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PHENOTYPIC STABILITY IN PEANUT (*Arachis hypogaea* L.)

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ABSTRACT : Twenty five genotypes of groundnut that are of local origin were collected from various location in Ismailia and Sharkia governorate were evaluated in demonstrative field in Wadi El-Molaak village, Abu Hammad district, Sharkia Governorate using randomized – complete block design in three replicates during three summer growing seasons 1999, 2000 and 2001 respectively, using two sowing dates (early and late). The mean performance and stability parameters (phenotypic) for No. of pods/plant, No. of seeds/pod, 100- seed weight and seed yield ardab/fad. were computed using Eberhart and Russell (1966) formulae. The results revealed highly significant genotype × environment interaction for all studied characters. The variance due to environments (linear) were significantly different for all studied characters . The obtained results showed that the different genotypes responded differentially to the changing environments (sowing dates). The "b" value was either more or less than unity in all cases, except genotype 11 (No. of pods/plant and seed yield/plant), genotype No.25 (No. of seeds/pod and seed yield ardab/fad). Genotype 1 and 19 for 100- seed weight and seed yield ardab/fad. respectively, where the value "b" approached near unity and indicated average response of the fluctuating environmental conditions (stable) prevailed during the different sowing dates.

Genotypes vi 2 , 5 ,17 and 18 had the highest No. of pods/plant and 100-seed weight as compared to population mean. Also, entries 13,14,19 and 20 had the highest No. of seeds/pod over the grand

mean. Peanut genotypes 4,21,22 and 25 were the heaviest in 100 - seed weight as compared to the evaluated groundnut genotypes. At the time, groundnut genotypes 9 and 16 showed the highest seed yield ardab/fad over the population mean. These genotypes of peanut perform well under favourable conditions (early sowing date), since "b" values were more than unity. Genotype 6 gave the highest number of pods and seeds/pod as well as seeds yield ardab/fad., genotype 14 gave the highest number of pods/plant and seed yield. Groundnut entry 7 had the heaviest 100- seed weight and peanut genotypes 5, 13 and 20 showed the highest seed yield ardab/fad over population. The beforementioned peanut genotypes performed better under less favourable environments, since they had low "b" value.

These information are of great valuable for groundnut breeder to choose the suitable genotype for fluctuating environments (stable genotypes), favourable environments (early sowing date) and less favourable environments (late sowing date) to be cultivated to obtain higher seed yield and yield component of peanut .

INTRODUCTION

The ability of some genotypes to maintain a relatively uniform performance over a wide range of environments has long been appreciated. Phenotypically stable lines are of great significance for the crop like groundnut which is considered as an unpredicatable legume. Stable lines of groundnut are needed to be cultivated under various environments

Patel *et al.*, (1983) reported that since the yield potential of groundnut (*Arachis hypogaea* Linn) varies with the environment, a study was conducted to evaluate 10 promising spreading groundnut varieties in comparison with 'M13' to have average stability and high level of performance for pod yield . The analysis of variance revealed significant difference in pod yield among the varieties in both the years variety × environment interactions were highly significant. The varieties differed significantly for linear response to environmental effects and also for the deviation from linearity. The significant variety × environment (linear) interaction indicated that the differences among the regression coefficients pertaining coefficients on the environmental mean were real. The variance due to pooled deviations was also highly significant, indicating that the linear regression and the deviations from linearity were the major components for differences instability for seed yield among varieties.

No. 18' had higher mean performance than 'M13' and 'GAUG 10' during both the years. It had also average regression value during both the years, indicating good stability to environmental changes accompanied with high mean yield. This variety also record significant deviation from regression during both the years, indicating that the performance cannot be predicated. 'No. 34-2-2 and 'JSP1' responded well under unfavorable conditions and not so well under unfavorable conditions. and not so well under favorable conditions. All the varieties had average stability during both the years expect 'M13' and 'JSP1'. They had slightly low stability of 0.8616 and 0.8294 during the 2 years.

