# GENOTYPE – ENVIRONMENT INTERACTION AND PHENOTYPIC STABILITY ANALYSES OF STRAW YIELD IN FLAX *(LINUM USITATISSMUM* L., )

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## *Abstract*

The material used for the present study consists of twelve flax genotypes viz Giza 8 Sakha1, Sakha2,Sakha3, Marlin, Escalina, S.533/39/5/11, S420/140/5/11, S.413/1/3/2, S.426/32/6/5, S.435/11/10/3 and S.421/3/6/5. They were evaluated over 12 environments, (two locations i.e., Etay El-Baroud Res. Station, Behera governorate and El-Gemmeiza Res. Station, Gharbia governorate),in three sowing date, in two seasons. The first experiment with the sowing data on October 25$^{th}$, the second one was occurred on November 10$^{th}$ (control) and the third trial was sown oin November 25$^{th}$ in two seasons, (2006/07) and (2007/08). The study was carried out using a randomized complete blocks design (RCBD), and stability parameters were estimated for

Straw yield. The data of mean squares showed that the environmental effects were more important than genotypes and environment x genotype interaction effects on straw yield of flax. The Genotype , S 421 / 3 / 6 / 5 would considered as adapted genotype across a wide range of environments with respect to straw yield also the varieties, Sakha 2, Sakha 3 and Scalina considered as stable genotypes across a wide range of environments. The line, S 436/3/6/5 considered as adapted genotype. The genotypes, Sakha1, Marlin and S 533/39/5/11 were more sensitive to any change in the environment and considered as haigh-yielding environments and the genotypes, Giza 8, S 420/140/5/11, S 413/1/3/2, S 426/32/6/5 and S 435/11/10/3 appeared to be more adapted to poorer environments.

## INTRODUCTION

Flax *(Linum usitatissimum* L.) is grown in Egypt as a dual purpose field crop. It is cultivated as oil crop in some regions, while and in Mediterranean region it is grown as a dual purposes crop for either fibers extracting from stem by retting and obtain oil from seeds by pressing. The long fine fibers are used in textile manufacturing for making clothes and the shortest ones are used in making twins, ropes, good paper and cigar filters. The fresh linseed oil used as edible for human and in some medical proposes. After boiling, it is used in many industries such as paints, inks, and varnish.

In Egypt during the last few years, new varieties characterized by high yield ability and good quality have bean related in addition to improve different agricultural practices for this crop. With respect to varieties differences, Abdel-Fatah (1994) and kineber (1994) showed that, straw and seed yields as well as its components differed significantly among flax cultivars Chloupek,and Hrstkova (2005), El-Kady *et. al.* (1995), Kineber *and* El-Kady (1996), reported that genotypes differed significantly in all characters of flax.

Knowledge of genotype-environmental (G-E) interaction can help plant breeders to reduce the cost of extensive genotype evaluation by eliminating unnecessary testing sites (Shafii et al. 1992, Kang and Magari 1996, Basford and Cooper 1998). Conversely, the presence of a large G-E interaction may necessitate the establishment of additional testing sites. Hence, if cultivars are being selected for a large group of environments, stability and mean yield across all environments and genotypes (Piepho 1996). Several methods have been proposed to analyses G-E interactions or phenotypic stability (Lin et al. 1986, Becker and Leon 1988, Piepho 1998, Truberg and Huhn 2000). These methods can be divided into two major groups, univariate and multivariate stability statistics (Lin et al. 1986). Joint regression is the most popular among the univariate methods because of its simplicity of calculation and application (Becker and Leon 1988).Joint regression provides a conceptual model for genotypic stability (Becker and Leon 1988, Romagosa and Fax (1993) and. Kang,. and R.Magari (1996). The regression of the yield of individual genotype on environment mean yields is determined. The G-E interaction from analysis of variance is partitioned into heterogeneity of regression coefficients (bi) and the sum of deviations (Es2di) from regressions. Finlay and Wilkinson (1963) defined a genotype with coefficient of regression equal to zero (bi = 0) as stable, while Eberhart and Russell (1966) defined a genotype with bi = 1 to be stable. Most biometricians consider S2di as stability parameter rather than bi (Eberhart and Russell 1966, Becker and Leon 1988). According to the joint regression model, a stable variety is one with a high mean yield, bi = 1 and S2di = 0 (Eberhart and Russel 1966).

