as described by Ebrehart and Russel (1966) and Tai (1971), respectively for testing fifteen peanut genotypes under eighteen environments for 100-seed weight, shelling percentage, pod yield and oil percentage are presented in Table (4).

100-seed weight (g):

Phenotypic stability and genotypic estimates are shown Table (4) revealed that the 'b' value ranged from (0.79) genotype-4 to (1.60) genotype-3 showed good level of 100-seed weight under improved environments (b>1). However, genotype-3 was moderate in seed weight. Whereas, genotype-4, genotype-5, genotype-5, genotype-6, genotype-8 and genotype-9 appeared to be more stable as revealed by lower and insignificant S^2d. the other genotypes of peanut were sensitive ones. Various breeders suggested that a variety may be stable a crossed different locations (environments) if it show unit regression coefficient (b=1) with low deviation from regression ($S^2d=0$) and high performance over environments. These results are agreement with those of El-Hosary *et al.*, (1988) and Naazar *et al.*, (2001), Abd El-Rahman *et al.,* (2016).

The values of 'α 'and 'λ' showed great differences among genotypes, and most genotypes had alpha α statistics were not deviated significantly from α=0, but exhibited λ values deviated significantly from unity for all peanut genotypes, indicating unstable, except genotype-7 which showed average degree of stability with good level 100-seed weight character.

Shelling percentage:

Data of stability parameters for Eberhart and Russell (1966) method for shelling percentage (%) is given in Table (4) indicated that, the most adapted peanut genotype for improved environments were, genotype-4. However, genotype-8 and genotype-9 were studied to less favorable conditions for shelling percentage. It can be noticed that S^2d values were small and insignificant in genotypes 1,2,5,6,7,8,9,11,12 and genotype-13 for shelling percentage, which should high degree of stability. Ideally, the most desired and stable genotypes for shelling percentage were genotypes 5,13,2,6 and genotype-12. Therefore, they could be grown under wide range of environments. Many investigators are agreement with Al-Kaddouss *et al.,* (2003) and Abd El-Raham (2016) for shelling percentage.

According to Tai (1971) method, the most average stable genotypes were genotype-11 and genotype-13 for shelling percentage. They exhibited 'α' values not deviated significantly from zero with 'λ' approached near unity. The tested genotypes were unstable.

Table (4): Phenotypic and genotypic stability for 100-seed weight and shelling percentage of fifteen peanut genotypes under eighteen environments.

Character Parameter genotypes	100-seed weight (%)					Shelling percentage %				
	X^-	b	S^2d	∂	λ	X^-	b	S^2d	∂	λ
Genotype-1	83.0	1.33*	11.4**	0.04	18.9*	71.8	1.01	14.1	-.02	15.7*
Genotype-2	84.5	0.89	12.5**	-001	21.3*	74.3	1.09	12.9	0.03	12.3*
Genotype-3	86.2	1.60**	28.32*	-0.03**	23.0*	71.6	0.99	22.1**	0.02	23.7*
Genotype-4	83.3	0.79	9.20	-0.14**	13.9*	76.3	1.31*	27.9**	0.07*	20.9*
Genotype-5	85.0	0.99	6.3	-0.3	10.1*	75.8	1.00	17.5	-0.002	23.1*
Genotype-6	91.6	0.87	9.5	-0.4	16.7*	73.8	0.96	10.9	-0.02	11.1*
Genotype-7	81.8	1.00	41.9**	-0.3	3.6	71.2	0.98	8.9	0.01	10.1*
Genotype-8	82.9	1.01	10.6	0.06	16.2*	70.9	1.99**	11.8	-.05*	13.1*
Genotype-9	84.9	1.15*	8.3	0.05	14.3*	63.3	1.07	15.1	0.02	16.3*
Genotype-10	83.3	0.99	14.3**	0.04	23.9*	71.1	0.78	19.3*	0.11*	21.1*
Genotype-11	85.9	0.97	17.8**	0.002	22.4*	71.2	0.96	7.9	-0.03	4.2
Genotype-12	89.9	0.91	23.5**	0.03	22.9*	73.1	1.17*	10.4	0.02	10.2*
Genotype-13	92.3	1.05	16.9**	-0.01	21.9*	74.7	1.15*	5.7	0.04	3.1
Genotype-14	90.8	0.90	19.5**	0.03	19.9*	74.4	0.89	21.6*	0.03	18.1*
Genotype-15	88.2	1.07	12.8**	0.07	14.5*	73.2	1.10	25.1**		24.2*
Grand mean	86.2					72.9				
L.S.D. 0.05	2.56					2.44				

Pod yield (ard/fed.)

Data of average mean (X^-) over environments, regression coefficient (b) each genotype and deviation mean square (S^2d) as well as grand mean (X^-G) for pod yitheld ard/fed. was shown in Table (5).