Patra and Mohanty, (1987) tested the cross-derivative 'OG 35-I', 'OG 9-2', OG 66-2', OG 49-I', 'OG 13-1', OG 71-3', Kisan and 3 checks 'TG3', 'AK12-24' and 'J11' in 7 different seasons at Chiplima, 'OG 35-1' 'OG 71-3', kisan and 'J11' of groundnut (*Arachis hypogaea* Linn) were found to be general adapters for yield 'OG 9-2' had an average stability but low yield, and showed adaptation to high-yielding environments as it gave high yield in the entries. 'OG 13-1' showed a below-average Stability (b>1.0) and performed better during the seasons when the environmental indices were higher. Rest of the entries were suitable during the seasons when the environmental indices were negative. The yield stability showed association with stability of shelling percentage, sound mature kernel percentage, 100-kernel weight, but more flexible association with mature, immature and tender pods/plant and pods/unit weight.

El- Hosary *et al.,* (1988) evaluated twelve promising varieties of groundnut (*Arachis hypogaea L.*) for stability of performance for pod yield over nine environments in Egypt. Highly significant coefficient was detected for genotype and genotype × environment interaction. Significant (bi) values were obtained for all genotypes and the slope of the regression lines did not deviate significantly for unity in the varieties L 404, L

447, NA 219, NA 297 and NA 299. The deviation from regression mean squares (s^2d) were significant for NA 128, NA 219, NA 242 and Giza 4 . The highest yielding genotypes were, L 447, NA 268, Giza 4 and L 262. The variety L 447 had average stability and high level of performance for pod yield and hence it seemed to be an ideal variety in the material under study.

Sanchez Dominguez (1991) evaluated 20 genotypes grown in Morelos during 1983-84. Analysis of 6 yield components indicated that H529 R15, Criollo de cuauchichinola (standard) Bachimba 22 and Guanajuato were the best genotypes, showing good stability and high pod yield over the 2- year period. Responding to favourable rainfall (954mm) during 1984, Criollo de Tlatenango and Virginia Bunch 46-2 gave the highest yield (around 1 t/ha).

Senapati and Roy, (1991). Derived information on stability from data on yield / plant and days to maturity in 51 groundnut genotypes of the bunch type from diverse sources (ICRISAT, Syria and Junagadh and orissa India) grown under 4 environments (Kharif / 1987 and 1988 and rabi 1988 and 1989) at Kayani, India. The genotypes JL 245, ICGV 87123, ICGV 86006 and ICGV 87170 were the most promising for West Bengal conditions.

Fundora *et al.*, (1993) in Cuba selected a total of 22 germplasms (11 foreign and 11 local) these genotypes were entered into breeding program. An additional 32 germplasms individually selected for their high productivity were also included. The accessions were evaluated in zonal trials under different environmental conditions and different sowing distances between plants. Peanut cultivar Cascaja Rosado was used as the control. For all the selected 22 germplasms, adaptability coefficients were near to one. Zenit, NTZKIT. CEMSA and Bombay genotypes had the greatest adaptability response to environment. Zenit had the highest mean pod yield in any environment and was classed as the most stable variety. Seed yield was correlated with pod yield of the locol germplasms, P503r, P259, P504c, P697 and P488c were considered highly stable and high mean pod yields. Zenit and P504c (VC crema 504) are recommended for extensive cultivation for the oil extraction and confectionery industries.

Further Zonal trials with the 22 germplasms tested are recommended to establish stability across different environments.

Varman and Manoharan, (1993) derived stability parameters for dry pod yield and 3 related traits in 10 genotypes of *Arachis hypogaea* over 4 location in India (Aliyarnagar, paiyur, Vellore and Vriddhachalam) during the 1985 dry season. Genotype × environment interaction was not significant for pod yield. VG exhibited high mean performance for all traits. JL 24, VG 55 and J1 were stable for shelling percentage, 100-pod weight and 100- seed weight, respectively.

Sojitra and Pethani, (1994) evaluated 29 genotypes of bunch peanut for adaptability in 2 location with 2 different sowing dates. Variation was significant for pod yield among genotypes and environments. Genotype × environment interaction was significant as were the linear and nonlinear components of genotype × environment interaction. Most of the genotypes were responsive to fluctuations in agroclimatic conditions. High yielding genotype J (E) had wide adaptability over all the environments. It had a high pod yield (13.0g/plant), average responsiveness and stable nature. It was suggested that high pod yield coupled with high responsiveness resulted in instability while medium yield and medium response led to greater stability .