The objectives of the present study were to assess genotype – environment interaction and to determine stable genotypes according to stability parameters.

## MATERIALS AND METHODS

Three Field experiments were curried out in 2006/07 and 2007/08 season at two locations, Etay-El-baroud and Gemmeiza Agricultural Research Stations. Twelve linseed genotypes were evaluated in three sowing dates i.e., $25^{th}$ October, $25^{th}$ November and $25^{th}$ December in each season and location. The pedigree of the genotypes is listed in Table (1).

Table 1.The pedigree of the genotypes

| No | Genotype | Pedigree |
|---|---|---|
| 1 | Giza 8 | Giza 6x Santa Catalina (by Fiber Crop Research Section, A.R.C). |
| 2 | Sakha 1 | Bombay x I. 1485 (by Fiber Crop Research Section, A.R.C). |
| 3 | Sakha 2 | Hera x I. 2348 (by Fiber Crop Research Section, A.R.C). |
| 4 | Sakha 3 | Belinka (2 E) x I. 2096( by Fiber Crop Research Section, A.R.C). |
| 5 | Marlin | Imported cultivar (Netherlands-origin) |
| 6 | Escalena | Imported cultivar (Belgium-origin ) |
| 7 | S. 533/39/5/11 | S. 420/140/5/10 x Bombay (by Fiber Crop Research Section, A.R.C). |
| 8 | S. 420/140/5/11 | S. 162/12 x Bombay (by Fiber Crop Research Section, A.R.C). |
| 9 | S. 413/1/3/2 | S. 5282/1 x S. 40/9 (by Fiber Crop Research Section, A.R.C). |
| 10 | S. 426/32/6/5 | S. 2465/2 x S. 105/2 (by Fiber Crop Research Section, A.R.C). |
| 11 | S. 435/11/10/3 | S. 162/12 x S. 2467/1 (by Fiber Crop Research Section, A.R.C). |
| 12 | S. 421/3/6/5 | S. 162/12 x S 6/2 ( by Fiber Crop Research Section, A.R.C). |

Table 2. Monthly temperature and relative humidity during the two seasons at Itay El-Baroud location.

| Season | 2006/07 Temperature °C | | | Relative Humidity % | 2007/08 Temperature °C | | | Relative Humidity % |
|---|---|---|---|---|---|---|---|---|
| Month | Max. | Min. | Mean | | Max. | Min. | Mean | |
| October | 28.3 | 14.90 | 21.60 | 69 | 28.00 | 14.10 | 12.5 | 70 |
| November | 25.20 | 11.50 | 18.35 | 72 | 26.50 | 12.10 | 19.30 | 69 |
| December | 20.70 | 8.30 | 14.50 | 75 | 19.80 | 10.20 | 15.00 | 69 |
| January | 17.30 | 7.30 | 12.30 | 63 | 21.20 | 10.80 | 16.00 | 65 |
| February | 19.60 | 7.45 | 13.53 | 65 | 23.00 | 9.10 | 16.05 | 62 |
| March | 22.40 | 7.90 | 15.15 | 60 | 25.30 | 9.90 | 17.60 | 55 |
| April | 25.30 | 11.60 | 18.45 | 53 | 29.30 | 12.30 | 20.80 | 53 |
| May | 29.30 | 14.10 | 21.70 | 50 | 31.00 | 16.00 | 23.50 | 52 |

Table 3. Monthly temperature and relative humidity during the two seasons at El-Gemmeiza location.