Eberhart and Russell (1966), suggested that both linear and non-linear component of G x E interactions should be used in jndging the stability of different genotype and described an ideal genotype as one with the highest yield over a wide range of environments, a regression coefficient of 1 and deviation mean squares of zero. Keeping this in view, the response as well as deviation from regression of each genotype were considered separately. The values of (b) differed in various genotypes Table (4) ranged from (0.3) for genotype-9 to (1.4) genotype-14, and deviated significant from unity (b>1) in peanut genotypes (4,6 and 14), hereby could be grown under favorable environments. Otherwise, the (b) value was significantly less than unity (b<1) in genotypes (1,9 and 15). Also, Hayward and Lawrence (1970) stated that the response to environment, as a measured by the regression parameter was found to be highly heritable and controlled by genes with additive effects.

Concerning, the deviation from regression 'S^2d' it was very small and not significantly deviation from zero to genotypes (2,5,6 and 10), which showed high dgree of stability for pod yield peanut Table (4). In this respect Eberhart and Russell (1966), a stable perforred variety (genotype) would have approximately b=1 and S^2d=0 and a high mean performance. However, Parada *et al.,* (1973) considered the square deviation from regression as a measure of stability, while the regression was regarded as a measure of response of a particular variety to environmental indices. In only time three stability parameters (X^-, b and S^2d), it can be see that, the most desired an stable genotypes were, (5, 10 and genotype-2).

Genotypic stability parameters was calculated as proposed by Tai (1971) who used a model that the linear response of genotypes to environmental effects (α) and the deviations from the linear response (λ) perfectly stable genotype was defined as one that has (α , λ) = (-1 , 1). A genotype of average stability has (α , λ) = (0 , 1), whereas that above average should have an estimate of α<0 , λ=1 and the values of α>=0 and λ=1 described as below average stable one. The distributions of the studied peanut genotypes with respect to their α and λ values are presented in Table (4) for pod yield ard/fed. in peanut genotypes. The obtained data revealed that the estimation of genotypic parameters statistic 'α' was not significantly different from α= 0 for all the studied genotypes of peanut, except for three genotypes i.e. (6,9 and genotyope-14). But parameter of λ for pod yield was significantly different from λ=1 for all genotypes peanut, except two genotypes (genotype-2 and genotype-10). The most average stable genotypes were showed in (genotype-2 and genotype-10) for pod yield ard/fed.

Oil percentage (%):

Estimates of phenotypic stability parameters Table (5) indicated that, the most adapted genotypes for improved environments were (genotype-4 and genotype-6) for oil percentage. However, genotypes (12,13 and 15) were studied to less favorable conditions. In the case of the insignificant 'b' value, the deviation from regression S^2d is considered the most appropriate criterion for measuring phenotypic stability, because it measures the predictability of genotypic reaction to various environments Backer *et al.*, (1982). It can be see that 'S^2d' was small and insignificant in genotypes (5,7,8,10 and 14) these genotypes were considered more stable. Otherwise the remaining peanut genotypes were sensitive ones. These results are in agreement with Al-Kaddouss *et al.*, (2003) and Rehab *et al.*, (2016).

Table (5): Phenotypic and genotypic stability for pod yield (ard/fed.) and oil percentage of fifteen peanut genotypes under eighteen environments.

Character Parameter genotypes	Pod yield (ard/fed.)					Oil percentage %				
	X^-	b	S^2d	∂	λ	X^-	B	S^2d	∂	λ
Genotype-1	22.3	0.8*	2.3**	-.01	19.2*	45.5	1.17	81.2**	0.01	4.0*
Genotype-2	23.4	0.9*	1.23	-.01	2.5	42.3	0.99	35.5*	0.003	0.09
Genotype-3	22.4	0.9*	2.01*	-.01	10.0*	47.1	1.34*	43.6**	0.04	1.6
Genotype-4	24.9	1.2*	3.3**	-0.001	18.8*	46.3	1.43*	25.4	0.04	3.1*
Genotype-5	24.3	1.1*	1.7	0.02	13.9*	46.4	1.11*	9.9	0.04	3.1*
Genotype-6	24.2	1.3*	1.6	0.10*	18.1*	46.3	1.42*	25.6*	0.04	3.6*
Genotype-7	23.4	0.9*	4..3**	-0.02	23.2*	47.0	1.11	-8.8	0.06*	5.9*
Genotype-8	22.8	1.1*	3.8**	0.04	27.3*	56.2	1.19	15.9	0.06*	3.7*
Genotype-9	21.7	0.3*	5.03**	-0.20*	8.5*	46.9	0.99	45.5**	0.01	1.7
Genotype-10	23.6	0.9*	0.58	-0.01	2.4	44.8	0.97	-9.3	-0.01	5.6*
Genotype-11	22.5	1.1*	2.3*	0.04	18.1*	43.5	0.84	26.6*	-0.03	3.2*
Genotype-12	23.02	1.1*	3.2**	0.02	23.3*	45.3	0.70*	43.8**	-0.04	1.9
Genotype-13	22.7	0.3	2.06*	-0.04	16.1*	45.7	0.69*	26.2*	-0.08*	5.1*
Genotype-14	24.4	1.4**	5.9**	0.11*	27.7*	44.3	0.98*	-6.9	-0.002	2.5*
Genotype-15	20.4	0.7*	3.4**	-0.07	13.4*	41.0	0.76*	42.3**	-0.05*	2.6*
Grand mean	23.1					45.8				
L.S.D. 0.05	1.15					2.09				