Singh and Sohu, (1995) determined the stability of two groundnut (*Arachis hypogaea*) multilines together with their four respective component lines over 12 unilocational environments (with 3 sowing dates and 4 planting densities) during kharif 1992. The multilines were derived from 2 crosses (multiline 1from M 145 × NcAc 1107 and multiline 2 from M37 × NcAc 1707) in the F8 generations by compositing equal proportions of seed from four phenotypically similar sib-lines. Genotype × environment interactions were highly significant for pod yield. The multilines were stable across environments, but some component lines (pure lines) were superior in pod yield and were also as stable as the multilines themselves.

The main targets of this research work are to evaluate 20 groundnut ecotypes and 5 check cultivars in 6 environments (3 seasons × 2 sowing dates) from point of view of their phenotypic stability according to the method outlined by Eberhart and Russell (1966) for seed yield and yield components in peanut (*Arachis hypogaea* L.) during three summer seasons of 1999, 2000 and 2001.

MATERIALS AND METHODS

Six field experiments were carried out during three summer successive growing seasons, i.e., 1999, 2000 and 2001 at Wadi El-Molaak Village, Abou Hammad district, Sharkia Governorate to investigate stability of 25 local ecotypes and checks of peanut (*Arachis hypogaea* L.).

1- Plant materials and experimental design.

Twenty peanut ecotypes were collected from different places in Sharkia and Ismailia Governorates and 5 peanut genotypes were obtained from Agriculture Research Center (A. R. C.) to be employed as check for comparison. Seeds were sown in

two sowing dates i.e., early (10^{th},May) and. late (30^{th}, May) in rows. Row length was 4m, row to row and plant to plant spacings were 60 cm and 25 cm, respectively. Table (1) show location and source of the studied peanut ecotypes.

The studied genotypes were randomly distributed in each replicate, using randomized complete block design with three replications in each sowing date and season.

The recommended agricultural practices for peanut production were performed at the proper time.

Collected data :

Seed yield and yield components:

a. Single plant observations :

Ten guarded and competitive plants were randomly taken from each plot in every replicate to determine the following characters :

1- Number of seeds/pods : were estimated as counted number of seeds of 10 random pods and obtained an average mean.

2- Number of pods/plant : were counted for 10 guarded and competitive plants and then number of pods was calculated as an average mean.

3- Weight of 100-seed (g): two random samples each of 100 seeds were counted and weighed on electric balance in grams and the difference between them did not exceed

Table (1) : Location and source of the studied peanut ecotypes .

Ecotypes entries	Location or village	Source	Growth habit
1	Zagazig	Sharkia	Spreading
2	Al-Ekhewa	Sharkia	Spreading
3	Abu-Aggwa	Sharkia	Spreading
4	El-Hefinia	Sharkia	Spreading
5	El-Thminin	Sharkia	Spreading
6	El-Horea	Sharkia	Spreading
7	Abu-Ezbawei	Sharkia	Spreading
8	Deeps	Sharkia	Spreading
9	El-Esdea	Sharkia	Spreading
10	Shetealea	Sharkia	Spreading
11	El-Manaif	Ismailia	Spreading
12	7-Abaar	Ismailia	Spreading
13	Gameatt-El Salam	Ismailia	Spreading
14	El-Baalwaa	Ismailia	Spreading
15	Village 1	Ismailia	Spreading
16	Village 2	Ismailia	Spreading
17	Village 3	Ismailia	Spreading
18	Village 6	Ismailia	Spreading
19	Village 8	Ismailia	Spreading
20	Village 9	Ismailia	Spreading
21	Giza 4	A.R.C	Spreading
22	Giza 5	A.R.C	Bunch
23	Giza 6	A.R.C	Bunch
24	R.C.	A.R.C	Bunch
25	N.C.	A.R.C	Bunch

3% and the mean of them was calculated .

b. Plot area observation:

Seed yield ardab/fad. : was determined using four inner rows to estimate seed yield ardab/fad.

Statistical analysis :

1. Mean performance (X) : the collected data were subjected to the convential two way analysis of variance for each sowing date in every season according to (Steel and Torrie (1980). The differences among the studied peanut genotypes were tested using least significant difference (L.S.D.).

Stability analysis :

The twenty five peanut genotypes were evaluated under 6 environments. The environments are two sowing dates (early and late sowing dates) in three growing seasons i.e., 1999, 2000 and 2001.