| Seasons | 2006/07 | | | Relative Humidity% | 2007/08 | | | Relative Humidity% |
|---|---|---|---|---|---|---|---|---|
| | Temperature °C | | | | Temperature °C | | | |
| Months | Maxi. | Mini. | Mean | | Maxi. | Mini. | Mean | |
| October | 29.50 | 13.20 | 21.35 | 71 | 29.00 | 13.50 | 21.25 | 72 |
| November | 26.00 | 12.20 | 19.10 | 75 | 26.30 | 12.90 | 19.6 | 77 |
| December | 23.80 | 9.10 | 16.45 | 75 | 25.00 | 10.10 | 17.55 | 76 |
| January | 19.00 | 8.00 | 13.50 | 72 | 21.00 | 12.20 | 16.60 | 71 |
| February | 22.00 | 7.50 | 14.75 | 72 | 24.30 | 9.80 | 17.05 | 70 |
| March | 25.30 | 9.90 | 17.60 | 70 | 26.50 | 10.20 | 18.35 | 69 |
| April | 27.00 | 10.50 | 18.75 | 65 | 29.00 | 12.00 | 20.50 | 65 |
| May | 31.00 | 14.20 | 22.60 | 64 | 32.10 | 15.00 | 23.55 | 65 |

Each Experiment was arranged in a randomized complete block design (RCBD ) with four replications. Plot area was 6 m2 and all recommended cultural practices for growing flax were applied . Data of Straw yield were subjected to proper statistical analysis of RCBD according to the method described by Snedecor and Cochran, 1981. Means were tested by LSD at 0.05 level of significance according to Waller and Duncan, 1969. Combined analysis of the two seasons over two locations was done according to the procedure outline by Le-Clergy et al., 1966

## RESULTS AND DISCUSSION

The data presented in Table (4) revealed that straw yield of twelve Linseed genotypes varied among environments ranged from 4.36 ton/fed., for the environment S1L1D3 to 4.70 ton/fed for the environment S2L2D1. The wide range of environmental index (EI) for straw yield was -0.188 to + 0.135 ,that indicated significant variation between environments. The environmental index covered a wide range and displayed a good distribution within the range. Therefore, the assumption for stability analysis is fulfilled (Mather and Calgari, 1974 and Becker and Leon, (1988). The same results could be observed with respect to Sakha 1, Sakha 2, Sakha 3 and Escalina varieties which considered as the most desired varieties occupies the most areas cultivated by high production of linseed varieties, However, Escalina variety had the widest range of environmental indices ( -0.609 to + 0.631 ) followed by Sakha 3 (-0.196 to + 0.284 ), while Marline variety had the closest one ( -0.169 to + 0.131 ) followed by Giza 8 ( -0.163 to + 0.137 ) as shown in Table (4).

The environmental indices were negative for all environments In the latest sowing date at two locations in both seasons with some few exceptions i.e., at (Gemmeiza) in the first season for the varieties, Sakha 3 , Escalina in the second season onely for the variety Escalina where the environmental indices were positive. This indicates that the latest sowing date had unfavorable condition for straw yield production of these genotypes. On the other hand, the environmental indices were positive for all environments either in the first or in the second sowing date at the two locations with the exception of Escalina variety when sown at the first location (Etay-EL-Baroud) that indicating the favorable condition of the both sowing dates for high straw yielding ability of the crop in that area. However, it seems to be that the first location (Etay-EL-Baroud)was not favorable for the variety , Escalina .These results agreed with those reported by Denis *et. al.* (1997), Abo-Kaied (2002), Adugna and labuschagne (2002) and Abo-kaid *et. al.* (2007).

The combined analysis of variance (Table 5) showed that the mean squares of environments, genotypes and their interactions were highly significant ( $p < 0.01$ ). The environments were the most important source of variation, explaining 90.62 % of the variance in straw yield, followed by the genotypes (6.98 %) and the interaction of G × E (2.40%). The large environments mean square showed that the influence of environmental effects on mean straw yield is more important than the mean differences in genotypes and by far greater is important than ( G x E ) interaction. However, the significance of environments mean square provide a sufficient range of environments and hence validating of environmental requirements suggested as by Eberhart and Russell (1966).

The presence G x E interaction indicates that certain genotypes tended to rank differently in straw yield at different environments.