With regard to Tai's procedure that' α' and 'λ' values differ from genotype to another. As shown in Table (4), the most average stable peanut genotypes were (2,3,9 and 12). They exhibited 'α' values not deviated significantly from zero with 'λ' approached near unity.

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الثبات المظهري والوراثي لمحصول القرون ومكوناته في الفول السوداني تحت البيئات المختلفة في مصر

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ثبات اداء التراكيب الوراثية تحت البيئات المختلفة من أهم أهداف برامج التربية. لذلك تهدف هذه الدراسة لانتخاب التراكيب الوراثية التي تمتلك محصول القرون ونسبه الزيت العالي مع الثبات تحت البيئات المختلفة في مصر. تم تقييم ثبات خمسه عشر تركيبا وراثيا من الفول الوراثي لصفات محصول القرون ومكوناته تحت ثمانية عشر بيئة متباينة (ثلاث سنوات × ثلاث مواقع ×ميعادين للزراعه) .

وقد تم تقدير مكونات التباين للتراكيب الوراثية وتفاعلاتها مع البيئة وحساب قيم الثبات المظهري بطريقه ابراهارت وراسل (١٩٦٦) والوراثي بطريقه تاي (١٩٧١).

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلي:

أظهر التحليل التجميعي للبيانات وجود اختلافات عالية المعنوية بين التراكيب الوراثية والسنوات والمواقع ومواعيد الزراعة وكذلك تفاعلاتهم للصات المدروسة في معظم الحالات، وهذا يدل علي ضرورة تقييم التراكيب الوراثية المدروسة تحت بيئات متعددة.

أظهرت نتائج تحليل الثبات التفاعل بين التركيب الوراثي × البيئة (الخطي) كان معنويا للصفات المدروسة، موضحا تباين استجابة التراكيب الوراثية للتغيرات البيئية وكانت قيم التفاعل التركيب الوراثي × البيئة (الخطي) معنويه عند اختيارها أمام قيم الانحرافات الكلية لصفتي وزن ال١٠٠- بذره ومحصول القرون أردب/الفدان، مشيرا لإمكانية استخدام الانحدار الخطي والانحرافات عن خط الانحدار كمقياس لوصف ثبات التراكيب الوراثية لهذه الصفات.

أظهر تحليل الثبات المظهري تميز التراكيب الوراثية (٤ ،٦) بدرجه عالية من الأقلمة لظروف البيئات الملائمة لصفه محصول القرون أردب/الفدان ونسبه الزيت والتركيب الوراثي (١٤) لصفه محصول القرون أردب/الفدان.

كما أظهرت النتائج أن التراكيب الوراثية (٢،٥،١٠) أكثر التراكيب ثباتا تحت مدي واسع من البيئات المختلفة لصفه محصول القرون أردب/الفدان، التراكيب الوراثية (٢ و٥) لصفتي نسبه التصافي ومحصول القرون أردب/الفدان والتراكيب الوراثية (٥و٨) لصفتي وزن ال١٠٠- بذره ونسبه الزيت.

أظهرت مقاييس تحليل الثبات الوراثي أن أكثر التراكيب الوراثية ثباتا تحت مدي واسع من البيئات هي التراكيب الوراثية (٢و١٠) لصفه محصول القرون أردب/الفدان، والتركيب الوراثي (٧) لصفه وزن ال١٠٠ يذره، والتراكيب الوراثية (١١و١٣) لصفه نسبه التصافي، والتراكيب الوراثية (٩و١٢) لصفه نسبه الزيت.

اتضح خلال تلك الدراسة توافق نتائج مؤشرات الثبات المظهري والوراثي في وصف ثبات التراكيب الوراثية (٢و١٠) لصفه محصول القرون أردب/الفدان، والتركيب الوراثي (١٣) لصفه نسبه التصافي . ولذلك توصي هذه الدراسة باستخدام تلك التراكيب الوراثية في برامج التربية لتحسين ثبات محصول الفول السوداني تحت البيئات المختلفة.

تمثل هذه المعلومات قيمه كبيره لمربي الفول السوداني لاختيار التراكيب الوراثية الأكثر ثبات لزراعتها تحت ظروف البيئات المختلفة أو الظروف الجيدة أو البيئات الأقل تفضيلا للحصول علي محصول عالي من القرون ونسبه الزيت.