Seed yield ardab/fad. and its component i.e., No. of pods/plant, No. of seeds/pod and 100-seed weight were assessed to estimate the stability parameters for comparing genotypes using the method Eberhart and Russell (1966).

This method depends upon the regression of each genotype on the environmental index coupled with square deviations from regression value would give an estimates of the desired stability parameters. The valuable genotype could be defined as the one which perform well under wide range of environmental conditions.

RESULTS AND DISCUSSION

Genotype (G) – environment (E) interactions are one of the main problems that face the breeder and stand against obtaining reliable estimate of the real performance of genotype. GXE is the differential response of genotypes when grown in various environments, arising from interplay of genetic and non-genetic effects on development of the plant. Thus, the phenotypic response to change in the environment is not the same for all genotypes . This makes it difficult for the breeder to decide which genotype should be selected, hence, it will reduce the efficiency of selection (Comostock and Moll, 1963).

The main objective for the majority of breeding programs is to select genotypes which perform consistently over a wide range of environments i.e., the genotypes which show stability. It is, there fore, of importance for the breeder to quantify and estimate the (G×E) component and to characters each genotype according to its environmental response. The analysis of variance was developed to estimate the (G×E) component and provide information on its existence, but it gives no measurement of the individual response of the genotype.

G×E reduces association between phenotypic and genotypic values and may cause selection from one environment to perform poorly in another, forcing plant breeders to examine genotypes adaptation. Measuring G×E is also important to determine an optimum breeding strategy for releasing genotypes with adequate adaptation to target environments. Characterizing and quantifing each genotype as a problem had been studied by many plant breeders ; Finlay and Wilkinson(1963) used modified regression technique of Yates and Cochran (1938) , they compared a number of barley varieties in several sites for several seasons. This approach was developed further by Eberhart and Russell (1966), where they used the slope of the regression lines and the sum of the deviations from regression parameter to describe the relative sensitivity of a genotype to environment (stability).

In this respect the method Eberhart and Russell (1966) has been employed in the present study in order to ascertain whether any portion of the interaction sum of squares was of predictive value. As shown in Table (2) pooled analysis of variance revealed that the mean squares among the groundnut genotypes (G) were highly significant for number of seeds/pod, 100-seed weight and seed yield ardab/fad. Highly significant G×E interaction were observed for all studied characters, suggesting that yield and yield components in groundnut genotypes are influenced by changes in environments. The variance due to environments (linear) were significantly different for all studied characters, indicating that the response to environments was genetically controlled. Genotypes × environments interaction (linear) component of variation of stability, were , also significant for all studied characters, except 100-seed weight, revealing the differential response of the genotypes to various agro-climats. The obtained results showed,

Table (2) : variance due to stability parameters for seed yield (ardab/fad.) and yield components in 25 groundnut Genotypes.

	d. f.	No. of pods/plant	No. of seeds/pod	100-seed weight (g)	Seed yield ardb/fad
Source	d.f.	$M.S_1$	$M.S_2$	$M.S_3$	$M.S_4$
Genotypes (G)	24	9.153	0.028**	6.455	0.744*
Environment (E)	5	237.26**	0.34**	137.33**	3.57**
G × E	120	18.89**	0.014**	18.18**	0.22**
Environment + (G ×E)	125	27.629**	0.2567**	22.94352	0.40542744
Environment (linear)	1	1186.3**	1.70**	686.67**	1.77073**
E × G (linear)	25	23.462*	0.0154*	14.798	0.315908**
Poold diviation	100	17.043**	0.01304**	18.2613**	0.4101**
Genotype 1	4	14.19**	0.024**	6.4025	0.4425**
Genotype 2	4	4.83**	0.006	2.65	0.0625
Genotype 3	4	6.043**	0.00625	6.995	0.41**
Genotype 4	4	14.018**	0.0045	13.22**	0.23**
Genotype 5	4	17.075**	0.0355**	15.36**	0.40**
Genotype 6	4	27.153**	0.02325**	25.4125**	0.5725**
Genotype 7	4	27.605**	0.0185**	7.595	0.2475**
Genotype 8	4	11.49**	0.006	35.0875**	0.39**
Genotype 9	4	59.018**	0.02325**	8.3625*	0.755**
Genotype 10	4	3.4825**	0.005	6.1675**	0.3325**
Genotype 11	4	4.08**	0.0165**	16.1675**	0.2825**
Genotype 12	4	10.425**	0.013*	24.6825**	0.9175**
Genotype 13	4	8.9775**	0.00575	21.37**	0.33**
Genotype 14	4	30.0425**	0.00925	24.92**	0.830**
Genotype 15	4	23.54**	0.00925	11.7475**	0.1125**
Genotype 16	4	7.695**	0.01025	16.58**	0.1875**
Genotype 17	4	21.3425**	0.00475	31.48**	0.8125**
Genotype 18	4	8.265**	0.01425*	35.8625**	0.2825**
Genotype 19	4	25.495**	0.00625	13.15**	0.310**
Genotype 20	4	9.9425**	0.010	15.7175**	0.5125**
Genotype 21	4	7.3625**	0.01	14.15**	0.1375**
Genotype 22	4	7.92**	0.003	50.9025**	0.1425**
Genotype 23	4	10.315**	0.0015	9.15*	0.1525**
Genotype 24	4	41.37325**	0.03975**	33.9575**	0.8925**
Genotype 25	4	24.39**	0.02025**	9.575*	0.5075**
Pooled	300	0.806667	0.00533	3.80	0.036667