Analysis of variance for phenotypic stability (Table 6) revealed that linear component of variation was highly significant for straw yield/fed , indicating that the differences among the regression coefficients pertaining to various linseed genotypes on the environmental mean were real.The linear proportion of variance represented 98.17 % from the total variance (linear and non-linear components). This would indicate that the major component of differences in stability was due to the linear regression and not to be the deviation from that linearity. Therefore, the predications of G x E interaction based on linear regression will have considerable practical value. These results confirmed by many researcher, ( Allard and Bradshaw 1964) , Denis *et al.,* 1997), Abo-Kaied 1992) , Abo-Kaied 2002), Adugna and labuschagne 2002), Chloupek and Hrstkova 2005) and Abo-kaid *et. al.,* 2007).

The bi statistics were significant for all cultivars expet Sakha2, Sakha3 and s421/3/6/5 had bi values of 1.56, 1.97 and 1.56 , respectively, indicating higher production potential in favorable environments . On the other hand , Giza 8, S 420 / 140 / 5 / 11, S 413 / 1 / 3 / 2 , S 426 / 32 / 6/5 and S 435 / 11 / 10 / 3, which had bi values of 0.78, 0.78, 0.26, 0.78 and 0.25, respectively, appeared to be more adapted to poorer environments. Therefore, the bi values provide some information to breeders who are searching for genotypes that have adaptability to special environments.

Becker *et. al.* ( 1982 ) considered the deviation from regression as the most appropriate criterion for measuring phenotypic stability because this statistics measures predictability of genotypic reaction to various environments. However, it appears that the regression coefficient (bi) is a measure of a linear response or the adaptability of a genotype to different environments, and the deviation from regression (S2di) is an estimate of stability or consistency of that response .

The significant S2di values of Sakha 1, Marline, S 533 / 39 / 5 / 11 , S 413 / 1 / 3 / 2 , S 426 / 32 / 6 / 5 and S 421 / 3 / 6 / 5 , indicating their instability (Table 4). On the other hand , statistics from Eberhant and Russel's model ( 1966 ) suggests that Giza 8, Sakha 1 , Marlin , S533 / 39 / 5 / 11 , S 420 / 140 / 5 / 11 , S 413 / 1 / 3 / 2 , S 426 / 32 / 6 / 5 and S 435 / 11 / 10 / 3 genotypes were instable types because of significant regression coefficient ( bi > 1 or < 1 ) .

Using the values of bi and S2di as indicators , the varieties, Sakha 2 , Sakha 3 and Escalina considers as stable varieties across different environments , the bi values were not significantly and differed than one,and their S2di values were also, not significantly and differed than zero, which confirmed the results of environmental index. Denis et al. (1997), Adugna and labuschagne (2002) and Abo-kaid et al (2007). came to the same trend.

The analysis of variance for stability are shown in Table (5). Partition of the G×E interaction into linear response and the deviation from that linearity. *Finlay and Wilkinson (1963)* considered the genotypes which had bi < 1 and S2di = 1 behaved as less sensitive to any change in the environments and would be more adapted to low poor – yielding environments.

Genotypes having (bi > 1) would show more sensitivity to environmental change and adaptability to high rich-yielding environments (Table 6). *Finlay and Wilkinson (1963)* reported also that geno types having bi=1 and S2di > 0, would indicated average stability associated with high mean yield, such genotypes would have general adaptability. From these points of view, the genotypes, Giza 8 , S 420/140/ 5 /11 , S 413/ 1/3/2, S 426/32/6/5 and S 435 /11/10/3 would considered as low sensitive to the change of environments and would be more adapted to low poor-yielding environments, such genotypes could tolerate any deficient in environment elements . On the other side , genotypes , Sakha 1, Marline and S 533 / 39 / 5 / 11 would considered as high (rich) yielding environments, such genotypes couldn't tolerated any deficient in the environments and need. Genotype , S 421 / 3 / 6 / 5 would considered as adapted genotype across a wide range of environments with respect to straw .

Table 4. Means (X) and environmental indices (EI) for straw yield of 12 environment

| | Giza8 | | Sakha1 | | Sakha2 | | Sakha3 | | Marlin | | Escalina | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean(x) | EI | Mean(x) | EI | Mean(x) | EI | Mean(x) | Ei | Mean(x) | EI | Mean(x) | EI |
| S1L1D1 | 4.31 | 0.117 | 5.01 | 0.124 | 4.85 | 0.120 | 4.33 | 0.074 | 4.26 | 0.101 | 3.92 | -0.401 |
| S1L1D2 | 4.23 | 0.037 | 4.92 | 0.034 | 4.76 | 0.030 | 4.25 | -0.006 | 4.18 | 0.021 | 3.85 | -0.471 |
| S1L1D3 | 4.06 | -0.133 | 4.71 | -0.176 | 4.56 | -0.170 | 4.07 | -0.186 | 4.07 | -0.089 | 3.69 | -0.631 |
| S1L2D1 | 4.28 | 0.087 | 4.99 | 0.104 | 4.83 | 0.100 | 4.30 | 0.044 | 4.24 | 0.081 | 4.92 | 0.599 |
| S1L2D2 | 4.20 | 0.017 | 4.90 | 0.014 | 4.74 | 0.010 | 4.22 | -0.036 | 4.16 | 0.001 | 4.82 | 0.499 |
| S1L2D3 | 4.03 | -0.163 | 4.70 | -0.186 | 4.54 | -0.190 | 4.54 | 0.284 | 3.99 | -0.169 | 4.64 | 0.319 |
| S2L1D1 | 4.33 | 0.137 | 5.04 | 0.154 | 4.89 | 0.160 | 4.37 | 0.11 | 4.29 | 0.131 | 3.97 | -0.351 |
| S2L1D2 | 4.25 | 0.057 | 4.95 | 0.064 | 4.80 | 0.070 | 4.29 | 0.034 | 4.21 | 0.051 | 3.90 | -0.421 |
| S2L1D3 | 4.07 | -0.123 | 4.74 | -0.146 | 4.60 | -0.130 | 4.06 | -0.196 | 4.03 | -0.129 | 3.74 | -0.581 |
| S2L2D1 | 4.30 | 0.107 | 5.02 | 0.134 | 4.86 | 0.130 | 4.33 | 0.074 | 4.27 | 0.111 | 4.93 | 0.609 |
| S2L2D2 | 4.22 | 0.027 | 4.93 | 0.044 | 4.77 | 0.040 | 4.25 | -0.006 | 4.19 | 0.031 | 4.84 | 0.519 |
| S2L2D3 | 4.04 | -0.153 | 4.73 | -0.156 | 4.57 | -0.160 | 4.07 | -0.186 | 4.02 | -0.136 | 4.64 | 0.319 |
| Grand mean | 4.193 | 0 | 4.886 | 0 | 4.730 | 0 | 4.256 | 0 | 4.159 | 0 | 4.321 | 0 |

Where: **S1**: season (2006/007 ) **S2** : season (2007/08 ) **L1** :Etay -Elbaroud **L2:** Elgemmeiza