highly significant variation for pooled deviation in correct to all characters, demonstrating that the major components different for stability were due to deviation from the linear function. The significance of genotype × sowing dates interaction agree with those of Patel *et al.*, (1983), Patra and Mohanty (1987) and El Hosary *et al.*, (1988).

Finaly and Wilkinson (1963) considered linear regression slopes as a measure of stability . Eberhart and Russell (1966) , suggested that linear and non -linear component of G×E interaction should be used in judging the stability of different varieties and described an ideal variety as one with the highest yield over a wide range of environments, a regression coefficient of 1 and deviation mean squares of Zero . Paroda and Hayes (1971) , suggested that the linear regression represent only a measure of response of certain genotype and concluded that genotypes with the lowest deviation (s^2d) around regression line are most stable. Taking this in consideration, the response as well as deviation from regression of each genotype were discussed separately. The values of (b) differed in various genotypes (Table,3).The different genotypes responsed differentially to the changing environments (sowing dates). The "b" value was either more or less than unity in all cases, except genotype 11 and 25 for No. of pods/plant and seed yield ardab/fad.; Genotypes 1 and 19 for seed yield ardab/fad. and 100-seed weigh, Where the value of "b" approached near unity and indicated average response to the fluctuating environmental conditions prevailed stable during the different sowing dates over years. Genotypes vi 2, 5 , 17, and 18 had the highest No. of pods/plant and 100-seed weight among the tested genotypes, as they had high mean of pods over the population average mean of pods/plant (51.6). Groundnut genotypes 13,14,19 and 20 had the highest No. of pods/plant; 7 for No. of seeds/pod; 4,21,22 and 25 for 100-seed weight and genotypes 9 and 16 for seed yield ardab/fad. These genotypes are suitable especially for favourable growing seasons as they had high "b" value (b>1) .Genotype number 6 gave the highest values over population mean for No. of pods/plant, No. of seeds/pod and seed yield ardab/fad., meanwhile genotypes 21 and 14 gave the highest values

Table (3) : Stability parameters for number of pods/plant, number of seeds/pod, 100-seeds weight (g) aud seed yield ardab/fad. for 25 genotypes of peanut during 6 sowing dates in three successive seasons at Wadi El Molaak village, Abou Hammad distract, Sharkia governorate.

	No. of pods / plant			No. of seeds / pod			100-seed weight (g)			Seed yield / fad (ard)		
	$\overline{X}$	b	Sd^2	$\overline{X}$	b	Sd^2	$\overline{X}$	b	Sd^2	$\overline{X}$	b	Sd^2
1	51.2	1.342	13.381	1.9	2.136	0.019	62.2	1.260	2.602	10.4	2.18	0.406
2	49.1	-1.093	4.023	1.9	1.080	0.0007	58.7	1.063	-1.151	9.9	2.48	0.026
3	50.4	3.240	5.236	1.9	1.644	0.210	56.6	0.485	3.194	10.2	0.79	0.373
4	49.9	1.611	13.210	1.9	2.208	-0.0008	61.6	1.167	9.420	10.4	2.71	0.193
5	53.1	2.593	16.269	1.8	1.112	0.030	61.6	1.589	11.561	10.5	-2.59	0.363
6	53.9	0.500	26.346	2.0	-0.016	0.018	59.3	0.938	21.614	10.7	0.23	0.536
7	50.8	1.197	26.797	2.0	2.420	0.013	60.7	-1.158	3.795	10.3	0.92	0.211
8	49.6	0.007	10.683	1.9	0.384	0.0007	57.1	0.428	31.288	10.3	2.99	0.353
9	50.3	-1.223	58.210	1.8	1.300	0.018	61.8	0.914	4.561	10.5	2.52	0.718
10	48.7	2.088	2.676	1.9	1.456	-0.0003	57.7	1.833	2.367	9.9	-1.29	0.296
11	55.2	0.604	3.272	2.0	0.540	0.011	58.8	0.963	12.234	10.7	1.21	0.246
12	47.4	-0.612	9.619	1.8	0.352	0.008	56.9	2.380	20.881	10.1	2.81	0.881
13	54.7	1.220	8.170	1.9	1.612	0.0004	60.2	0.299	17.569	10.8	-1.16	0.293
14	54.9	3.792	29.235	1.9	0.360	0.004	69.5	0.270	21.121	10.7	-1.15	0.793
15	50.0	-0.456	22.734	1.8	1.120	0.004	60.1	1.828	7.945	10.3	3.84	0.076
16	49.5	-1.878	6.887	1.8	0.680	0.005	58.7	1.805	12.780	10.5	3.34	2.881
17	52.9	3.658	20.536	1.9	0.916	-0.0006	61.9	1.829	27.680	10.4	-1.04	0.776
18	52.7	1.850	7.458	1.9	0.360	0.009	62.4	1.624	32.062	10.3	0.59	0.246
19	58.9	1.699	24.687	2.0	2.216	0.0009	56.3	-0.341	9.349	11.6	1.20	0.273
20	54.3	4.047	9.136	2.3	-0.720	0.005	60.2	1.435	11.917	10.6	0.18	0.476
21	53.7	-0.716	6.556	1.9	0.720	0.005	62.9	2.139	10.350	10.6	0.52	0.101
22	49.9	0.021	7.112	2.0	-0.180	0.002	60.8	1.271	47.102	10.2	-0.88	0.106
23	49.4	1.288	9.508	1.9	0.936	-.004	63.9	0.509	5.350	9.9	2. 14	2.483
24	46.6	-0.339	40.567	1.9	1.072	0.034	59.3	0.639	30.157	10.0	1.17	0.855
25	54.2	0.702	23.583	2.0	1.040	0.015	63.6	1.471	5.775	10.7	1.37	0.471
$\overline{X}G$	51.6			1.9			60.5			10.4		

for 100-seed weight and seed yield ardab/fad. These genotypes performed better especially under less favourable conditions for all growing seasons as reflected by low "b" value.

Groundnut genotypes 11 and 22 recorded the highest number of seeds/pod over the grand mean (1.9). Genotypes; 25 gave the highest No. of pods/plant, 7 (heaviest 100-seed weight) and 5,13 and 20 gave the highest seed yield ardab/fad. indicating that these genotypes are fitted, in this case, for less favourable sowing dates as they had low "b" value (b>1) . Genotypes 20,11 and 6 performed better under less favourable environments as "b" value was less than unity. These results are in accordance to Patel *et al*., (1983), Patra and Mohanty (1987), El- Hosary *et al*., (1988) and sojitra and Pethani (1994).

These information are of great attention for the peanut breeder to choose the suitable genotype for fluctuating environment, favourable environments (suitable sowing dates) and less favourable environments (late sowing date) to be cultivated to obtain higher seed yield and yield component of peanut.