**D1:** October 25th, **D2:** November 10th (control) **D3**: November 25th.

. Table 4 . cont

| | Giza8 | | Sakha1 | | Sakha2 | | Sakha3 | | Marlin | | Escalina | | Grand mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean(x) | EI | Mean(x) | EI | Mean(x) | EI | Mean(x) | Ei | Mean(x) | EI | Mean(x) | EI | |
| S1L1D1 | 4.86 | 0.115 | 4.83 | 0.117 | 4.75 | 0.121 | 4.94 | 0.122 | 4.49 | 0.107 | 4.86 | 0.120 | 4.62 |
| S1L1D2 | 4.77 | 0.025 | 4.74 | 0.027 | 4.66 | 0.031 | 4.85 | 0.032 | 4.41 | 0.027 | 4.77 | 0.030 | 4.62 |
| S1L1D3 | 4.69 | -0.055 | 4.54 | -0.173 | 4.47 | -0.159 | 4.65 | -0.168 | 4.23 | -0.153 | 4.57 | -0.17 | 4.36 |
| S1L2D1 | 4.84 | 0.095 | 4.81 | 0.097 | 4.73 | 0.101 | 4.92 | 0.102 | 4.48 | 0.097 | 4.84 | 0.100 | 4.68 |
| S1L2D2 | 4.75 | 0.005 | 4.72 | 0.007 | 4.64 | 0.011 | 4.83 | 0.012 | 4.4 | 0.017 | 4.75 | 0.010 | 4.59 |
| S1L2D3 | 4.55 | -0.195 | 4.52 | -0.193 | 4.45 | -0.179 | 4.63 | -0.188 | 4.22 | -0.163 | 4.55 | -0.19 | 4.43 |
| S2L1D1- | 4.89 | 0.145 | 4.87 | 0.157 | 4.77 | 0.141 | 4.98 | 0.162 | 4.53 | 0.142 | 4.91 | 0.170 | 4.65 |
| S2L1D2 | 4.80 | 0.055 | 4.78 | 0.067 | 4.68 | 0.051 | 4.89 | 0.072 | 4.45 | 0.067 | 4.82 | 0.080 | 4.57 |
| S2L1D3 | 4.60 | -0.145 | 4.58 | -0.133 | 4.49 | -0.139 | 4.69 | -0.128 | 4.26 | -0.123 | 4.62 | -0.12 | 4.37 |
| S2L2D1 | 4.86 | 0.115 | 4.85 | 0.137 | 4.76 | 0.131 | 4.94 | 0.122 | 4.49 | 0.107 | 4.86 | 0.120 | 4.70 |
| S2L2D2 | 4.77 | 0.025 | 4.76 | 0.047 | 4.67 | 0.041 | 4.85 | 0.032 | 4.41 | 0.027 | 4.77 | 0.030 | 4.62 |
| S2L2D3 | 4.57 | -0.175 | 4.56 | -0.153 | 4.48 | -0.149 | 4.65 | -0.168 | 4.23 | -0.153 | 4.57 | -0.17 | 4.43 |
| Grand mean | 4.745 | 0 | 4.713 | 0 | 4.629 | 0 | 4.818 | 0 | 4.383 | 0 | 4.740 | 0 | |

Where: **S1**: season (2006/007 ) **S2** : season (2007/08 ) **L1** :Etay -Elbaroud **L2:** Elgemmeiza

**D1:** October 25th, **D2:** November 10th (control) **D3**: November 25th.

Several conclusion may be drawn from the present data that are relevant to flax yield breeding programs which include yield stability as an objective, i.e, flax genotypes differ in straw yield stability across changing environments, and high yield potential and stability are not mutually exclusive in the range of environments sampled.

Table 5. Combined analysis of variance for straw yield of 12 genotypes over 12 environments

| Source of variation | d.f | M.S |
|---|---|---|
| Environments (E) | 11 | 218.52** (MSE) |
| Reps/ Environments | 36 | 0.565 (MSB) |
| Genotypes( G) | 11 | 16.85**(MSG) |
| Environments+Envi.x Genotype | 132 | 32.15** |
| GXE | 121 | 5.75** (MSGE) |
| Environments (linear) | 1 | 53.83** |
| GXE ( linear response) | 11 | 185.25** |
| Dev.from linear response | 120 | 3.45 |
| Pooled error | 396 | 0.95( MSE) |
| Linear proportion of variance ( % ) | | 98.17 |

(**) indicate significant at 1% level of probabilit

# CONCLUSION

The varieties, Sakha2, Sakha 3 and Scalina considered as stable genotypes across a wide range of environments. The line, S 436/3/6/5 considered as adapted genotype. The genotypes, Sakha1, Marlin and S 533/39/5/11 were more sensitive to any change in the environment and considered as haigh-yielding environments and the genotypes, Giza 8, S 420/140/5/11, S 413/1/3/2, S 426/32/6/5 and S 435/11/10/3 appeared to be more adapted to poorer environments.