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الثبـات المظهـري في الفـول السـوداني

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تم تقييم خمسة وعشرون تركيباً وراثياً من الفول السوداني مـن منـاطق مختلفـة فـي محافظتي الإسماعيلية والشرقية منها خمسة تراكيب وراثية من مركز البحوث الزراعيـة للمقارنة وذلك باستخدام تصميم القطاعات الكاملة العشوائية خلال ثلاث مواسم صيفية هي ١٩٩٩ ، ٢٠٠٠ ، ٢٠٠١ على التوالي وذلك باستخدام ميعادين للزراعة (مبكر ومتأخر) . ولقد تم تقـدير متوسـط السلوك ومقاييس الثبات المظهرى للمحصول ومكوناته لصـفات عـدد القـرون للنبـات وعـدد البذور/القرن، ووزن ١٠٠ بذرة ومحصول البذور أردب للفدان وأستخدمت طريقة إيبرهارت وراسل (١٩٦٦) لتقدير الثبات المظهرى. وأشارت النتائج إلى وجود إختلافات معنوية جداً بالنسبة للتفاعل بين التركيب الوراثى × البيئة لكل الصفات تحت الدراسة. ولقد كان التباين الراجع للبيئات (خطى) معنوياً لكل الصفات .

وكذلك أوضحت النتائج المتحصل عليها ان التراكيب الوراثية المختلفة إستجابت بصور مختلفة للبيئات المتغيرة (مواعيد الزراعة). وكان قيم معامل الإنحدار إما أكثر أو أقل من الوحدة فى كـل الحالات ، ما عدا التركيب الوراثى ١١ (عدد القرون/النبـات ومحصـول البـذور أردب/فـدان) ؛ والتركيب الوراثى رقم ٢٥ (عدد البـذور/القـرن ووزن ١٠٠ بـذرة بالإضـافة إلـى محصـول البذور/اردب فدان ، والتركيب الوراثى ١، ١٩ بالنسبة لمحصول البذور أردب/فدان، حيث ان قيمة معامل الإنحدار "b" قاربت إلى الوحدة وأشارت إلى إستجابة متوسطة للظـروف البيئيـة المتغيـرة (الثبات) السائدة خلال مواعيد الزراعة المختلفة.

ولقد أظهرت التراكيب الوراثية ٥، ١٨،١٧ ، ١٩ أعلى متوسط لعدد القرون/نبات ووزن الـ ١٠٠ بذرة بالمقارنة بمتوسط العشيرة ، وايضا نجد ان التراكيب الوراثية رقـم ١٣ ، ١٤ ، ١٩ ، ٢٠ أعطت اعلى عدد من البذور/قرن بالمقارنة بالمتوسط العام ونجد ان التراكيب الوراثية للفـول السودانى ٢١ ، ٢٢ ، ٢٥ كانت ذات أثقل وزن للمائة بذرة بالمقارنة بالتراكيب الوراثية التى تـم تقييمها . وفى نفس الوقت فإن التراكيب الوراثية ٩ ، ١٦ أوضحت أعلى متوسط لمحصول البذور اردب/ فدان عن متوسط العشيرة تحت الدراسة . وهذه التراكيب الوراثية للصفات المختلفـة فـى الفول السودانى تستجيب جيداً تحت الظروف المفضلة (ميعاد الزراعة المبكر) وذلك لأن قيمة معامل الإنحدار"b" كانت أعلى من الوحدة .

أعطى التركيب الوراثى رقم ٦ أعلى عدد من القرون/النبات وكذلك عدد بذور القرن ومحصول البذور أردب/فدان. وأعطى التركيبان الوراثيان رقم ١٤ ، ٢١ أعلى عدد من القرون/النبات وكذلك أعلى محصول للبذور أردب/فدان. ولقد أعطت التراكيب الوراثية ٧ (أثقـل وزن للمائـة بـذرة) ، والتراكيب ٥ ، ١٣ ، ٢٠ أعلى محصول بذور أردب/فدان عن متوسط العشيرة.

ولقد استجابت التراكيب الوراثية المذكورة سابقاً تحت ظروف البيئية الأقل (ميعاد الزراعة المتأخر) ، ذلك لأنها أعطت قيمة أقل من الوحدة لمعامل الإنحدار "b" .

هذه المعلومات ذات قيمة كبيرة لمربى الفول السودانى لإختيار التراكيـب الوراثيـة للبيئـات المتغيرة (التراكيب الوراثية الثابتة) ، والظروف البيئية المفضلة (ميعاد الزراعة المبكر) والبيئات الأقل تفضيلا (ميعاد الزراعة المتأخر) حتى يمكن زراعتها (للحصول على محصول عالى من البذور ومكوناته فى الفول السودانى).