Table 6. Mean straw yield, phenotypic (bi, S2di) stability parameter for linseed genotypes over 12 environments

| Genotype | Mean t/fad | bi±s.e | S2di | Classification of genotypes |
|---|---|---|---|---|
| Giza 8 | 4.19 | 0.78*±0.165 | 0.174 | Low (poor)-yielding environment |
| Sakha1 | 4.88 | 1.56*±0.232 | 0.385* | High (rich)- yielding environment |
| Sakha2 | 4.73 | 0.87±0.266 | 0.092 | Yield stability |
| Sakha3 | 4.21 | 1.06±0.192 | 0.012 | Yield stability |
| Marlin | 4.11 | 1.97*±0.151 | 0.985* | High (rich)- yielding environment |
| Escalina | 4.32 | 1.14±0.249 | 0.055 | Yield stability |
| S533/39/5/11 | 4.75 | 1.56*±0.199 | 2.125* | High (rich)- yielding environment |
| S420/140/5/11 | 4.71 | 0.78*±0.181 | 0.076 | Low (poor)- yielding environment |
| S413/1/3/2 | 4.62 | 0.26*±0.112 | 0.846* | Low (poor)- yielding environment |
| S426/32/6/5 | 4.80 | 0.78*±0.164 | 0.548* | Low (poor)- yielding environment |
| S435/11/10/3 | 4.30 | 0.25*±0.149 | 0.028 | Low (poor)- yielding environment |
| S421/3/6/5 | 4.74 | 1.03±0.113 | 0.885* | Yield adaptability |

- significant at 0.05 levels of stability

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# التفاعل بين البيئة والتراكيب الوراثية والثبات المظهرى لمحصول القش فى الكتان

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استخدم لدراسة هذا البحث ١٢ تركيب وراثى هى (الاصناف التجارية جيزة ٨ وسخا١وسخا٢ووالصنفين المستوردين مارليين واسكالينا والسلالات المبشرة س٥٣٣/٣٩/٥/١١ وس٤٢٠/١٤٠/٥/١١ وس٤١٣/١/٣/٢وس٤٢٦/٣٢/٦/٥وس٤٣٥/١١/١٠/٣وس٤٣٦/٣/٦/٥ فى١٢ بيئة تمثل موقعين للزراعة هما محطة البحوث الزراعية بايتاى البارود ومحطة البحوث الزراعية بالجميزة وثلاث مواعيد زراعة الميعاد الاول كان فى ٢٥ اكتوبر والثانى ١٠ نوفمبر والثالث ٢٥ نوفمبر فى موسميين ٢٠٠٦/٢٠٠٧و٢٠٠٧/٢٠٠٨على التوالى ، كان التصميم المستخدم هو تصميم القطاعات الكاملة العشوائية فى اربع مكررات . و قد تم حساب تقدير الثبات الوراثى المظهرى لمحصول القش طبقا لـ (*Eberhart and Russell 1966*)

اشارت النتائج الى ان التباين الكبير الراجع لتأثير البيئة على محصول القش كان اكثر اهمية عن التأثير الراجع الى اختلاف التراكيب الوراثية وهذا انعكس على التفاعل بين التراكيب الوراثية والبيئة اما دراسة الثبات الوراثى المظهرى طبقا لـ (*Eberhart and Russell1966*) اشارت الى النتائج الاتية:-

الأصناف سخا ٢ ، سخا ٣ ، سكالينا تعتبر أصناف ثابته من الناحيه المظهريه بينما السلاله S421/3/6/5 تعتبر سلاله أكثر تأقلما للتغيرات البيئيه و كانت التراكيب الوراثيه سخا ١ ، مارلين ، S533/39/9/11 أكثر حساسيه لأي تغيرات بيئية و تعتبر تراكيب وراثيه مناسبه للبيئات الغنيه أو عاليه المحصول بينما التراكيب الوراثيه جيزه ٨ ، S 420/1/5/11 ، S 413 /1/3/2 ، S 420/32/6/5 ، S435/11/10/3 أكثر مناسبه للبيئات الفقيرة منخفضة المحصول.